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Evaluation of Research Capital Funding (SRIF2006-08) to Higher Education Institutions 2006-2008

Report by PACEC to the four UK higher education funding bodies and the Department for Business Innovation and Skills

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Project Team

Barry Moore (Project Director)
Rod Spires
Kate Hale
Tom Hilton
Matt Rooke
Nii Djan Tackey
Professor Peter Townroe

PACEC
Public and Corporate
Economic Consultants
www.pacec.co.uk
49-53 Regent Street
Cambridge CB2 1AB
Tel: 01223 311649
Fax: 01223 362913
e-mail: admin@pacec.co.uk

List of Acronyms

BIS	Department for Business Innovation and Skills
CoRIF	Consolidated Radio Isotope Facility
DEL	Department for Employment and Learning
GSK	Glaxo SmithKline
GVA	Gross Value Added
HEFCE	Higher Education Funding Council for England
HEFCW	Higher Education Funding Council for Wales
HEI	Higher Education Institution
HESA	Higher Education Statistics Agency
JIF	Joint Infrastructure Fund
NERC	Natural Environment Research Council
NMR	Nuclear Magnetic Resonance
QR	Quality Related (Fund)
RIF	Research Investment Fund
SFC	Scottish Funding Council
SRIF	Science Research Investment Fund
UK	United Kingdom

Key Messages from the Evaluation

The capital funding provided to universities and colleges across the UK over the two years 2006-08 has contributed to raising the research capability, research capacity and the quantity and quality of research output, thereby stimulating and supporting innovation and driving productivity and growth across the UK economy.

The funding has helped to lever-in other funding, so the scale of investment that universities and colleges have made was greater than would have been the case without the capital funding. Consequently, the scale, reach and timeliness of research capital investments were greater than would otherwise have been possible. Furthermore a substantial part of the funding acted as seed corn and as a result the impacts of the investments generated – as described below – would have been considerably less without the capital funding. The evidence also shows that the funded investments are now more strategically focused to help support research goals.

The investment has continued to improve the quality of research and has supported new areas of research for almost all universities and colleges. Improved student and staff morale, better quality and quantity of research training and increasing interdisciplinary collaboration are also benefits associated to these capital investments. Additionally the facilities funded have contributed to attracting and retaining top quality researchers and have had a positive impact on the research skills of staff.

The vast majority of project objectives were met, with projects being delivered on time and within budget. While these funds have been invested into research facilities the evidence demonstrates the interconnection of all activities in higher education institutions (HEIs), with benefits downstream for knowledge exchange and for teaching at both postgraduate and undergraduate levels.

The research facilities that resulted from the funding have been increasingly made available to outside organisations, which has increased the effectiveness of knowledge exchange activities. In particular, this improved availability has strengthened the relationships between industry and universities and colleges. Altogether these funds have had a highly positive impact on the global competitiveness of UK research.

The 2006-08 round of research capital funding has built on previous rounds. These continued investments have helped enable the majority of universities and colleges to acquire modern, state-of-the-art infrastructure, with the subsequent positive impacts from the use of the facilities, as set out in this report. However, the evidence is also clear that continued investment – supported by continued capital funding – is essential if the UK research base is to remain excellent and internationally competitive.

Executive Summary

X1 Aims of the project

X1.1 In February 2012 Public and Corporate Economic Consultants (PACEC) was commissioned by the three Higher Education Funding Councils of England, Scotland and Wales, the Department for Employment and Learning and the Department for Business Innovation and Skills to undertake to quantify the benefits that have arisen from the provision of research and infrastructure capital funding through the Science Research Investment Fund (SRIF) covering the period April 2006 to March 2008 (SRIF2006-08). The primary aims of this evaluation of SRIF2006-08 are:

- To assess whether the research capital funding provided from April 2006 to March 2008 has led to the achievement of the outputs, outcomes and objectives set for those capital programmes.
- To identify where the outputs, outcomes and objectives of those programmes have not been met, the reasons for such non-achievement and any lessons to learn for the future.
- To assess and, where possible, quantify the benefits that have been achieved through SRIF2006-08 capital funding.
- To prepare 10 case studies, to be selected from 30 case studies to be undertaken, to provide an economic appraisal of the returns of the project.

X2 Framework and empirical methodology

X2.1 A standard logic evaluation framework is to guide the empirical research programme. This framework, widely used in value-for-money evaluations, distinguishes **inputs** (resources committed to the policy programme); **activities** supported or facilitated by funded projects of HEIs; **outputs** which are the direct products from the different activities/projects being undertaken and the **benefits** for HEIs, users and the wider economy **(**as reflected in impacts and outcomes) arising from these outputs.

X2.2 The empirical research involved an integrated programme of secondary and primary data collection, database assembly and data analysis.

- **Postal survey**, A stratified random sample of 500 project (203 useable responses; response rate of about 40%)
- **A web-based** survey of users internal to the HEI (194 useable responses)
- **A telephone survey and web-based survey** of users external to the HEI (50 useable responses)
- **Case studies** of 30 SRIF2006-08 projects involving Project Coordinator and Project Manager
- **Desk research of:**
  - SRIF2006-08 funding applications
  - Selected Higher Education Statistics Agency (HESA) data

X2.3 The data analysis is organised within the logic evaluation framework and provides quantitative and qualitative evidence of the outputs, outcomes and impacts from

SRIF2006-08 funding (i.e. the gross effects of SRIF2006-08) and also the gross additional effects by allowing for what would have occurred in the absence of SRIF2006-08 research capital funding.

X2.4 The following policy performance measurements are made:

- Benefits are assessed for:
  - HEIs
  - Internal users (academics and postgraduates) of the research capital facility
  - External users (firms and other organisations) of the research capital facility
  - The wider UK economy
- Cost effectiveness:
  - cost per job created by research capital spend
- Cost benefit balance sheet
- Effectiveness (achievements relative to objectives)

X3 SRIF2006-08 funding and other inputs

X3.1 SRIF2006-08 funding amounted to £1.08bn, of which England accounted for £901m 84%), Scotland for £103m (10%), Wales for £46m (4%) and Northern Ireland for £24m (2%)

X3.2 The Top 6 HEIs (University of Cambridge, Imperial College London, King's College London, Manchester University, University of Oxford, University College London), and 36 High research-intensity HEIs were allocated £799m (360 projects). The remaining 115 HEIs were allocated £277m[1].

X3.3 Additional funding from other sources that supported SRIF2006-08 investment was £0.91bn, giving a total of £1.99bn in research capital funding for the period 2006 to 2008.

X3.4 Project managers were asked how much of the additional investment would have been made in the absence of SRIF2006-08. In the absence of SRIF2006-08, £541m in research capital funding would have been available, indicating that £372m of funding was 'levered in' by SRIF2006-08. In other words if SRIF2006-2008 had not gone ahead, total investment would have been lower by more than the value of SRIF2006-08.

X3.5 Subsequent to the completion of the SRIF2006-08 programme in 2008, further funding from both the public and private sector has been forthcoming primarily to extend the scale of the project and cover upgrade costs.

[1] This classification of HEIs derives from HEFCE-funded research published as the report Evaluation of the Effectiveness and Role of HEFCE/OSI Third Stream Funding 2009/15 http://www.hefce.ac.uk/pubs/year/2009/200915/

X4 SRIF2006-08 investment projects

X4.1 Over half (56%) of SRIF2006-08 was used to fund buildings only, compared with only 12% funding equipment only and the remainder funding a mix of buildings and equipment. Only 12% of building projects were new builds.

X4.2 Science, Technology, Engineering and Mathematics (STEM) disciplines were allocated 74% of SRIF2006-08 funding

X4.3 Biological Sciences were the top beneficiary of SRIF2006-08 with an allocation of £196m and total funding of £438m, Medicine and Dentistry received £146m (total £250m) and Engineering and Technology £142m (total £215m).

X4.4 37% of Project Managers faced at least one constraint that they perceived mattered to a large extent in meeting the projects objectives. The main constraints most frequently reported were related to funding and lack of qualified personnel.

X5 Outputs

X5.1 SRIF2006-08 was invested in research infrastructure but some of that investment also benefited postgraduates, undergraduates and knowledge exchange activity, as well as research.

X5.2 SRIF2006-08 investments are cited by over 90% of project managers as having a high or medium impact on their HEI's research quality and in supporting the opening up of new areas of research. 67% of project managers reported a high impact on research quality, 65% on the opening up of new areas of research, 62% on raising research productivity and 56% a high impact on the quantity of research carried out.

X5.3 Other frequently cited outputs included increased student and staff morale (64% high impact) and improved quality and quantity of research training (57%) and (36%) respectively.

X5.4 Utilisation of SRIF2006-08 research infrastructure as reflected in the percentage of time utilised on average per year was 56% for buildings, 39% for research equipment supporting specific research projects and 45% for research equipment supporting generic research capabilities.

X5.5 Utilisation of buildings was higher for the Top 6 and High Research HEIs, higher for generic research equipment but lower for specific research equipment.

X5.6 Just over half (54%) of Project Managers reported external organisations using SRIF2006-08 funded infrastructure.

X6 Benefits

X6.1 SRIF2006-08 has delivered a diverse range of benefits by facilitating an enhanced quality and quantity of research, improved training of researchers and increased engagement of the HEI and its staff and students with external organisations and individuals. The HEIs themselves have benefited, as have their academic staff and students and a wide range of external commercial and public sector organisations and individuals in the wider economy and society more generally.

X6.2 **Benefits to HEIs:** Almost all (93%) of the project managers claimed a high or medium impact on their department's reputation, while 70% claimed the impact was high. Improved research infrastructure helped attract research funding and facilitated increased interdisciplinary collaboration with 88% and 79% of respondents reporting a high or medium impact respectively. In terms of employment and skills, the HEIs are not only able to attract higher quality staff, but are now better able to retain staff and this was particularly the case for the more research-intensive HEIs. On the whole, two-fifths (40%) of projects have had a highly positive impact on the research skills of their staff.

X6.3 More than a third of the project managers claimed that SRIF2006-08 has significantly increased the effectiveness of their engagement in knowledge exchange, whilst more than a quarter felt that the new infrastructure had either strengthened their existing partnerships with external non-academic partners (29%) or generated new such partnerships (26%).

X6.4 The benefit of attracting higher quality staff is skewed in favour of the top UK research universities. Only one in five (21%) project managers in less research-intensive HEIs claimed a high impact in this area, compared to 39% of those in Top 6 universities.

X6.5 **Benefits to external users:** More than half of the project managers in the survey (54%) indicated that external organisations (firms, public sector organisations, charities etc) used their SRIF2006-08-funded infrastructure.

X6.6 The area where impact was greatest was the strengthening of relationships between industry and HEIs, which presents the prospect of collaborating for innovation in the future. Around one in five project managers (21%) believed that the infrastructure has enhanced networking between academics and industry.

X6.7 Just under a fifth of the project managers (18%) also believed that the SRIF2006-08 projects have had a high impact on the skills and capabilities of external partners. Importantly, around one in six (16%) project managers indicated that collaboration has led to their external partners developing new products and processes.

X6.8 Overall, about one in ten (11%) project managers felt that the projects have already made a high impact on the overall business performance of the external users.

X6.9 **Wider UK benefits:** Almost half of the project managers (48%) believed that the investments made have had a high impact on the global competitiveness of UK research. More than two-fifths (43%) were convinced that the investments have improved the UK's innovation capabilities considerably.

X6.10 With regards to external engagement, four-fifths (80%) believed that the investments had at least a medium impact but more importantly 41% of project managers reported a high impact on the ability of their research to meet national strategic priorities.

X6.11 **Overall policy performance:** Overall, the 2006-08 research capital funding programme has been remarkably effective (i.e. achievements relative to objectives) with over 90% of projects entirely or largely satisfying their overall objectives.

X6.12 Two-thirds of managers of buildings projects (67%) claimed to be 'entirely' satisfied that they had achieved their original objectives, while fewer than half of managers of equipment projects (47%) claimed a similar level of effectiveness.

X6.13 Overall SRIF2006-08 was 86% effective (weighted average) with respect to projects meeting their objectives.

X6.14 37% of project managers faced one or more constraints in securing their project objectives. Funding problems were the most frequently reported constraints causing projects to not fully achieve their objectives.

X6.15 **Cost effectiveness** (i.e. cost per job from SRIF2006-08 spending on buildings and equipment): It is estimated that over the period of construction activity and the manufacturing of equipment, 25,100 jobs were created for a cost per job of £54,800. These estimates exclude any jobs created in the HEI sector and jobs created via additional R&D resulting from the improved research infrastructure. Including such jobs would reduce the cost per job of SRIF2006-08 and it should be recognised that, unlike the spending-related jobs noted above, many of these jobs not counted would continue to exist over a number of years.

X7 Impacts on internal users

X7.1 Over half (53%) of HEI academic staff use the SRIF2006-08 facilities every day and about one sixth (17%) every other day. Over three-quarters (78%) of respondents reported their primary activity was basic research. One quarter of respondents used the facilities for internal collaborative research and a similar proportion for external collaborative research. Facilities were also used for postgraduate (37%) and undergraduate teaching (21%)

X7.2 Prior to provision of the upgraded facilities, the main premises-related constraint facing academics in achieving their research objectives was poor quality and lower specification research infrastructure (52% major/moderate constraint). Limited access was also a constraint faced by one third of internal users. The constraint imposed by

obsolete technology was a major problem for 14% of respondents and a moderate constraint for a further 14%.

X7.3 With respect to equipment, just under half (47%) reported poor quality and low specification as a major or moderate constraint on their research objectives, while a quarter reported that no comparable equipment had been available to them. Equipment rendered obsolete by new technologies was also a major constraint for 22% of respondents prior to investment under SRIF2006-08. This was a moderate constraint for a further 12%.

X7.4 SRIF2006-08 improvements to premises are reported to have had a major impact on both the quality and quantity of research carried out by internal users (67% and 53% respectively). The upgraded facilities also enabled new areas of research to be opened up for 68% (major/moderate impact).

X7.5 Improved premise facilities also had major/moderate impacts on interdisciplinary research (50% of respondents) and increased collaborative working both within the HEI and with external organisations.

X7.6 The reported impacts of new and improved equipment also reveal a wide range of impacts and benefits to users, the HEI, students and the wider UK economy. Increased research quality (68%), research output (50%) and the opening up of new areas of research (50%) are reported as major impacts by internal users. About one quarter (23%) of respondents point to increased engagement with external organisations and increased collaborative work within the HEI. Improved teaching capability is reported as a major impact by 25% of internal users.

X7.7 The counterfactual analysis indicates significant additionality of impacts, with about two-thirds of respondents reporting that impact would not otherwise have been realised (not at all or slightly) in the absence of SRIF2006-08.

X7.8 Just over two-thirds (68%) of internal users reported an excellent level of satisfaction with the upgraded facilities and 28% a good level.

X7.9 Almost half (47%) of internal users stated that SRIF2006-08 was either critically important (22%) or very important (25%) to the retention and recruitment of research staff.

X8 Impact on external users

X8.1 Of the 50 external users interviewed or responding to a questionnaire on the web, 44% were HEIs, 48% were businesses and the remainder were in the public sector or third sector. Just under half (46%) of the businesses were large firms.

X8.2 Over half (52%) of users had previously made regular use of HEI infrastructure and this was also the case with business respondents (54%).

X8.3 The main sources of information on the availability of SRIF2006-08 research facilities were existing academic networks (61%) or previous engagement with HEIs (25%).

X8.4 Almost half (47%) of all external users and 64% of businesses had been using the SRIF2006-08 research infrastructure for more than two years, indicating perhaps the development of long term relationships. One third (33%) had been using the equipment for less than one year. The frequency of use was variable, with some external users using the research facilities only once a year and others every day. Over three-quarters (78%) of business were charged a fee compared with only 16% of HEIs.

X8.5 The main constraints faced by external users in carrying out the research in-house (that is, constraints judged to be 'severe') were the insufficient scale of facilities available in-house, (for 62% of all external users and 76% of businesses) and the infeasibility of developing in-house facilities owing to their cost, (for 26% of all external users and 30% of businesses). With respect to equipment, the constraint of insufficient scale was most frequently reported, with 61% of all users and 76% of business users reporting this as a 'severe' constraint

X8.6 The main motivations for external organisations using SRIF2006-08 facilities and equipment and perceived as 'critically important' were the quality of staff at the HEI and the convenience of the location (48% for all external users and 50% for businesses).

X8.7 The SRIF2006-08 infrastructure was primarily used for research by external users (57% of all external users) with 26% of all external users using it for collaborative research and 35% of businesses for this purpose.

X8.8 The major impacts reported by external users from SRIF2006-08 facilities were increased collaboration with HEIs (45% for all external users and 47% for businesses), the development of new products and processes (30% for all external users and 37% for businesses) and enhancement of workforce skills (30% for all external users and 42% for businesses). Just under one third (32%) of businesses also reported enhancement of innovative capabilities. Similar frequencies to those presented above for the impact of facilities funded by SRIF2006-08 are also reported for the impacts associated with equipment.

X8.9 External users were asked to judge the impacts of the use of SRIF2006-08 on their quality of service, productivity, turnover and employment. The most frequently reported impacts were related to the quality of service and productivity, with 40% of users judging their quality of service to have increased by more than 20% and 38% their productivity to have increased by more than 20%.

X8.10 Just over one third (36%) of respondents reported that the impacts arising from SRIF2006-08 funded facilities would not have occurred at all in the absence of SRIF2006-08. Just over one quarter (27%) of respondents reported that the impacts

arising from SRIF2006-08 funded equipment would not have occurred at all without SRIF2006-08.

X8.11 The external users reported a very high degree of satisfaction with the SRIF2006-08 funded research infrastructure. 98% of all external users claimed to have had an excellent or good experience in using the infrastructure. Over two-thirds (68%) of businesses reported an excellent experience and just under one third (32%) a good experience.

X8.12 The main constraint faced in using the research infrastructure was the limitation resulting from excess demand, which was reported by 19% of external users, although 9% reported a lack of support staff and the out-of-date technology of the infrastructure

X9 Legacy and sustainability

X9.1 SRIF2006-08 enabled only a minority (17%) of the project managers to acquire the scale of research infrastructure that *completely* meets their overall objectives, although 54% of projects were of a scale to meet their objectives to a large extent.

X9.2 Perhaps more importantly, the SRIF2006-08 investments have enabled the majority of the HEIs to acquire modern, state-of-the-art infrastructure. One in five (22%) claimed the investment had enabled them to entirely fulfil this need and 54% to largely fulfil this need. 84% of project managers with projects in STEM departments reported that they had entirely or largely been able to meet their need for state-of-the art infrastructure compared with only 63% in non-STEM disciplines.

X9.3 With regard to the extent to which SRIF2006-08 helped HEIs address the issue of previous under-investment in research capital infrastructure, the survey evidence suggests that SRIF2006-08 made good progress in this respect. More than half of the projects (56%) have helped to meet the backlog of investment to a large extent, although only 4% of project managers reported that the backlog of investment that they faced in their discipline/department had been entirely alleviated.

X9.4 Nearly all (98%) of the project managers were in no doubt that HEIs would continue to need further investments in the future in order to fully meet their research objectives. Almost three-fifths of them (59%) believed that future substantial capital investments would be required.

1 Introduction

1.1 Background to SRIF2006-08

1.1.1 The current drive to renew, improve the quality of, and develop UK higher education research infrastructure has its roots in the 1998 *Comprehensive Spending Review* and the subsequent launch of the Joint Infrastructure Fund (JIF), which had a total value of £750 million, co-funded by the government and the Wellcome Trust. The goal was to renovate the UK research infrastructure, much of which dated back to the 1960s and 1970s and was approaching the end of its lifecycle, and to bring the UK to the forefront of a fast-moving and highly competitive world of scientific advancement.[2] In 2002, JM Consulting Ltd found that around half of the UK higher education (HE) estate was in poor shape and in need of major investment in order to make up for underinvestment in previous years. The HE estate included some £26 billion worth of research and teaching buildings and £8 billion of equipment and contents.

1.1.2 In response to this the JIF was accordingly replaced by the first Science Research Investment Fund (SRIF), which ran from 2002 to 2004 and totalled around £1 billion. This was subsequently extended to a second round (SRIF2) of a similar value, running from 2004 to 2006. The third round (SRIF2006-08) allocated just over £1 billion between 2006 and 2008, and is the subject of this evaluation. The SRIF2006-08 allocations were designed to build upon the prior investments made in SRIF1 (2002-2004) and SRIF 2 (2004-2006).

1.1.3 Specifically SRIF2006-08 funding aimed to:

- Contribute to the long-term financial sustainability of higher education institution (HEI) research activities and the physical infrastructure supporting them
- Contribute to addressing past under-investment in HEIs' physical infrastructure for research
- Promote collaborative partnerships between HEIs, industry, charities, government and NHS trusts
- Promote high-quality research capability in areas of national strategic priority, as set out in the government's ten year investment framework for science and innovation[3]

1.1.4 The funding aimed to make significant progress towards sustainable institutional infrastructure, and support and encourage pioneering research, particularly in science, technology, engineering and mathematics (STEM) subjects, with a view to increasing the UK's competitiveness on an international scale. HEIs were asked to ensure that they address whole life costs and environmental issues when developing their programmes, and emphasis on these aspects of projects has become progressively more important each year since funding became available.

[2] The Allocation of the Science Budget 1999-00 to 2001-02; The Allocation of the Science Budget 2008/09 to 2010/11 (2007) Department for Innovation, Universities and Skills

[3] http://webarchive.nationalarchives.gov.uk/+/http:/www.hm-treasury.gov.uk/spending_sr04_science.htm

1.2 Aims of the evaluation

1.2.1 The aims of this evaluation of SRIF2006-08 are:

- To assess whether the research capital funding provided from April 2006 to March 2008 has led to the achievement of the outputs, outcomes and objectives set for those capital programmes.
- To identify where the outputs, outcomes and objectives of those programmes have not been met, the reasons for such non-achievement and any lessons to learn for the future.
- To assess and where possible to quantify the benefits that have been achieved through SRIF2006-08 research capital funding provided from April 2006 to March 2008.
- To undertake 30 case studies, a selection of which is to form part of the report, ranging in levels of impact. The case studies are to provide as robust as possible an economic appraisal of the returns (quantifiable or otherwise) of the project. These case studies would need to be agreed by the steering group and should be representative across all four countries and types of institution

1.3 Approach and methodology

The evaluation logic model

1.3.1 Our empirical research programme to achieve the above aims and objectives is organised and guided by the standard logic evaluation framework widely used in policy evaluation research and government value for money assessments. This framework distinguishes relevant **inputs** (resources committed to the policy programme); **activities** supported or facilitated by funded projects of HEIs; **outputs** which are the direct products from the different activities/projects being undertaken, and the **impacts** and **outcomes** arising from these outputs in order to secure the aims and objectives of the policy programme.

1.3.2 The evaluation framework with selected examples of the different elements in the broad categories of inputs, activities, outputs, and impacts and outcomes is shown in Table 1.1 below. Inputs include the SRIF2006-08 funding and other funding from a range of different sources. Activities supported by the SRIF2006-08 funded projects include new equipment, new premises and refurbishment of existing premises. Outputs arise from the different activities supported by the SRIF2006-08 research capital investments. Outputs generate impacts and benefits in a wide variety of ways. There are benefits for HEIs and their constituent schools and departments including departments concerned with knowledge exchange. There are impacts and benefits for individual researchers, students and external users, and there are wider impacts and benefits for the local, regional and national economy.

1.3.3 In approaching the measurement of the different elements in the evaluation framework we have used both quantitative and qualitative indicators. Moreover, although the SRIF2006-08 programme was initiated and funded in the period 2006-2008, it should be recognised that some of its outputs, impacts and outcomes are still

emerging, and will continue to do so, and therefore any evaluation at this stage will not capture the full stream of benefits ultimately arising from this investment. At the same time owing to technical progress some equipment purchased under SRIF2006-08 may well be becoming obsolescent and no longer state of the art.

Figure 1.1 An evaluation framework for the SRIF2006-08 research capital funding

Inputs • SRIF2006-08 funding 2006-2008 • Other research capital funding inputs
Activities • Increase area of floor space provided • Improved and refurbished premises for research • Increase quantity of new and improved equipment
Outputs • Increased quantity of research • Improved research quality • Attraction of better quality students • Increase numbers of external users • Basic, applied and user-led research • Collaborative/interdisciplinary research within the HEI • Knowledge exchange events • Collaborative research with external organisations • Postgraduate and undergraduate teaching and research training
Impacts and outcomes • Improved research and educational experience for staff and students • Improved overall satisfaction of staff, students and other users • Improved staff recruitment and retention • Improved staff morale • Improved reputation of HEI • Strengthened external engagement of HEI with external organisations and communities • Enhanced R&D capability and innovative potential of external user organisations

Empirical methodology and data collection

1.3.4 The empirical research involved an integrated programme of secondary and primary data collection, database assembly and data analysis:

- **Postal survey of project managers** supported by web-based questionnaire and telephone prompting. A stratified random sample of 500 project managers selected from a sampling frame of 729. The 203 useable responses to date equal a response rate of just over 40%
- **A web survey of internal users** (academic staff, postgraduates and undergraduates) of SRIF 2006-08 (194 useable responses)

- **A web survey of external users** (firms, public sector organisations, other) of SRIF2006-08 (50 useable responses)
- **Case studies** of 30 SRIF2006-08 projects involving:
  - a face-to-face or telephone interview with the Project Coordinator
  - a face-to–face or telephone interview with the Project Manager
- **Desk research of:**
  - SRIF2006-08 funding applications
  - Selected Higher Education Statistics Agency (HESA) data

Empirical methodology and data analysis

1.3.5 In evaluating the value and benefits that have been achieved through the research capital funding provided by SRIF2006-08, the approach adopted here recognises that some of the identified achievements and benefits would still have been realised had SRIF2006-08 not been introduced (i.e. the counterfactual). The analysis therefore not only measures the *perceived* outputs, impacts and benefits from SRIF2006-08 funding (i.e. the gross effects of SRIF2006-08) but also the *perceived* gross additional effects, by asking project managers and users what would have occurred in the absence of SRIF2006-08 research capital funding.

Performance measures

1.3.6 In approaching the issue of assessing the achievements of SRIF2006-08 a cost/benefit analysis in which both costs and benefits would be quantified and appropriately discounted was ruled out owing to the prevalence of a range of benefits for which only qualitative evidence could be assembled. The evaluation presented below therefore uses cost effectiveness measures and subjective assessments by users of their satisfaction with the SRIF2006-08 equipment and facilities. The following policy performance measures are measured:

- Cost effectiveness
  - cost per job created by research capital spend
- Effectiveness (achievements relative to objectives)

1.3.7 In addition, benefits and costs will be brought together in a cost benefit balance sheet which presents SRIF2006-08 funding and other funding secured for the research capital project investments, as well as the nature, range and frequency of which perceived benefits are reported by HEI project managers.

1.4 Report structure

1.4.1 Following this Introduction, Chapter 2 analyses the SRIF2006-08 funding and other sources of research capital funding in support of SRIF2006-08 in the period 2006 to 2008. Chapter 3 focuses on presenting the activities and investment projects funded under SRIF2006-08. Chapter 4 analyses the outputs and Chapter 5 the outcomes and impacts (benefits) including the different measures of policy performance of SRIF2006-08. Chapters 6 and 7 report on the experience of internal and external

users respectively. Chapter 8 focuses on legacy and sustainability. Chapter 9 presents conclusions and recommendations.

2 SRIF2006-08 Inputs

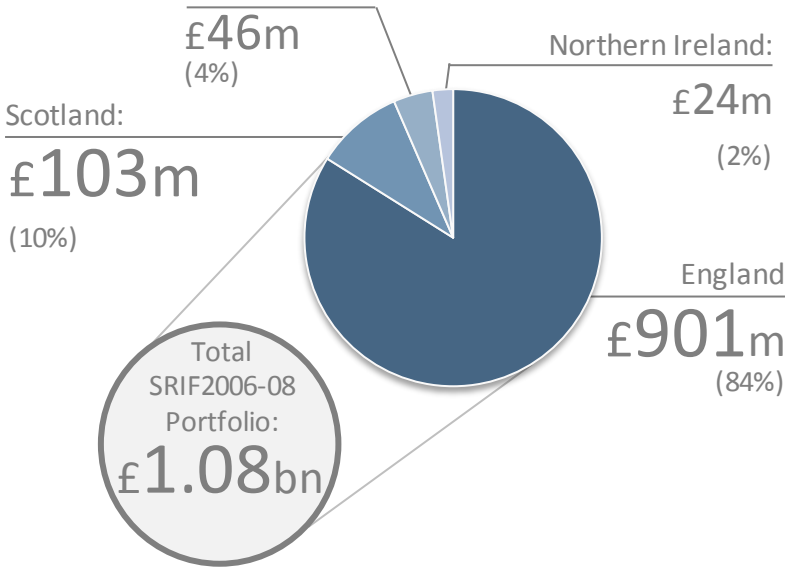
2.1 Introduction

2.1.1 This chapter analyses the scale and deployment of research capital funding carried out under the SRIF2006-08 programme. SRIF was a UK-wide programme of capital investment providing funding for equipment and premises for research, and was funded jointly by the former Office of Science and Technology (now part of the Department for Business Innovation and Skills, BIS) and the four UK HE funding bodies (HEFCE, DEL, HEFCW, SFC). SRIF2006-08 was the third round of funding since the 2000 Spending Review committed the government to support the upgrading of the research infrastructure of the nation's HEIs as part of the reform of the then Joint Infrastructure Fund (JIF). The increased level of funding and the improvements made in the efficiency of the funding process led to significant progress in addressing problems of unfit and non-compliant infrastructure that existed in 2001. As at 2006, the JM Consulting report (Future needs for capital funding in higher education, September 2006) estimated that the remaining UK science research infrastructure backlog had been reduced to £1-2 billion (at 2006 prices). SRIF2006-08 focused on securing further improvements in the condition of the HEI estate as well as upgrading the stock of research equipment.

2.2 The SRIF2006-08 portfolio

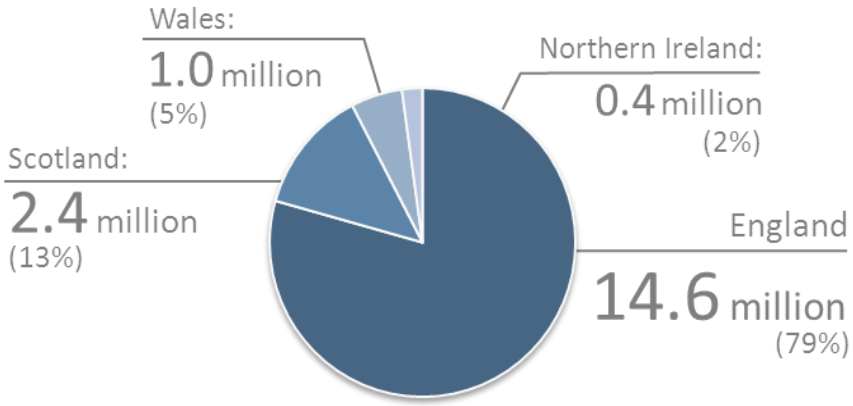
2.2.1 SRIF2006-08 allocated £1.08bn for the period April 2006 to March 2008. The funding allocation was formula-based with 50% allocated in proportion to HEIs' formula funding for research and the remaining 50% allocated on the basis of the combined total of HEI external research income. The resultant allocations to the constituent countries of the UK are shown in Figure 2.1. The size of the non-residential estate and the insured asset value are shown in Figure 2.2 and Figure 2.3 respectively.

Figure 2.1 SRIF2006-08 allocation by country



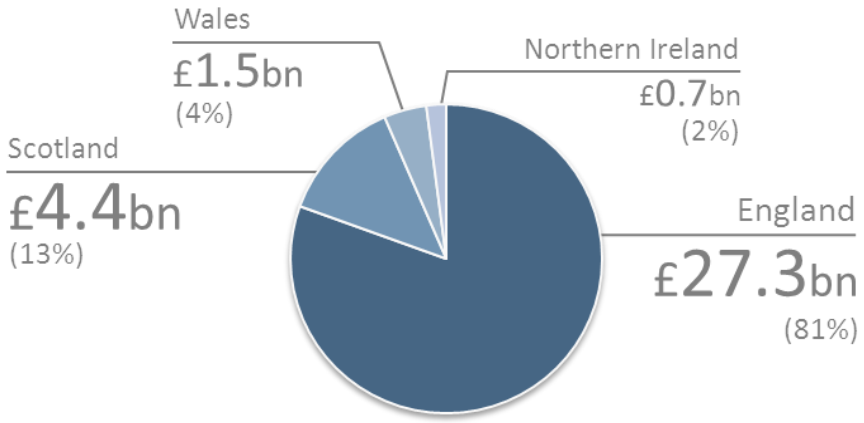
Source: SRIF2006-08 Management Data

Figure 2.2 Size of the non-residential HEI estate (square metres, 2004/05)



Source: JM Consulting (2006)

Figure 2.3 Insured asset value of the non-residential HEI estate (2004/05)



Source: JM Consulting (2006)

2.2.2 Of the 157 HEIs in the UK, the Top 6 and 36 High Research intensity HEIs were allocated £800m in support of 360 projects, equal to about three-quarters of total SRIF2006-08 capital research funding. The level of funding per research academic differed sharply across the HEI research clusters in each country and across HEI research clusters within countries. For example, in England SRIF2006-08 funding per full-time equivalent (FTE) research academic working in the Top 6 cluster was three times that of a research academic in the 'Other' HEIs. SRIF2006-08 funding per research academic in England was 31% higher than in Scotland (See Table 2.1).

Table 2.1 Distribution of the SRIF2006-08 portfolio

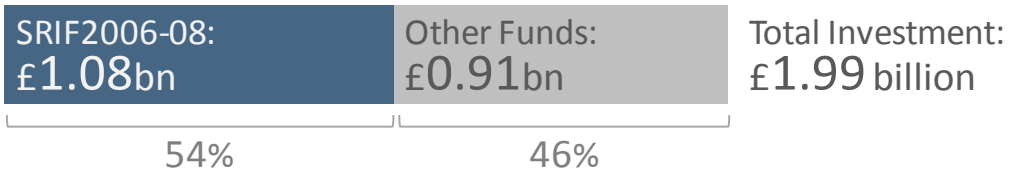
Country	HEI Research Intensity Cluster	HEIs		Number of Projects	SRIF2006-08 Allocation			Funding per Research Academic FTE
		Number	Share of UK		Total	Share	Average per HEI	
England	Top	6	3.8%	117	£347.3m	32.3%	£57.9m	£21,053
	High	36	22.9%	243	£452.5m	42.1%	£12.6m	£18,516
	Other	83	52.9%	210	£103.1m	9.6%	£1.2m	£7,031
	Total	*125*	*79.6%*	*570*	*£903.0m*	*83.9%*	*£7.2m*	£16,240
Scotland	Top	2	1.3%	15	£51.9m	4.8%	£26.0m	£14,991
	High	5	3.2%	41	£40.8m	3.8%	£8.2m	£11,827
	Other	12	7.6%	45	£10.2m	1.0%	£0.9m	£7,145
	Total	*19*	*12.1%*	*101*	*£103.0m*	*9.6%*	*£5.4m*	*£12,336*
Wales	High	4	2.5%	34	£43.2m	4.0%	£10.8m	£17,301
	Other	7	4.5%	14	£3.3m	0.3%	£0.5m	£3,773
	Total	*11*	*7.0%*	*48*	*£46.5m*	*4.3%*	*£4.2m*	*£13,804*
N. Ire	High	2	1.3%	10	£23.6m	2.2%	£11.8m	£14,482
UK Total		*157*	*100%*	*729*	*£1,076m*	*100.0%*	*£6.9m*	*£15,607*

Source: SRIF2006-08 Management Data; NOTE: 'Research academics' are 2005-06 academic FTEs, excluding non-researching lecturers (HESA)

2.3 Other funding sources

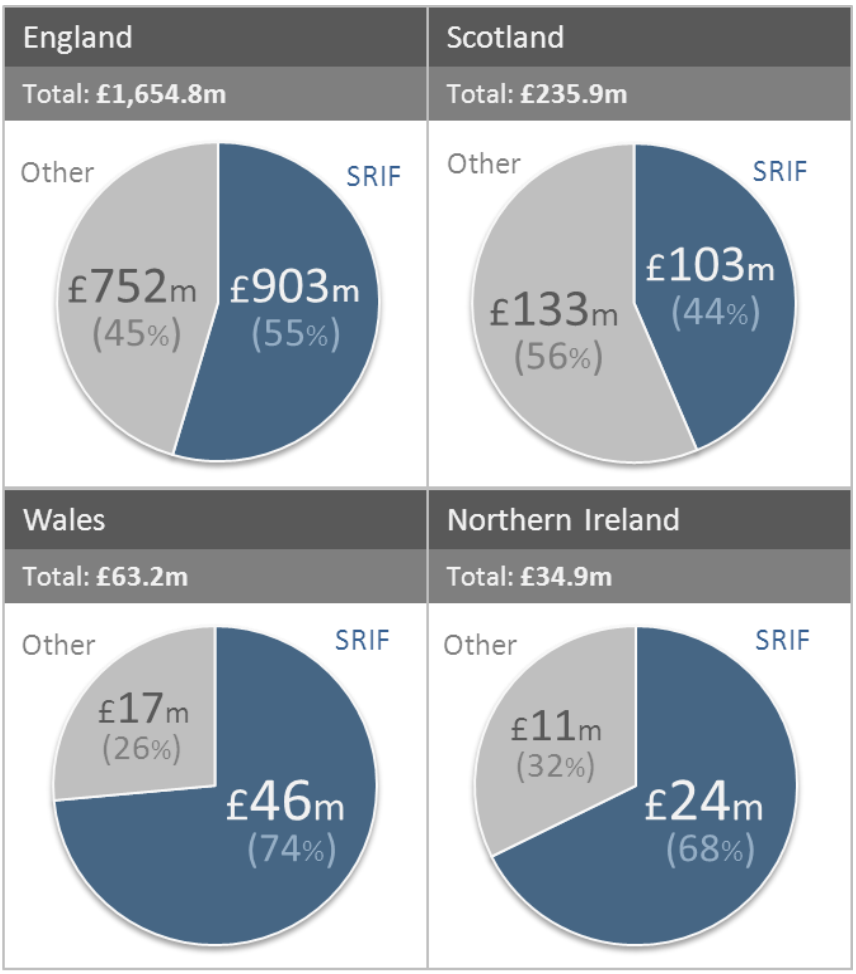
2.3.1 In addition to the money provided under SRIF2006-08, support for the upgrading and renewal of the HEI estate and research equipment was provided in the form of funding from other sources, increasing the total of HEI research capital funding to just under £2bn, and accounting for 46% of total investment. These funds derived in part from other public sector organisations, such as the Regional Development Agencies, charitable trusts such as the Wolfson Foundation, and from funds allocated for capital spending within HEIs. Figure 2.5 reveals that research capital funds other than SRIF2006-08 comprised a much greater proportion of the total research capital spend in Scotland, accounting for 56% of total investment, compared with Wales where such non-SRIF2006-08 spending only accounted for 26% of total investment. This brings Scotland's share of total UK research capital spend to 12%, much closer to its share of UK non residential estate and insured assets.

Figure 2.4 Total SRIF2006-08 supported investments



Source: SRIF2006-08 Management Data

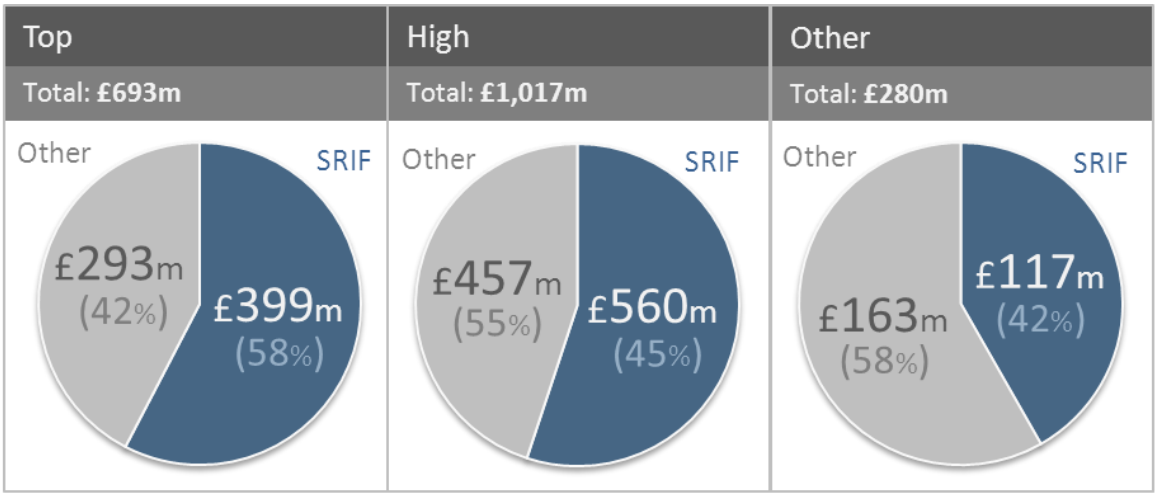
Figure 2.5 Total SRIF2006-08 supported investments by country



Source: SRIF2006-08 Management Data

2.3.2 Funding from 'other' sources clearly favours investment in the Top 6 and High Research clusters. Considering total research capital spending (including both SRIF2006-08 and funds from other sources) increases the share of research capital investment by the Top 6 and High Research cluster to 85.5% (£1.71m of a total of 1.99m), compared with their share of SRIF2006-08 of 74.4%. However, although less research intensive HEIs received a smaller share of SRIF2006-08, they obtained funding elsewhere to raise their total investments share to 15% compared with an 11% share of SRIF2006-08 funds. Less research intensive HEIs have therefore leveraged a larger proportion of their research capital from non SRIF2006-08 investors.

Figure 2.6 Total SRIF2006-08 supported investments by research intensity cluster



Source: SRIF2006-08 Management Data

2.4 Additionality and leverage

2.4.1 Critical to any evaluation is an attempt to address the issue of counterfactual: in this case to what extent would the investment have occurred had the SRIF2006-08 funding not been available. The first stage of this assessment is to estimate the proportion of the ***overall*** project investment that would have been carried out had the HEIs not received SRIF2006-08 funding. Project managers were asked 'Had you not received SRIF2006-8 funding, what proportion of the overall project investment would have been carried out in its absence?'. Table 2.2 shows that 22% of respondents reported that no project investment would have taken place in the absence of SRIF2006-08 funding compared with 42% reporting that 1-24% of overall project investment would have been carried out in the absence of SRIF2006-08. For the UK the average proportion of overall investment that would have taken place in the absence of SRIF2006-2008 was 24%. However there are important cross country differences in this proportion ranging from 27% for England to 20% for Scotland, 12% for Wales and 15% for Northern Ireland. There may be several reasons for these country differences; for example, the greater number of research-intensive HEIs in England, or the greater variety and number of alternative sources of funding available in England. What is clear however is the greater reliance on SRIF2006-08 by HEIs outside England for maintaining and upgrading their estate and equipment.

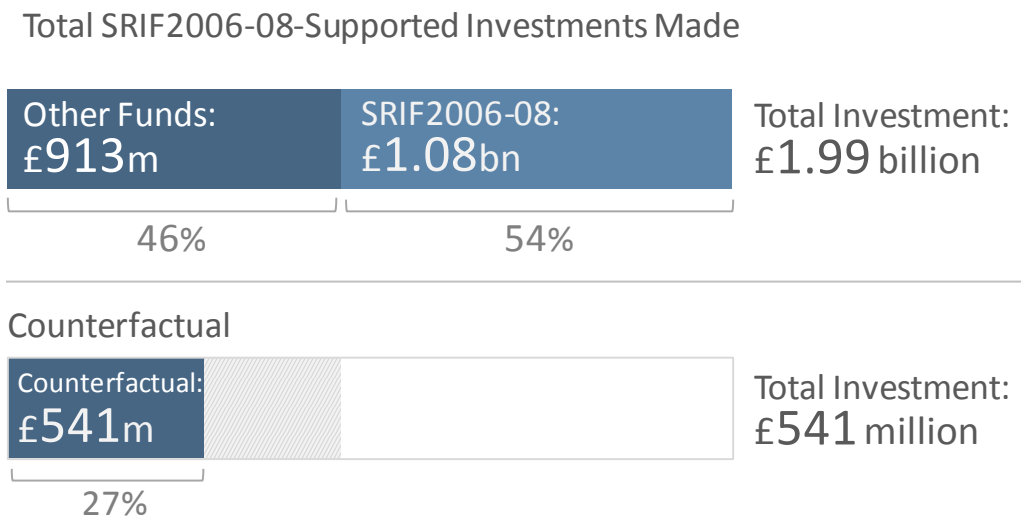
Table 2.2 Proportion of overall project investment that would have been carried out in absence of SRIF2006-08 funding

	Percentages of all respondents				
	Total	England	Scotland	Wales	Northern Ireland
100%	0	0	0	0	0
75-99%	5	6	3	0	0
50-74%	11	14	9	0	0
25-49%	20	23	14	6	21
1-24%	42	**35**	51	**78**	60
0%	22	23	23	15	19
Average proportion of investment that would have taken place in the absence of SRIF2006-08(%)	24%	27%	20%	12%	15%
Number of respondents	*198*	*143*	*34*	*16*	*5*

Source: PACEC Survey of Project Managers, 2011 (Q13)

2.4.2 The counterfactual investment was then calculated on a project-by-project basis, summed for all projects, and weighted to take account of the size of investment and the characteristics of the survey sample relative to the population of SRIF2006-08 investments as a whole. The result was that 27% of the total investment would have gone ahead in the absence of SRIF2006-08 funding (slightly more than the 24% indicated by Table 2.2). The total investment made in HEIs during the period 2006-2008 was £1.99 billion, of which £1.08bn was SRIF2006-08 funding and £913m was from other sources. If it is assumed that the amount of investment which would have gone ahead anyway is 27%, as measured from the survey data, this would indicate that £541m of the total investment would have gone ahead in the absence of SRIF2006-08 funding (See Figure 2.7). This also implies that an additional £372m was leveraged in by SRIF2006-08 investment such that, in total, £1.45bn was SRIF2006-08 dependent. In other words if SRIF2006-2008 had not gone ahead the total investment would have declined by more than the value of SRIF2006-08.

Figure 2.7 Counterfactual (total SRIF2006-08-supported portfolio)

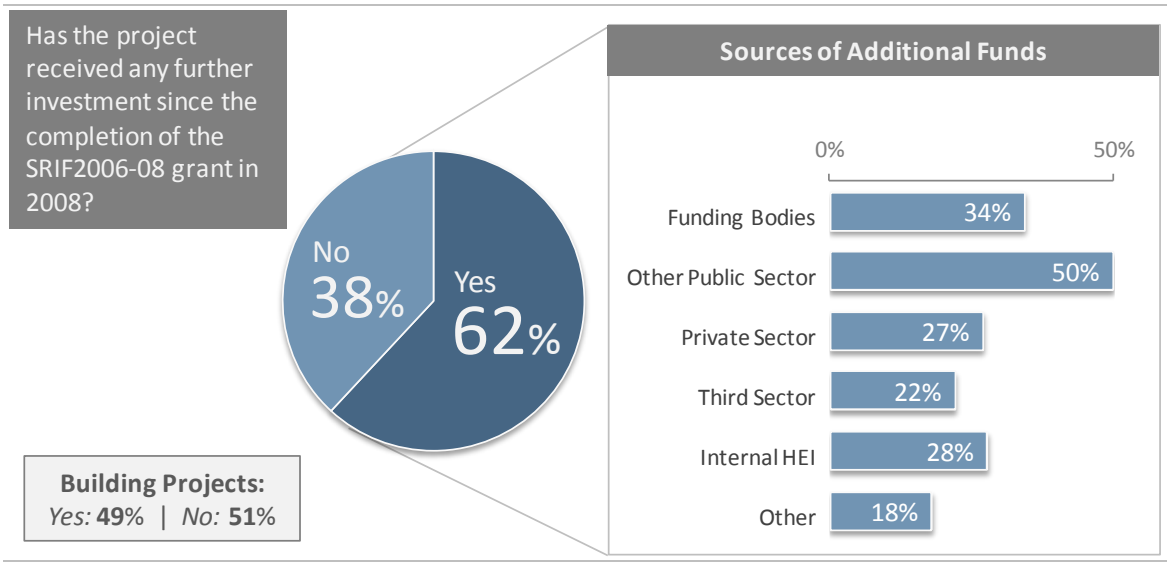


Source: Project Manager Survey Respondents: 198

2.5 Further investment

2.5.1 Subsequent to the completion of the SRIF2006-08 grant in 2008, around three-fifths (62%) of the funded projects received further investment from a mix of funding bodies, including sources both external and internal to the HEI (Figure 2.8). Interestingly, both the private sector and the voluntary sector also provided additional post-SRIF2006-08 funding.

Figure 2.8 Further capital investments



Source: Project Manager Survey Respondents: 197

2.5.2 Table 2.3 shows the purpose of the further investment. Just over half (55%) of SRIF2006-08 projects used further funding to extend the scale of the project, indicating perhaps that despite the initial investment, unmet needs still prevailed.

Table 2.3 Purpose and use of further investment

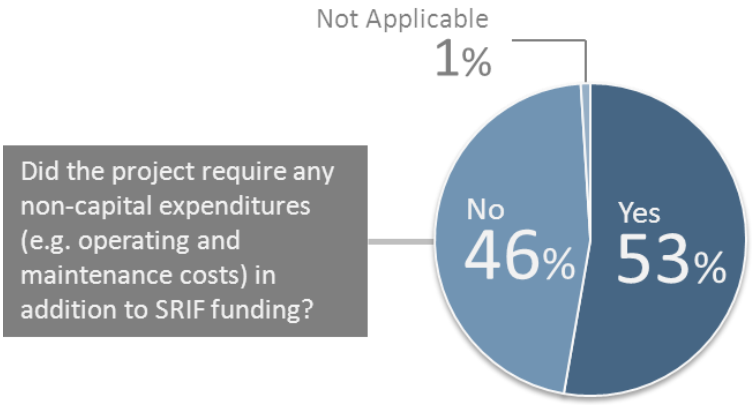
	Percentages of all respondents						
	Total	England Top	England High	England Other	Scotland	Wales	Northern Ireland
Extend project scale	55	57	52	55	50	51	100
Unexpected capital costs	3	8	3	3	0	0	0
Unexpected ongoing operating/maintenance costs	16	23	15	9	23	16	0
Replacement costs	18	23	15	20	14	17	33
Upgrade costs	45	50	42	**64**	**16**	50	33
Obsolescence costs	2	0	3	0	0	17	0
Other	19	19	22	11	19	0	100
Number of respondents	*114*	*20*	*33*	*31*	*21*	*6*	*3*

Respondents could select more than one option, so percentages in any column may sum to more than 100
Source: PACEC Survey of Project Managers, 2011 (Q4)

Operating and maintenance costs

2.5.3 Buildings and capital equipment, particularly the former, typically require ongoing operating and maintenance costs. These costs are not met from SRIF2006-08 and must be obtained from other sources, including the HEI hosting the research capital investment. More than half (53%) of the projects required such ongoing operating and maintenance expenditure (Figure 2.9) suggesting that for the other projects operating and maintenance cost were met through increased productivity.

Figure 2.9 Operating and maintenance costs



Source: Project Manager survey Respondents: 201

3 SRIF2006-2008 Investment Projects

3.1 Introduction

3.1.1 The funds provided to HEIs under SRIF2006-08 in the period 2006 to 2008 could be used for any of the following purposes:

- The refurbishment of buildings used for research
- The replacement of research premises by new build or acquisition
- The replacement, renewal or upgrading of equipment used for research

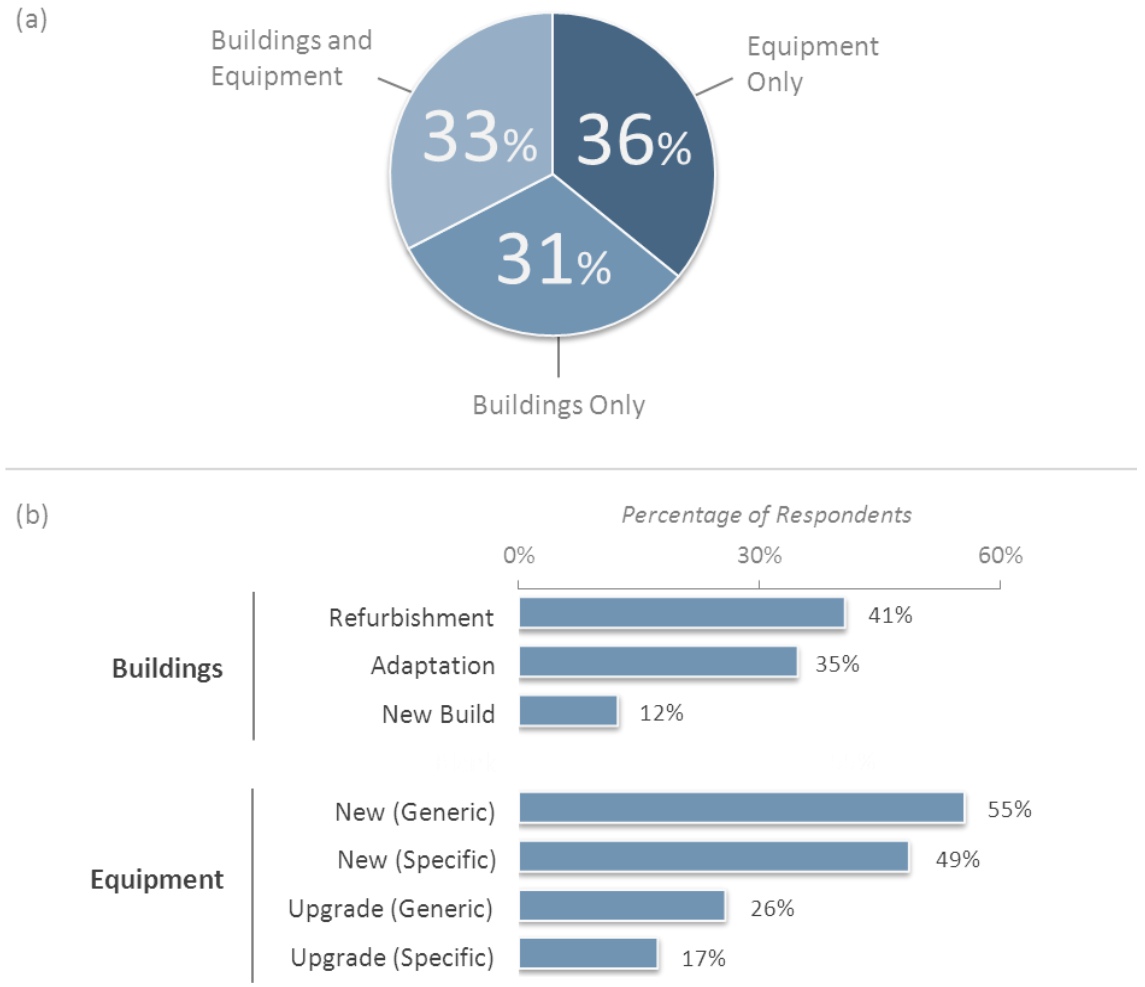
3.1.2 Under the SRIF2006-08 programme 729 projects were funded, including projects concerned solely with buildings (the estate), projects concerned solely with equipment for research, and projects involving both buildings and equipment. The breakdown of SRIF2006-08 investment by these three research capital categories is shown in Table 3.1 and Figure 3.1 The three types of project accounted for roughly a third of the total projects each. However, the mean capital spend on 'buildings only' was significantly greater than the other two categories, accounting for 56% of the total SRIF2006-08 budget, compared with 12% for 'equipment only'.

Table 3.1 Research capital projects funded by SRIF2006-08

Type	Projects	Share	Median Value	Mean Value
Equipment Only	262	36%	£234,705	£512,662
Buildings Only	229	31%	£1,195,000	£2,650,308
Buildings and Equipment	238	33%	£762,947	£1,406,741
Total	*729*	*100%*	£574,000	£1,476,053

Source: SRIF2006-08 Management Data

Figure 3.1 Projects funded by SRIF2006-08 by type of project (% of number of projects)



Source: (a) SRIF2006-08 Management Data / (b) Project Manager survey Respondents: 202

3.1.3 Further disaggregated analysis, by type of project and country, is shown in Table 3.2. There are important differences in the frequency and type of project across HEIs, according to research intensity and country. Adaptation and refurbishment of buildings are relatively low outside of the High research-intensity cluster of HEIs in England. By contrast the number of projects involving new equipment to support specific research in the Top 6 research-intensity cluster of HEIs in England is relatively low, particularly when compared with projects funded under SRIF2006-08 in Wales.

Table 3.2 Types of project investment, by country

	Percentages of all respondents						
	Total	England Top	England High	England Other	Scotland	Wales	Northern Ireland
New buildings	12	14	16	10	13	6	0
Adapted existing buildings	35	38	41	**21**	29	50	41
Refurbished buildings	41	50	49	**28**	32	36	79
New equipment to support specific research project	48	**24**	44	58	48	**76**	79
New equipment to support generic research capability	55	57	57	54	59	42	62
Upgraded existing equip to support specific research project	17	**5**	**9**	**30**	26	20	19
Upgraded existing equip to support generic research capability	26	31	19	31	31	18	21
Other	5	2	3	4	11	6	0
Number of respondents	*202*	*33*	*65*	*50*	*33*	*17*	*5*

Respondents could select more than one option, so percentages in any column may sum to more than 100
Source: PACEC Survey of Project Managers, 2011 (Q2)

3.2 Investment by academic discipline

3.2.1 Successive governments have in recent years placed increasing emphasis on the need to support both research and research training in STEM academic disciplines. Research capital investment is an essential element in the attempts by government to encourage and support research in the STEM disciplines. Perhaps not surprisingly, the majority of research capital projects funded by SRIF2006-08 were in STEM academic disciplines, with around three-quarters of SRIF2006-08 investment going into these disciplines (Table 3.3).

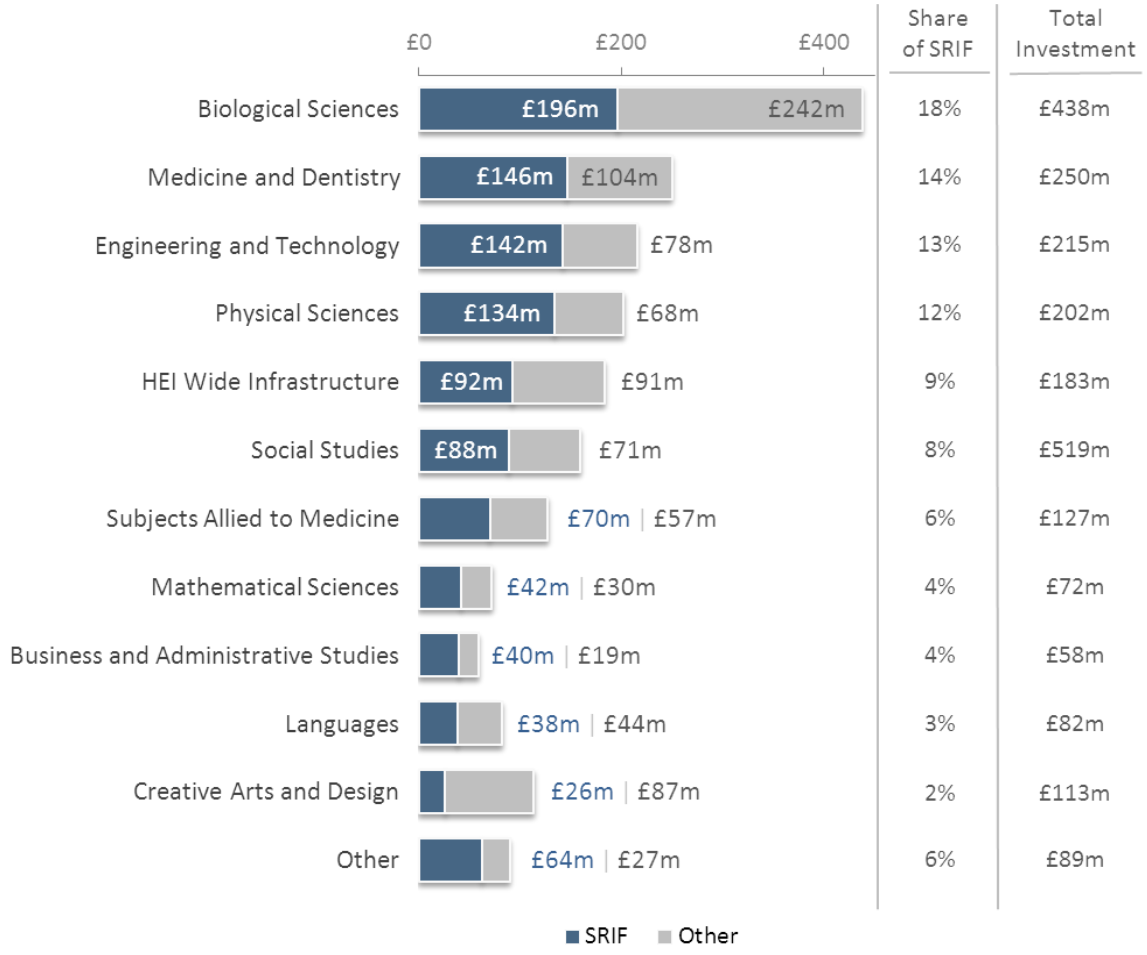
Table 3.3 Investment in STEM and non-STEM projects

Discipline	Projects		SRIF2006-08 Funding	
	Total	Share	Total	Share
STEM	502	69%	£798m	74%
Non-STEM	179	25%	£194m	18%
HEI Wide	48	7%	£84m	8%
Total	729	*100%*	£1,076m	*100%*

Source: Project Management Data; STEM refers to science, technology, engineering and maths

3.2.2 A more detailed breakdown of research capital funding by academic discipline is presented in Figure 3.2. Research capital investment in biological sciences accounted for 18% of SRIF2006-08, and overall investment in this discipline was £438m. The overall investment in biological sciences was about double that for engineering and technology, where total research capital investment was £215m, of which SRIF2006-08 accounted for £142m.

Figure 3.2 Total investment by academic discipline



Source: Project Management Data

3.3 Lessons for research capital implementation

3.3.1 Project managers were asked to recall any lessons to be learnt about how the research capital investment was implemented or used. Sixty-one project managers took the opportunity to present their views on the implementation experience of SRIF2006-08.

3.3.2 The majority of project managers were satisfied with the implementation process for their SRIF2006-08 projects and indeed there were some very positive comments on the implementation process.

Table 3.4 Verbatim positive comments on the implementation process

The project was most successful. Interaction with HEFCE was problem free.
It was a good experience because (1) I had good management skills and was able to specify and cost the project quite precisely (2) The university had a good project management team (3) The external interaction worked well with the HEI.

Given the complexities involved (equipment as well as internal refurbishment), the procedures for obtaining and managing the investment were wholly reasonable

3.3.3 A number of comments emphasised the importance of good planning, project management and close engagement and interaction with users and stakeholders in the project. Suggestions where the implementation process could be improved focused on the early planning and design stage, the procurement process and the need for technical and financial support once the project was up and running. The following is a summary of the comments and suggestions put forward by project managers:

- At the **planning and design stage** of the project, the great importance of involving the full range of interested parties including Project Manager, key internal users and external users was strongly emphasised. This ensured not only the minimum disruption to ongoing critical research activities but also that the facilities provided appropriately met the needs of potential users.
- At the **procurement stage** it was noted that the process was cumbersome and that it tended to delay purchases and it was pointed out that there was often a considerable delay between seeking the investment and getting it. The procurement process for equipment was described as being prolonged despite clear specifications being available at the start of the project. The source of the problem was perceived by some project managers to be largely a consequence of the processes adopted by the HEI. There were some doubts as to whether the centralised procurement approach necessarily reduced costs. Time constraints for purchasing were also pointed to as a problem that needed addressing and one respondent suggested that it would be helpful to have a reserve fund to carry over. Timing issues associated with tendering and acquiring key items of equipment within the project timescales were also raised as issues that needed addressing when reviewing the implementation process. One respondent suggested that introducing a multi-stop deadline for expenditure would allow the fit between capital spend and staff recruitment to be better optimised.
- **The refurbishment/building stage** attracted few comments suggesting that for the great majority of Project Manager respondents it proceeded satisfactorily. It was commented that building work always took longer than envisaged necessitating the need in some cases to plan for temporary accommodation.
- A number of observations were made with respect to **the equipment element** of SRIF2006-08. It was pointed out that specialist equipment typically requires further investment in staffing to support the technical understanding of individual researchers. Support for such staff would increase the scale of research output and the efficiency with which the new equipment is used. Allocation of funding for maintenance and other operational costs would also enable projects to be utilised more efficiently. For example, it was suggested that operating costs be funded for the first 2-3 years as a starting point prior to other research grant income being raised.
- It was suggested that SRIF2006-08 might have given greater emphasis to new capital equipment relative to refurbishment of premises or new build. The funding mechanisms by some HEIs to enable the replacement of new equipment were said to be poorly defined and ever changing and this could potentially create problems for high-tech equipment where technological progress may be relatively rapid.

4 Outputs

4.1 Introduction

4.1.1 This chapter analyses the usage of SRIF2006-08 and the research, training and other outputs that arise. The outputs generated are wide ranging and include for example increases in the quantity and quality of research, the strengthening of staff and post-graduate research training, raised staff morale and increased internal and external collaboration. Estimates of the extent to which these outputs would not have been generated without SRIF2006-2008, i.e. gross additionality, are also presented for the quantity of research outputs, the quality of research outputs and the number of postgraduate students trained.

4.2 Research infrastructure usage

4.2.1 The starting point in analysing the SRIF2006-08 research infrastructure usage is to look at utilisation rates, as reflected in the percentage of time in a year that the premises and equipment are in use. Utilisation of research infrastructure and outputs might be expected to be positively associated with increased utilisation generating increased outputs. Utilisation, however, does not necessarily correlate with the number of users. Moreover, the availability of a particular item of research equipment may be critical for research being undertaken, even though it may only be used infrequently.

4.2.2 Table 4.1 shows that, typically, buildings have greater utilisation than research equipment during the course of the year. This may reflect, in part, the higher degree of specificity associated with particular types of research equipment, compared with upgraded and refurbished premises, where a wide range of research activity might take place. It is notable that there was considerable variation in the utilisation of research equipment across the clusters of research intensive HEIs. The Top cluster of HEIs show much lower utilisation of equipment, compared with either the High or Other clusters. This may indicate that the equipment used in the Top cluster of HEIs is typically more research-specific than is the situation elsewhere. For buildings, it is at the Other cluster of HEIs where utilisation is relatively low, compared with the Top and High research-intensity clusters.

Table 4.1 Percentage of the time that the SRIF2006-08 funded infrastructure is utilised on average per year

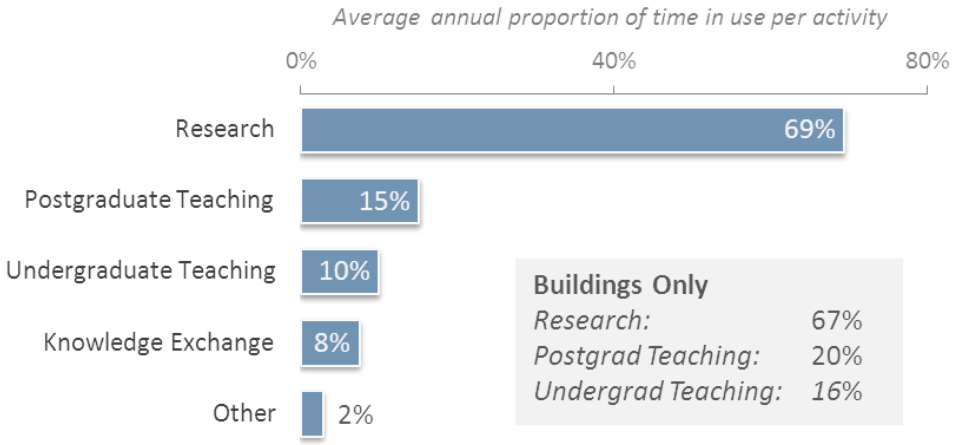
	Average (mean) amount			
	Total	Top	High	Other
Buildings	55.9	69.8	**67.6**	**33.8**
Equipment supporting specific research projects	39.2	**24.5**	40.0	**45.7**
Equipment supporting generic research capabilities	45.2	51.6	45.7	41.2
Number of respondents	*165*	*30*	*77*	*59*

Source: PACEC Survey of Project Managers, 2011 (Q5)

Internal users

4.2.3 There is a variety of uses to which the SRIF2006-08 funded research capital might be put, and a broad classification of the type of activity is presented in Figure 4.1. Research is by far the most frequently cited activity supported by the SRIF2006-08 investment. More than two-thirds of project use (69%) was given to this activity. The facilities provided by SRIF2006-08 were, firstly and foremost, to support research activities. They were though of benefit to postgraduates and undergraduates and to support knowledge exchange activities.

Figure 4.1 Usage by activity type



Source: Project Manager Survey Respondents: 199

Table 4.2 Percentage time the SRIF2006-08 funded project is in use to support key activities

	Average (mean) amount			
	Total	STEM	Non-STEM	HEI Wide
Research	69.3	**73.4**	61.3	**36.8**
Postgraduate teaching	15.1	14.0	**19.0**	21.8
Undergraduate teaching	9.9	9.3	10.7	19.9
Knowledge exchange with external users	7.5	7.9	6.0	6.6
Other	2.8	1.8	3.0	**14.9**
Number of respondents	*199*	*139*	*38*	*10*

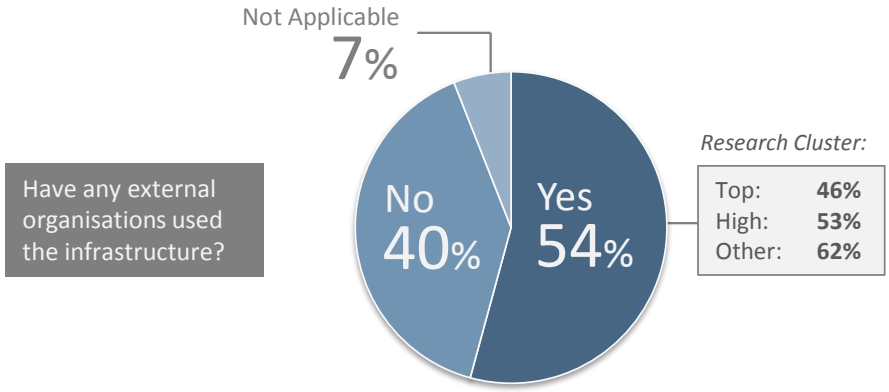
Source: PACEC Survey of Project Managers, 2011 (Q6)

External users

4.2.4 The encouragement of academic-industry engagement and associated knowledge exchange to enhance the innovative capacity and capability of private sector companies, public sector bodies and other external organisations is now widely regarded as important for raising national competitiveness. Interactions between HEIs and external organisations occur through a wide variety of mechanisms, including collaborative research, consultancy, contract research and the use by external organisations of facilities (premises and equipment) provided by HEIs. Figure 4.2 shows that more than half (54%) of SRIF2006-08 funded facilities in the HEIs had external users.

4.2.5 Obtaining access to HEI facilities is a key motivation for business engagement with HEIs. A recent report for HEFCE '*Strengthening the Contribution of English Higher Education Institutions to the Innovation System: Knowledge Exchange and HEIF Funding'* (PACEC, April 2012) revealed that 45% of HEIs cited access to HEI facilities as high or medium importance. The use of facilities provided by SRIF2006-08 is important for a number of reasons. Where collaborative research is undertaken it helps academics understand the nature of the challenges faced by business and other external organisations and is important in improving their responsiveness and understanding of what they can realistically deliver through their knowledge exchange activities. It helps not only to make research more demand led and alert to user needs but also helps to fosters a dialogue between academics and innovators on the value of research in HEIs and how best to exploit it.

Figure 4.2 External organisations using SRIF2006-08 funded infrastructure



Source: Project Manager Survey Respondents: 201

4.2.6 We can gain further insights into the use of SRIF2006-08 by external users by analysing the share of projects by HEI type (research intensity) and user type. Table 4.3 shows that the highest frequency (62%) of engagement with external users was with the less research intensive HEIs (Other), and that a greater frequency of engagement with the Other cluster of HEIs was the case for all types of organisations. SMEs engaged with 30% of projects in the Top research intensive HEIs, compared with Large Companies where the share of projects used was only 17%, although there was significant use of research capital facilities by Other HEIs. One striking feature of the evidence presented in Table 4.3 is the relatively high average number (7.8) of SMEs engaging with Other HEIs, compared with 2.1 and 2.7 for the High research intensity and Top clusters, respectively. This is accounted for by two HEIs with strong links with the SME sector each reporting a very high number of SME users.

Table 4.3 External users by type and research cluster: share of projects with external users and average number of external users by HEI type

(a) Share of projects with external users (by HEI and user type)

Type of Organisation

HEI Research Intensity Cluster	SMEs	Large Companies	Other HEIs	Other Public Sector	Third Sector	All Users
Top	30%	17%	35%	22%	17%	46%
High	37%	28%	35%	23%	19%	53%
Other	40%	33%	43%	32%	25%	62%
All HEIs	*36%*	*27%*	*38%*	*25%*	*21%*	*54%*

(b) Average number of external users (by HEI and user type)

Type of Organisation

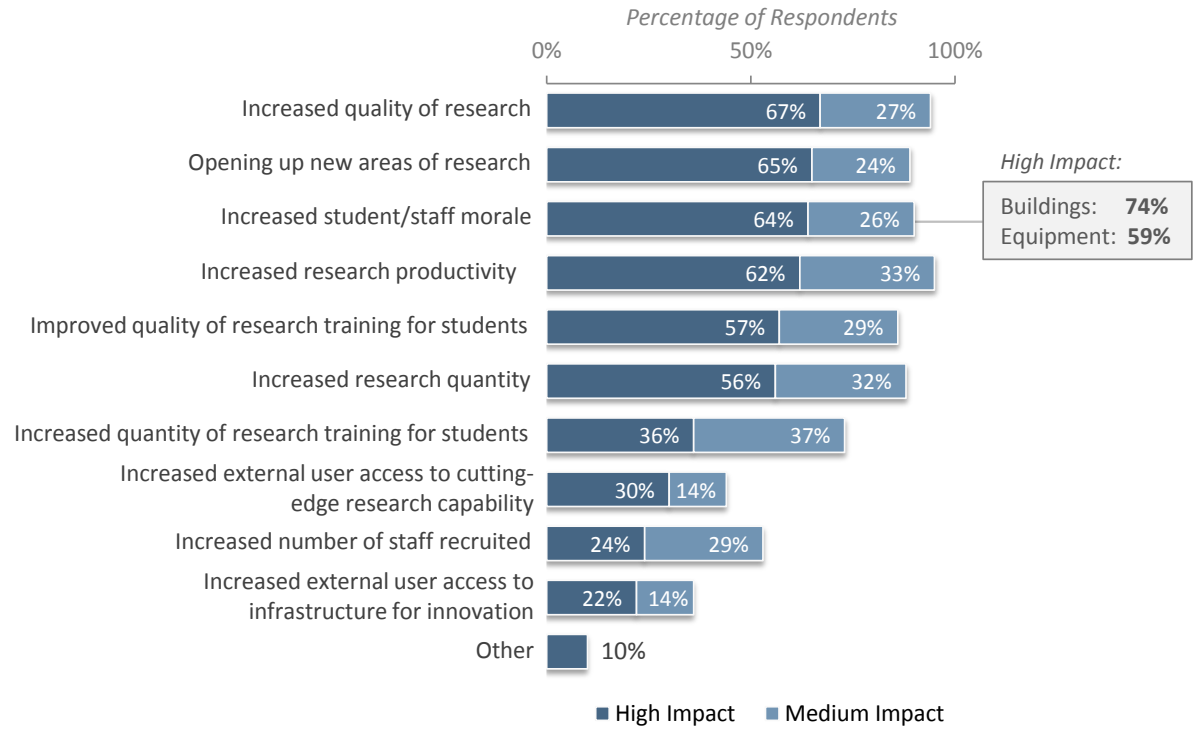
HEI Research Intensity Cluster	SMEs	Large Companies	Other HEIs	Other Public Sector	Third Sector	All Users
Top	2.7	2.2	3.9	2.0	2.8	13.6
High	2.1	1.7	2.1	1.0	1.9	8.7
Other	7.8	1.3	2.7	2.3	1.2	15.3
All HEIs	*4.0*	*1.7*	*2.7*	*1.7*	*1.9*	*11.9*

Source: Project Manager Survey Respondents: 201

Outputs

4.2.7 The main outputs from the SRIF2006-08 programme are shown in Table 4.4. Enhanced research quality, the opening up of new research areas, and the productivity and quantity of research emerge as the most frequently cited outputs, in terms of where the upgraded research infrastructure was perceived to have had a high or medium impact. It is also claimed that the investments have had widespread impacts on staff and students morale, and on research training. External users were less frequently mentioned as accessing the projects, although almost a quarter of project managers claimed that usage from this source has increased.

Figure 4.3 Outputs from new and upgraded premises and equipment funded under SRIF2006-08



Source: Project Manager Survey Respondents: 201

4.2.8 The analysis of high impact outputs by country (Table 4.4) shows some interesting differences across the four countries. In the case of research related impacts the percentage of Project Managers reporting high impacts is for all types of research impact higher for Scotland and Wales compared with England, whereas for Northern Ireland the picture is rather mixed. For staff and training related impacts overall the percentage of Project Managers reporting a high impact is typically lower than for research related impacts with the exception of the impact of SRIF2006-08 on student and staff morale. There are no systematic differences across countries of high staff and training impacts. Increased internal collaboration across academic disciplines is reported by over half of project managers in Scotland, Wales and Northern Ireland and by 43% of project managers in England. There is also evidence that SRIF2006-08 has had a high impact in generating and strengthening external partnerships in each country.

Table 4.4 High impact outputs from new and upgraded premises and equipment funded under SRIF2006-08 by country

	Percentage of all respondents reporting high impact				
	Total	England	Scotland	Wales	Northern Ireland
Research related impacts					
Increased quantity of research	57	55	65	66	41
Increased quality of research	68	**64**	83	72	79
Increased research productivity	62	58	75	75	41
Opening up new areas of research	65	62	74	73	79
Staff and training related impacts					
Increased number of staff recruited	24	28	12	25	0
Improved quantity of research training for students	37	38	28	50	21
Improved quality of research training for students	58	58	47	72	60
Partnerships					
Increased collaboration between academic disciplines	46	43	52	57	60
Generation of new non-academic external partnership (e.g. with industry)	27	26	26	28	41
Strengthening existing external partnerships	31	28	39	35	41

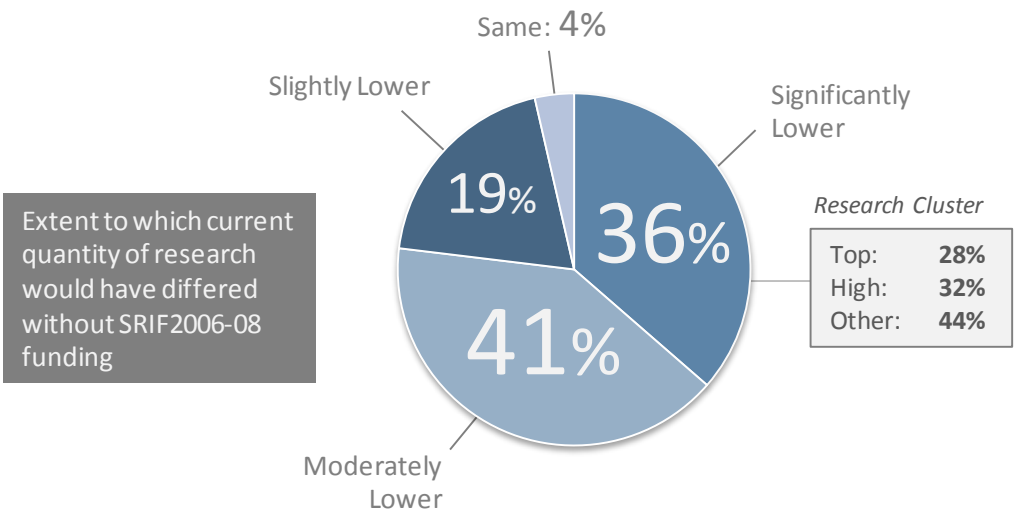
PACEC Survey of Project Managers

4.3 Additionality and counterfactual

4.3.1 Critical to any evaluation is an attempt to address the issue of counterfactual. In order to assess the counterfactual, the project managers were asked for their best estimates for a number of outputs, and how these would have been affected in relation to their current levels, had they not received SRIF2006-08 funding. More than a third of the project managers (36%) were in no doubt that the quantity of research outputs at their HEI would have been significantly lower, had they not received SRIF2006-08 funding for their projects. In other words, they estimated that less than 60% of the current level of the quantity of research outputs would have occurred. Around two-fifths (41%) believed that the quantity of research outputs would have been moderately lower (i.e. 60% to 79% of the current level). Only 4% of managers

thought the quantity of research outputs would have remained at the same level. It is notable from Figure 4.4 that the less research-intensive HEIs were more likely than the more research intensive Top and High research intensity HEIs to report that the quantity of research would have been significantly lower (i.e. greater additionality) in the absence of SRIF2006-08.

Figure 4.4 Counterfactual: quantity of research



Source: Project Manager Survey Respondents: 199

4.3.2 The survey of Project Managers also provides evidence on the extent to which the counterfactual for each individual country differs; i.e. whether the gross additionality is similar or not across countries. A relatively high additionality in a country would indicate a potentially greater impact of SRIF2006-08 in that country compared with other countries. The reasons for this are likely to be complex, reflecting the particular type of capital projects funded in each country, factors internal to HEIs as well as the external context within which the HEI is operating.

4.3.3 The counterfactual analysis indicating how the quantity of research output would have been affected had SRIF2006-08 not been available shows small differences across the four countries (see Table 4.5). Overall the position for the UK is an average of 40% gross additionality in relation to current levels of research output.

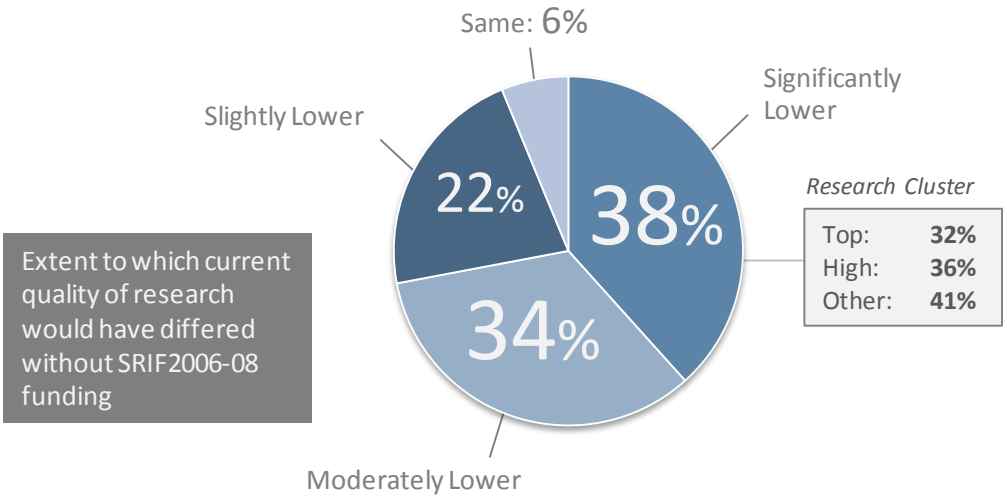
Table 4.5 Had you not received SRIF2006-08 funding, how would this have affected the quantity of research output in relation to current levels?

	Percentages of all respondents				
	Total	England	Scotland	Wales	Northern Ireland
Significantly lower (< 60%)	36	33	44	41	41
Moderately lower (60% to 79%)	41	40	32	53	59
Slightly lower (80% to 99%)	19	20	24	6	0
Same (100%)	4	5	0	0	0
Slightly higher (101% to 120%)	0	0	0	0	0
Significantly higher (>120%)	0	1	0	0	0
Not applicable	1	1	0	0	0
Weighted average	*60%*	*62%*	*56%*	*54%*	*53%*
Number of respondents	*199*	*145*	*33*	*16*	*5*

Source: PACEC Survey of project managers, 2011 (Q14)

4.3.4 A slightly higher proportion of the project managers were convinced about the positive impact of SRIF2006-08 funding on the quality of research at their HEI. As can be seen from Figure 4.5, almost two-fifths (38%) indicated that the quality of research would have been significantly lower in the absence of the SRIF2006-08 investment. Around one in three (34%) thought the quality of research would have been moderately lower, while 6% believed the quality of research would have remained at the same level. The more frequently reported higher additionality of less research-intensive HEIs was again evident although this may well reflect their lower research base.

Figure 4.5 Counterfactual: quality of research



Source: Project Manager Survey Respondents: 199

4.3.5 The analysis of additionality associated with the quality of research output produces very similar results across the four countries with some exceptions for Wales and Northern Ireland, although sample sizes are small for these two countries. On

average for the UK the quality of research output would be 59% lower in relation to current levels indicating additionality of 41% of current levels with similar results across the four countries

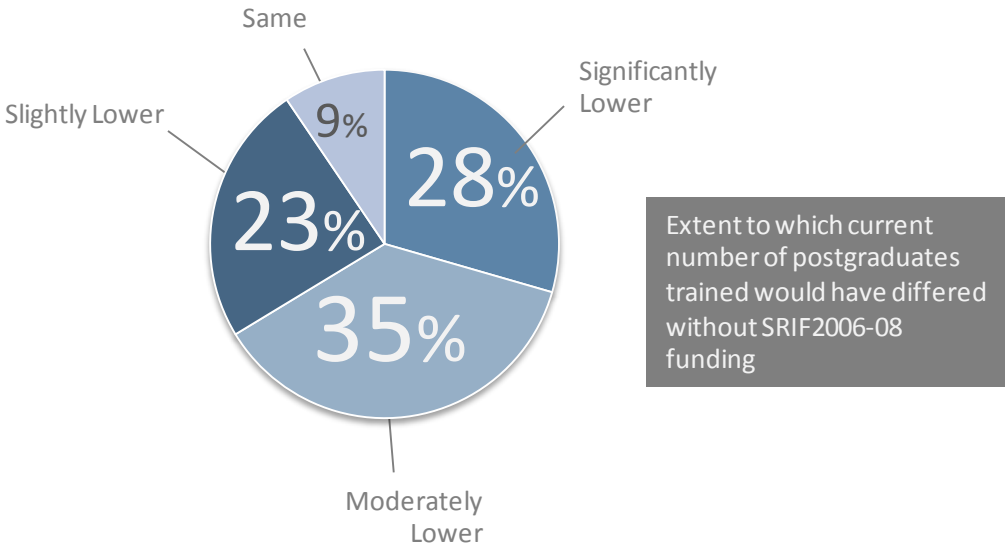
Table 4.6 Had you not received SRIF2006-08 funding, how would this have affected the quality of research output in relation to current levels?

	Percentages of all respondents				
	Total	England	Scotland	Wales	Northern Ireland
Significantly lower (< 60%)	38	39	32	47	41
Moderately lower (60% to 79%)	34	32	34	34	59
Slightly lower (80% to 99%)	22	20	34	19	0
Same (100%)	6	**8**	0	0	0
Slightly higher (101% to 120%)	0	0	0	0	0
Significantly higher (>120%)	0	0	0	0	0
Not applicable	1	2	0	0	0
Weighted average	*59%*	*59%*	*62%*	*54%*	*53%*
Number of respondents (rate=%)	*199*	*145*	*33*	*16*	*5*

Source: PACEC Survey of project managers, 2011 (Q14)

4.3.6 There was a slight difference in the project managers' estimation of the impact of SRIF2006-08 investments on the number of postgraduates trained at their HEI. Figure 4.6 shows that 28% of managers estimated that trained postgraduate numbers would have been significantly lower, and a little over a third (35%) were convinced the number of trained postgraduates would have been only moderately lower (i.e. 60% to 70% of the current level). Less than one in ten (9%) stated that their number would have remained at the same level.

Figure 4.6 Counterfactual: postgraduates



Source: Project Manager Survey Respondents: 199

4.3.7 Table 4.7 shows the cross country counterfactual analysis of postgraduates receiving training as a consequence of SRIF2006-08. For the UK, gross additionality is 40% of current levels, close to that for the other output indicators reported above. However, Scotland stands out with a significantly lower additionality of 29%.

Table 4.7 Postgraduate students trained

	Percentages of all respondents				
	Total	England	Scotland	Wales	Northern Ireland
Significantly lower (< 60%)	28	31	21	22	0
Moderately lower (60% to 79%)	35	33	27	**59**	40
Slightly lower (80% to 99%)	23	**19**	**42**	19	40
Same (100%)	9	10	10	0	0
Slightly higher (101% to 120%)	0	1	0	0	0
Significantly higher (>120%)	0	0	0	0	0
Not applicable	5	6	0	0	21
Weighted average	*61%*	*59%*	*71%*	*64%*	*62%*
Number of respondents	*199*	*145*	*33*	*16*	*5*

Source: PACEC Survey of Project Managers, 2011 (Q14)

5 Benefits

5.1 Introduction

5.1.1 This chapter focuses on the outcomes and impacts derived from the outputs presented in Chapter 4. We describe outcomes here as the consequences for individuals and organisations of the generation of the outputs described above. The *impacts* are then the final effects of these outcomes on end goals such as employment, gross value added (GVA), social or environmental conditions, health or education etc.

5.1.2 A number of issues arise in attempting to separate outcomes from impacts. For example, a new piece of equipment (funded under SRIF2006-08) may open up a new area of life sciences research at a specific HEI. The new research being conducted can be considered an output of the SRIF2006-08 investment. This in turn may have multiple consequences. There may be an immediate, direct employment effect if new staff are required to operate the equipment. The recruitment of new staff may enable new and innovative processes to be developed that can be shared with, say, the pharmaceutical industry through increased knowledge exchange and collaborative research (typically considered *outcomes*); which in turn would raise the productivity of the HEI's partners in pharmaceutical products. If raising GVA in the pharmaceutical industry is the desired end goal, then an increase in GVA may be viewed as an impact. However, if we are concerned with generating jobs, then the initial step of hiring new staff at the HEI may itself be regarded as the impact. It is also possible to view impact as a consequence of the increased productivity. For example, increased productivity may lead to the development of new drugs (typically considered an outcome), which in turn may lead to another 'impact', such as improvement in the health of the population.

5.1.3 The complexities of the relationships described above highlight some of the difficulties that are frequently encountered in attempts at measuring the definitive impacts of university research. Indeed, many impacts, particularly on health, society, or the environment, are difficult to both quantify and value. And even though four years have passed since the end of SRIF2006-08, the impacts of much HEI research often take much longer to be realised. Lastly, the direct users of SRIF2006-08 funded infrastructure may have only limited awareness of the ultimate impacts of their work upon end users and other beneficiaries.

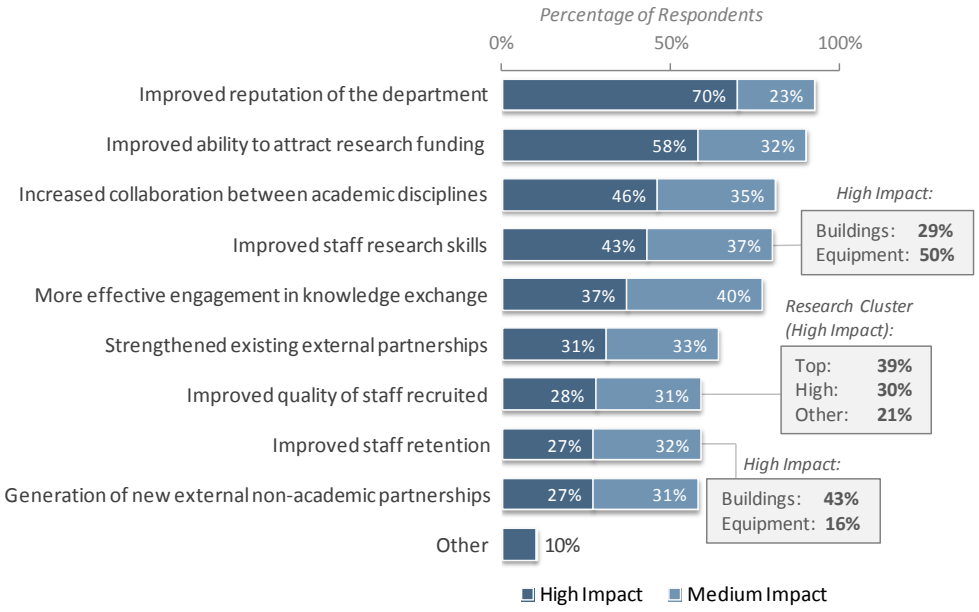
5.1.4 Notwithstanding the complexities of outcomes and impacts, multiple 'end goals', time lags and measurement difficulties, it is still possible to group the identified consequences of SRIF2006-08 investments under a broad heading of 'benefits', not in the technical sense of a monetised cost-benefit analysis, but rather in the general sense of positive consequences. We separate the benefits into three categories – benefits to HEIs, benefits to external users, and benefits to the wider UK economy.

5.2 Benefits to HEIs

5.2.1 By far the largest impact of the SRIF2006-08 investment cited by the project managers at the HEIs was on the reputation of the department or faculty. Almost all the project managers claimed at least a medium impact on their department's reputation, whilst almost three-quarters (70%) claimed the impact was high (Figure 5.1). Beyond this, a wide range of benefits appears to have been generated by SRIF2006-08 supported infrastructure. In terms of employment and skills, the HEIs are not only able to attract higher quality staff, but are now better able to retain current staff. On the whole, more than two-fifths (40%) of projects have had a highly positive impact on the research skills of their staff.

5.2.2 SRIF2006-08 also appears to be supporting increased collaboration and partnership work, both across disciplines within HEIs, and between HEIs and external organisations. More than a third of the project managers claimed that SRIF2006-08 has significantly increased the effectiveness of their engagement in knowledge exchange, whilst more than a quarter felt that the new infrastructure had either strengthened their existing partnerships with external non-academic partners (29%) or generated new such partnerships (26%).

Figure 5.1 HEI benefits



Source: Project Manager Survey Respondents: 201

5.2.3 The evidence from the survey appears to suggest that new buildings have a far greater impact on staff and student morale than new equipment (Figure 5.1). It is also clear that the staff retention effects (described above) are primarily driven by the former; thus, for example, 43% of buildings projects had a high impact on retention, compared with 16% of equipment projects.

5.2.4 With regard to attracting higher quality staff, the benefits are skewed in favour of the top UK research universities. This suggests that there may be synergies between the

provision of new infrastructure and other factors that characterise high-end HEIs, such as greater supporting financial resources or a higher quality pool of existing staff. The detailed evidence from the survey shows that less research-intensive HEIs find it more difficult to attract high-quality staff. Only one in five (21%) project managers in less research-intensive HEIs claimed a high impact in this area, compared to 39% of those in the Top cluster of universities. With regard to increasing staff research skills, the evidence appears to suggest that projects involving investment in equipment generate higher benefits; as demonstrated by half of such projects which reported a high impact in this area.

5.2.5 The analysis of benefits to HEIs across countries is shown in Table 5.1. A widespread benefit to HEIs was an improvement in their reputation, with 70% of respondents reporting this as a high impact benefit. This benefit is more frequently reported by Scottish and Welsh respondents than by those in England and particularly so in the case of Northern Ireland. An improved ability to attract funding also stands out as an important benefit for HEIs and is more frequently reported in Northern Ireland and Wales than in England and Scotland. The benefit of improved staff and student morale is reported by nearly two-thirds of respondents with the exception of Scotland where puzzlingly less than half of respondents identified this as a high impact benefit. About one third of respondents claimed a high impact on Third Mission activity i.e. the capacity to engage more effectively in knowledge exchange, although this benefit is less frequently reported by project managers in Northern Ireland.

Table 5.1 High and medium impact benefits for HEIs from SRIF2006-08 by country (medium impact in parentheses)

	Percentage of all respondents reporting high impact				
	Total	England	Scotland	Wales	Northern Ireland
Research related benefits					
Improved reputation of the Department	70 (23)	69 (26)	80 (11)	75 (12)	41 (59)
Improved ability to attract research funding	58 (32)	53 (35)	65 (23)	75 (19)	79 (21)
Engage more effectively in knowledge exchange	37 (40)	36 (39)	39 (41)	41 (40)	21 (60)
Staff and training related benefits					
Increased student and staff morale	64 (26)	68 (24)	**48 (40)**	62 (19)	81 (0)
Increased quality of staff recruited	28 (31)	29 (33)	23 (25)	32 (19)	21 (60)
Increased staff retention	27 (32)	28 (32)	26 (34)	26 (19)	0 (81)
Improved staff research skills	43 (37)	41 (37)	47 (41)	53 (28)	41 (38)
Partnership related benefits					
Increased collaboration between academic	46 (35)	43 (43)	52 (15)	57 (13)	60 (21)

disciplines					
Generation of new non-academic external partnership (e.g. with industry)	27 (31)	26 (30)	26 (30)	28 (31)	41 (40)
Strengthening existing external partnerships	31 (33)	28 (35)	39 (20)	35 (48)	41 (0)

PACEC Survey of Project Managers
NB Figures in parentheses show medium impact

5.2.6 A sample of the large number of unprompted observations and comments by project managers which provide further insights on the benefits of SRIF2006-08 to HEIs are shown in Table 5.2 below..

Table 5.2 Verbatim observations on the benefits of SRIF2006-08 funding

An excellent cross campus research investment which increased research collaboration and effectiveness of our research

SRIF provided much needed capital investment – A follow-on programme is highly desirable

This fairly modest investment made a very substantial contribution to enhancing the research capabilities…. We believe it was a very successful investment providing good value for money

The scheme was good – simple and flexible. More (much more) of this type of investment is needed to keep the UK competitive in research

The SRIF grants were extremely important in allowing HEIs to set their research (investment) priorities. It provided HEIs with funding they needed but at the same time incentivised them to raise running costs through grant applications. We need this type of scheme although the projects have to be well managed.

SRIF was hugely beneficial to our research capability and capacity, but we could do with more investment as we have expanded both capability and capacity to fully exploit our existing facilities and investment in new technology for state of the art equipment is now warranted.

The purchase of this microscope led to a very substantial upgrade in our research capabilities in high end microscopy. The investment has been intensively used by several groups and has been a great asset to the department. Money very well spent.

Research capital funding is essential for the sustainability of high quality research with impact. It helps to attract high quality staff and students and to leverage additional research funding from research councils and industry. It is vital for the future of research in the UK that capital funding is increased/maintained. SRIF

funding allowed us to build many strong industrial research partnerships

This kind of funding is vital for supporting world-class scientific research

This was a critical investment at a critical time. Without it we would have lost significant ground and opportunity to exploit our ideas and concepts. This would have resulted in a loss of international standing

An excellent programme that allowed investment in equipment that in this case will serve the research community for the next 20 years

The modest funding in this area has been of considerable benefit. It provided equipment that has been of value to industry; in sustaining our research plans; and in providing postgraduate student projects

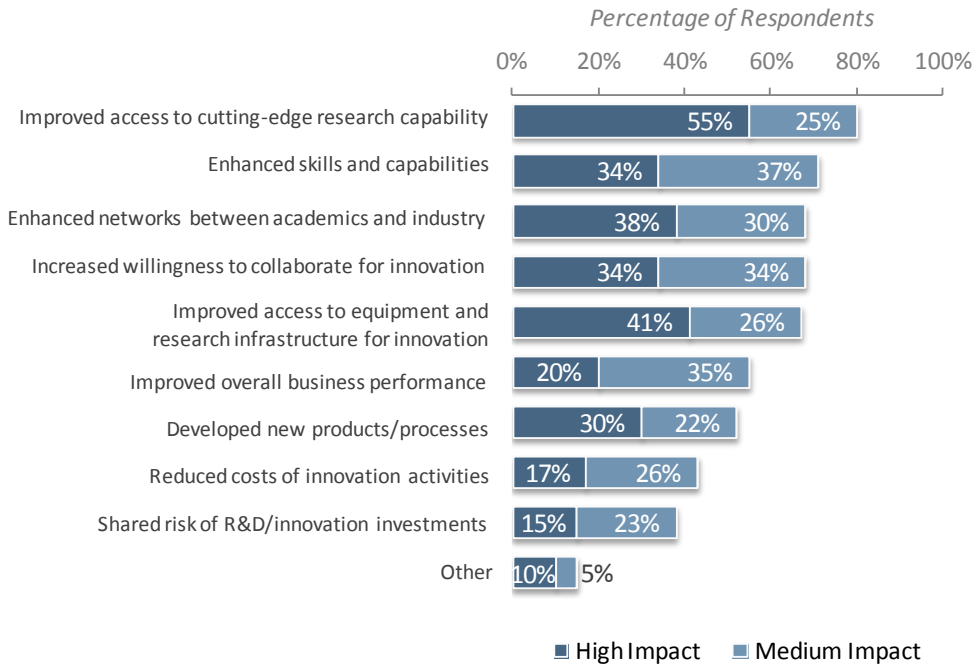
Loss of key staff to other universities and lack of replacement staff continue to pose problems. The current economic downturn is hitting our faculty very hard. SRIF investment provided a much needed lift

It is hard to exaggerate the impact on our research environment of this funding, which could not have been achieved with institutional funds

5.3 Benefits to external users

5.3.1 More than half of the project managers in the survey (54%) indicated that external organisations (firms, public sector organisations, charities etc) used their SRIF2006-08 funded infrastructure. Figure 5.2 shows the perceptions of the project managers about the benefits realised by their external partners. The responses are shown here as a percentage of those reporting external users, not the whole survey sample.

Figure 5.2 High and medium impact on external organisations making direct use of SRIF2006-08 funded projects (% of projects with external users)



Source: Project Manager Survey Respondents

5.3.2 The rankings in terms of the percentage of respondents perceiving a high or medium impact of SRIF2006-08 on external users of funded projects is similar across the four countries; for example, 'Improved access to cutting–edge research capability' is the most frequently cited impact in England, Scotland and Wales. Improved access to equipment and research infrastructure for innovation is the second most frequently cited benefit for external users by project managers in each of the four countries. There are also some interesting cross country differences, for example in the percentage of respondents citing the 'Development of new products/processes'.

Table 5.3 High and medium impact on external organisations making direct use of SRIF2006-08 funded projects by country (medium impact in parentheses)

	Percentages of all respondents				
	Total	England	Scotland	Wales	Northern Ireland
Developed new products/processes	30 (22)	27 (23)	49 (6)	11 (37)	52 (48)
Improved access to cutting-edge research capability	55 (25)	56 (22)	53 (36)	54 (21)	52 (48)
Improved access to equipment and research infrastructure for innovation	41 (26)	42 (24)	40 (29)	32 (32)	52 (48)
Shared risk of R&D/innovation investments	15 (23)	17 (22)	16 (26)	0 (22)	0 (0)
Reduced costs of innovation activities	17 (26)	18 (25)	16 (34)	0 (11)	52 (0)
Enhanced skills and capabilities	34 (37)	34 (40)	40 (38)	32 (22)	0 (0)
Increased willingness to collaborate for innovation	34 (34)	34 (35)	33 (35)	32 (21)	48 (52)
Enhanced networks between academics and industry	38 (30)	40 (32)	31 (39)	33 (21)	100 (0)
Improved overall business performance of the organisation	20 (35)	21 (36)	21 (39)	11 (11)	48 (52)
Other	10 (5)	12 (6)	7 (0)	0 (11)	n/a
Number of respondents (rate=%)	*110*	*76*	*22*	*9*	*2*

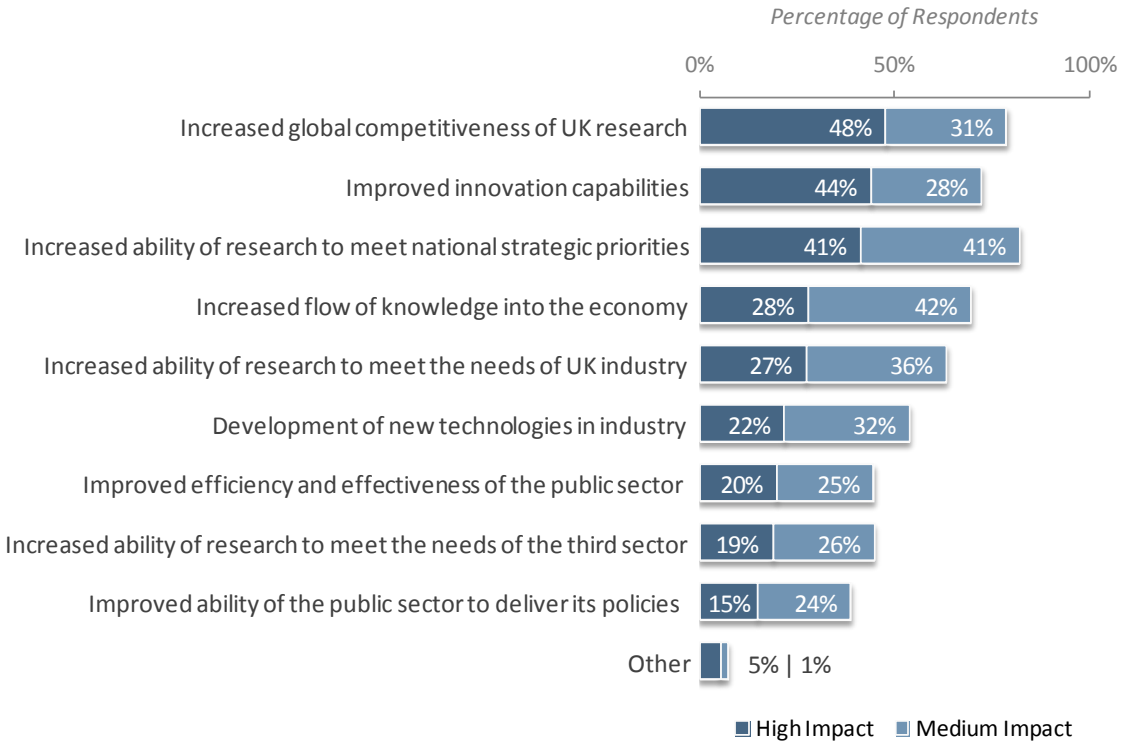
Source: PACEC Project Managers Survey

5.3.3 Again, strong collaborative effects are noted. The area where impact was greatest was the strengthening of relationships between industry and HEIs, with the prospect of collaborating for innovation in the future. Around two in five respondents (38%) believed that the infrastructure investment has enhanced the links between academics and industry. Just over a third of the respondents (34%) also believed that the SRIF2006-08 projects have had a high impact on the skills and capabilities of external partners. Importantly, 30% indicated that the collaboration has led to their external partners developing new products and processes. Overall, one in five (20%) felt that the projects have already made a high impact on the overall business performance of the external users, although it is important to point out that that this type of benefit often takes longer to accrue than in other areas.

5.4 Wider UK benefits

5.4.1 The survey also sought the views of the project managers on the benefits of SRIF2006-08 funded projects to the wider UK economy. Their responses, which are set out in Figure 5.3 and Table 5.4, corroborate to a large extent what is perceived to be the effects of academic research on the competitiveness and productivity of the UK economy. The perceived significance of SRIF2006-08 in upgrading the UK research base is clear. Almost half of the project managers (48%) believed that the investments made have had a high impact on the global competitiveness of UK research. More than two-fifths (44%) were convinced that the investments have improved the UK's innovation capabilities considerably.

Figure 5.3 Perceptions of Project Managers of the wider UK benefits of SRIF2006-08



Source: Project Manager Survey Respondents: 201

5.4.2 The cross country analysis of project managers' perceptions of the wider benefits of SRIF2006-08 to the UK is shown in Table 5.4. The overall ranking of the different types of benefit (in terms of the percentage of respondents indicating a high/medium impact benefit) is broadly similar across each of the four countries. Northern Ireland exhibits somewhat greater deviation from the other countries but the sample there is very small. A relatively high percentage of Scottish and Northern Ireland respondents pointed to the 'increased ability of research to meet national strategic priorities and this was also the case with respect to 'the ability of research to meet the needs of industry'. A relatively high percentage of Scottish project managers also pointed to the benefit of 'improved innovation capabilities'.

Table 5.4 Perceptions of Project Managers of the wider UK benefits of SRIF2006-08 by country (high impact with medium impact in parentheses)

	Percentages of all respondents				
	Total	England	Scotland	Wales	Northern Ireland
Increased global competitiveness of UK research	48 (31)	48 (30)	47 (34)	50 (31)	62 (19)
Improved flow of knowledge into the economy	28 (42)	27 (41)	29 (44)	38 (28)	21 (79)
Increased ability of research to meet national strategic priorities	41 (41)	38 (44)	51 (34)	44 (28)	62 (38)
Increased ability of research to meet the needs of UK industry	27 (36)	24 (37)	39 (25)	25 (47)	41 (59)
Facilitated the development of new technologies/technological platforms in industry	22 (32)	21 (30)	21 (40)	31 (22)	21 (40)
Improved innovation capabilities	44 (28)	41 (31)	55 (17)	45 (15)	21 (60)
Improved efficiency and effectiveness of the public sector	20 (25)	21 (28)	23 (19)	13 (13)	0 (21)
Improved ability of the public sector to deliver its policies	15 (24)	16 (24)	15 (24)	6 (20)	0 (40)
Increased ability of research to meet the needs of the third sector	19 (26)	22 (28)	12 (20)	13 (7)	21 (60)
Other	5 (2)	6 (2)	8 (0)	0 (6)	n/a
Number of respondents	*202*	*147*	*34*	*16*	*5*

PACEC: Project Managers Survey

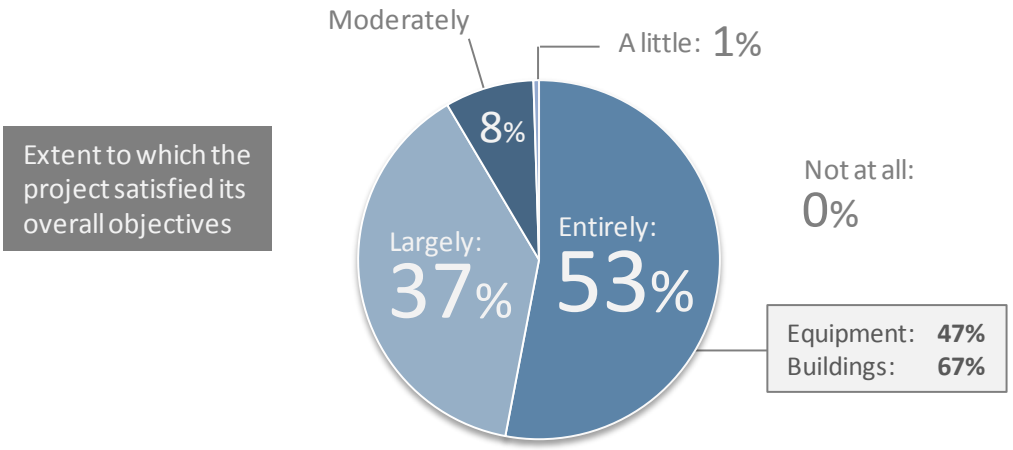
5.4.3 The project managers did not consider the impact of SRIF2006-08 investments on other areas of the UK economy to be as high. It is likely this view is influenced by their knowledge of the long gestation period between HEI research on the one hand and its impacts, in the form of bringing products from research to market. Perhaps even more significant may be the fact that academic researchers often have limited awareness of the ultimate impacts of their research on the wider economy. In this regard, it is particularly notable that only around one in five project managers believed the SRIF2006-08 investments have had a high impact on the non-marketable parts of the economy, such as the public and third sectors.

5.5 Overall effectiveness and constraints faced

5.5.1 The project managers were asked to assess their own projects against the objectives set out in their original bids to the funding bodies at the beginning of the SRIF2006-08 funding period. As might be expected, it is difficult to encapsulate and present the diverse range of objectives from such a large and heterogeneous portfolio of projects in a simple and meaningful way here. Notwithstanding this limitation, Figure 5.4 shows that more than half of the projects (53%) appear to have entirely satisfied their objectives, with a further 37% largely satisfying their objectives. Less than 10% of the projects were perceived to have only satisfied their objectives to a moderate or lower

degree. It is also notable that there was a large, significant difference in the levels of overall satisfaction between building projects and equipment projects. Around two-thirds of managers of building projects (67%) claimed to be 'entirely' satisfied they had achieved their original objectives. By contrast, fewer than half of managers of equipment projects (47%) claimed a similar level of satisfaction.

Figure 5.4 Project Manager overall satisfaction

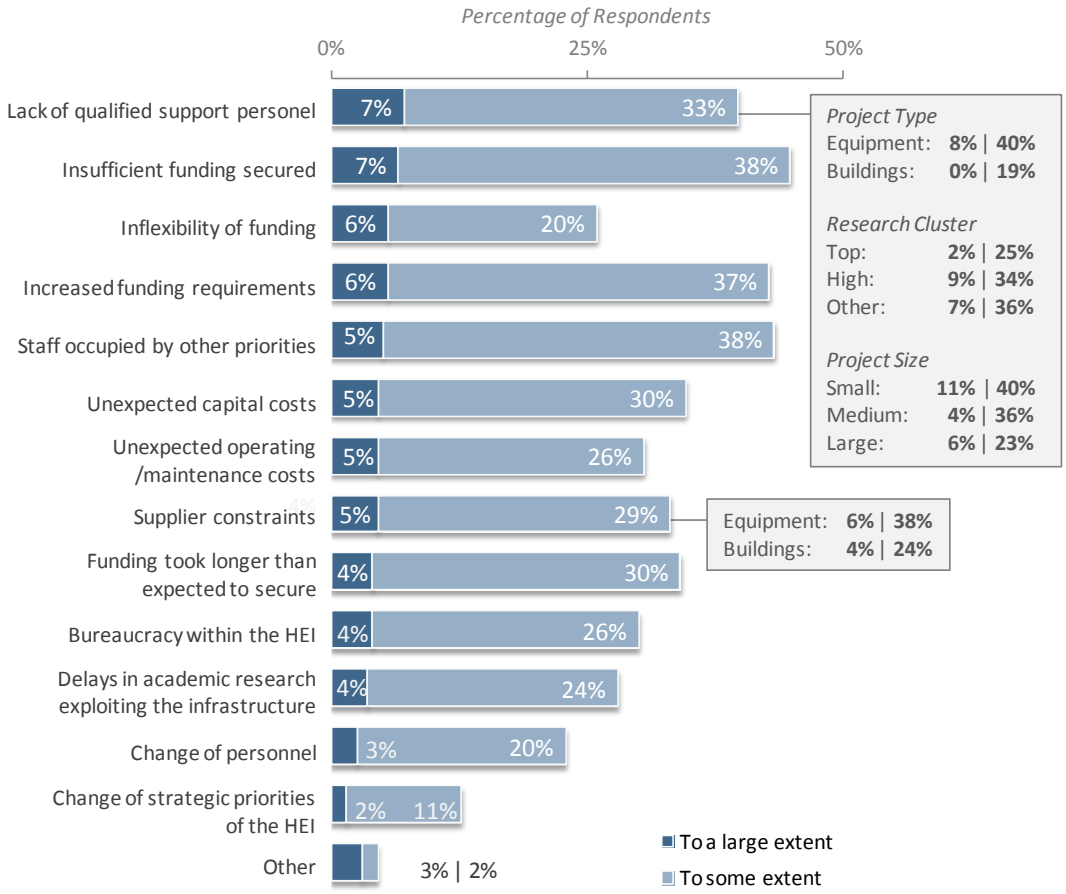


Source: Project Manager Survey Respondents: 200

5.5.2 Figure 5.5 sheds some light on some of the possible reasons for the observed differences in the levels of satisfaction between buildings and equipment projects, and suggests they may be explained by the constraints faced by the project managers. It is clear that different projects were constrained to a different extent by specific factors. For example, none of the managers of building projects reported they had been constrained to a large extent by a lack of qualified support personnel, whereas almost one in ten managers of equipment projects (8%) had. On the same issue, twice as many equipment project managers (40%) as building project managers (19%) claimed they had been constrained 'to some extent'. The impact of a lack of qualified support personnel also differed according to the project size, with smaller projects more adversely affected than larger projects.

5.5.3 There was considerable difference between buildings and equipment projects, too, with regard to suppliers. In particular, fewer than one in three managers of buildings projects (28%) cited supplier constraints to some or large extent, compared with more than two-fifths of managers of equipment projects (44%).

Figure 5.5 Constraints faced by Project Managers



Source: Project Manager Survey Respondents: 196

5.5.4 We now analyse the constraints faced by the different types of research capital and infrastructure provided for SRIF2006-08. Insufficient funding is seen to emerge as the main constraint faced by project managers in achieving their projects' objectives and this was particularly the case for buildings projects, with one in six project managers reporting this factor constraining them to a large extent. Unexpected operating and maintenance costs also emerge as an important constraint for 14% of project managers.

Table 5.5 Constraints faced by type of research capital infrastructure provided (% of respondents)

Constraint faced to a large extent (some extent)	Total	Equipment only	Buildings only	Buildings and equipment
Insufficient funding	11 (41)	12 (30)	**16** (43)	5 (42)
Funding took longer to secure	6 (36)	1 (26)	**11 (**36)	0 (40)
Inflexibility of the funding	6 (25)	1 (13)	**0 (38)**	**17 (10)**
Funding requirements increased	4 (35)	**16** (22)	**0** (34)	7 (42)
Unexpected capital costs	6 (41)	2 (**24**)	7 (**52**)	7 (**28**)
Unexpected operating and maintenance costs	8 (22)	6 (14)	**14 (16)**	1 **(32)**
Bureaucracy within the HEI	1 (21)	3 (16)	1 (22)	2 (22)
Change of strategic priorities of the HEI	0 (17)	1 **(4)**	0 **(24)**	0 **(11)**
Change of personnel	1 (16)	1 (14)	**0** (17)	3 (15)
Staff occupied by other priorities	0 (38)	1 (33)	0 (38)	0 40)
Supplier constraints	5 (32)	6 (23)	7 **(41)**	2 **(20)**
Lack of qualified support personnel	3 (23)	5 (30)	**0** (21)	**6** (23)
Delays in academic research exploiting the infrastructure	3 (21)	7 (17)	3 **(4)**	2 **(48)**
Other	15 (19)	12 (0)	**0 (39)**	**34 (2)**

Source: Project Manager Survey
NB Figures in parentheses are % of respondents reporting constraints to 'some extent'.

5.5.5 The analysis by country revealed very few differences in the frequency and severity of constraints faced by project managers. Table 5.6 shows that the percentage of project managers in Wales who had experienced constraints to a large extent was higher than in England and Scotland. This reflects more frequent problems related to the inflexibility of funding and to insufficient funding.

Table 5.6 Problems in meeting project objectives to a large extent or some extent

	Percentages of all respondents				
	Total	England	Scotland	Wales	Northern Ireland
Any problem to a large extent	37	36	29	44	n/a
Any problem to any extent	87	86	89	85	n/a
Number of respondents (rate=%)	*196*	*141*	*34*	*16*	*5*

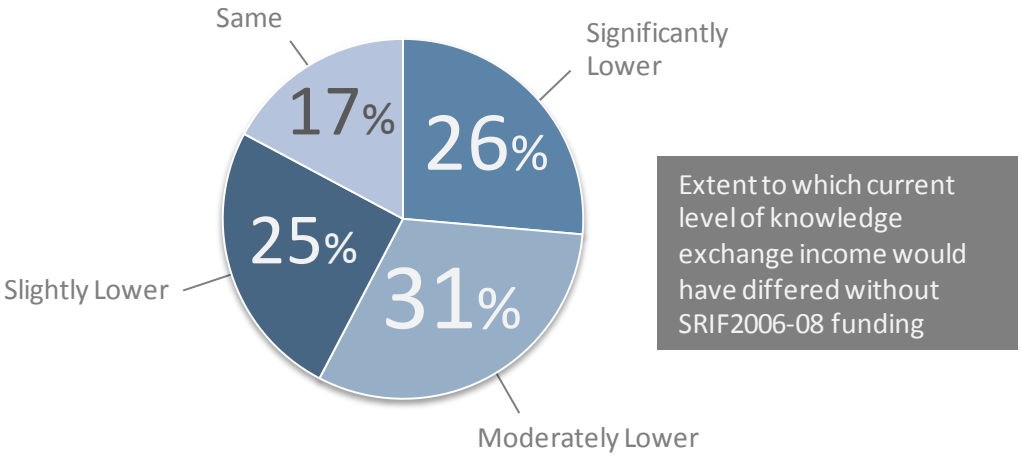
Source: PACEC Survey of Businesses, 2011 (q20)

5.5.6 Taken together, however, the evidence from the responses of the project managers does not indicate they were facing any severe constraints across the broad range of factors likely to present difficulties for such projects. Indeed, for most constraints fewer than one in ten project managers reported facing a problem in meeting the project's objectives 'to any large extent'.

5.6 Additionality and counterfactual

5.6.1 Two main benefit indicators are reported here; income derived from knowledge exchange and staff numbers. The impact of SRIF2006-08 funding on the income derived from knowledge exchange is much lower when compared with the output indicators presented in Chapter 4. Only a quarter of the project managers (26%) believed that their knowledge exchange income would have been significantly lower without the SRIF2006-08 investment. A similar proportion, exactly one-quarter (25%), thought their income would have been slightly lower (i.e. 80% to 99% of the current level), while one in six (17%) opined income would have remained unchanged (see Figure 5.6). On average, in the absence of SRIF2006-08, knowledge exchange income would have been 56% of its current levels indicating additionality of 44% of current knowledge exchange income.

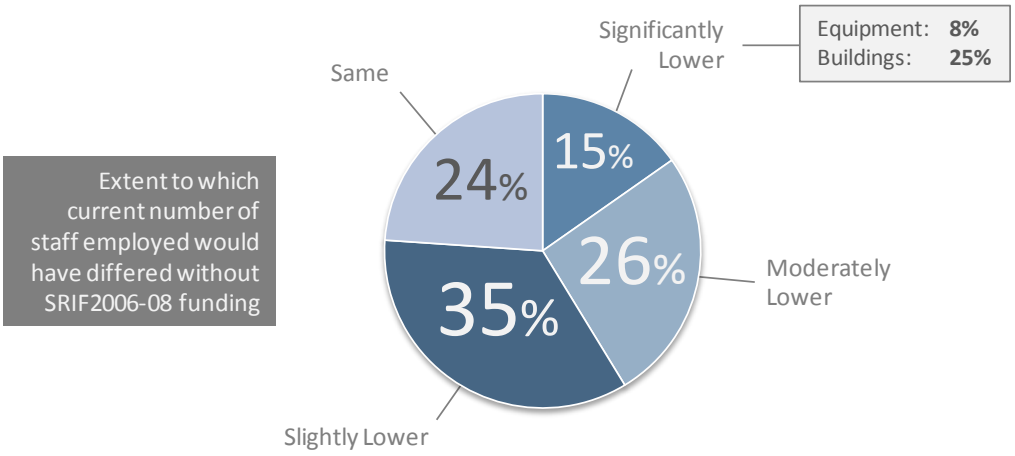
Figure 5.6 Counterfactual: knowledge exchange income



Source: Project Manager Survey Respondents: 199

5.6.2 Secondly, the project managers were asked about the impact of SRIF2006-08 on staff numbers, in particular the number of new staff employed as a result of the investment. It can be seen from Figure 5.7 that the impact on employment has been modest by comparison. Only one in seven project managers (15%) estimated that the number of new staff employed would be significantly lower. Around a quarter (26%) thought employment would have been moderately lower, or remained about the same (24%). On average, in the absence of SRIF2006-08, the number of staff employed would have been 70% of their current levels indicating additionality of 30% of current staff levels. Perhaps unsurprisingly, there was a large and significant difference in perception between building projects and equipment projects. Around a quarter of managers of building projects (25%) believed the number of staff employed would have been significantly lower without the SRIF2006-08 investment. But fewer than one in ten managers of equipment projects (8%) took a similar view.

Figure 5.7 Counterfactual: staff employed



Source: Project Manager Survey Respondents: 199

5.7 Policy performance

5.7.1 We now turn to the analysis of policy performance. As discussed above a fully monetised cost-benefit analysis is beyond the scope of this project, and we focus on the more limited objectives of establishing a measure of policy effectiveness (achievements relative to objectives) and cost effectiveness (cost per job of SRIF2006-08 spending on construction and equipment, but not including direct and indirect jobs from improved research outputs). In addition a cost-benefit balance sheet summarises the costs and benefits focusing on the frequency with which project managers reported benefits of different kinds.

5.7.2 The first policy performance measure is the **effectiveness** of SRIF2006-08. Table 5.7 shows the extent to which projects satisfied their objectives. The final row shows the weighted average (SRIF2006-08 expenditure by project). Overall 86% of SRIF2006-08 project objectives were met, with equipment only and buildings only having a slightly higher effectiveness than the buildings and equipment projects.

Table 5.7 Extent to which projects satisfied their objectives (weighted by level of SRIF2006-08 funding)

	Percentages of all respondents			
	Total	Equipment Only	Buildings Only	Buildings and Equipment
Entirely (100%)	53	61	**59**	**41**
To a large extent (50% to 99%)	42	31	**36**	**53**
To a moderate extent (10% to 49%)	6	7	5	6
A little (1% to 9%)	0	1	0	0
Not at all (0%)	0	0	0	0
Weighted average extent satisfaction	*86*	*87*	*87*	*83*

Source: PACEC Survey of Businesses, 2011 (Q15)

5.7.3 A **cost per job measure** is now estimated based on the jobs generated by the spending on construction and equipment funded by SRIF2006-08. The expenditure of £1.08bn of SRIF2006-08 funding will have affected the UK economy in a variety of different ways. The direct expenditure upon buildings and equipment supported employment in the construction and manufacturing industries. In turn, the companies carrying out the work on new buildings and equipment in SRIF2006-08 funded projects will have supported further jobs in their supply chains. In order to quantify the employment impact of the SRIF2006-08 funded expenditure, we have constructed an economic impact model, using data from the Office for National Statistics on levels of employment, expenditure, and output in the construction, manufacturing and distribution sectors. The model includes the turnover which is necessary to support a single job in each of these sectors, and the distribution of expenditure by companies in these industries on other industrial sectors in their supply chains.

5.7.4 Using this model, we estimate that expenditure of £1.08bn (split in the ratio 82:18 between construction and manufacture, based on the ratio of expenditure on buildings and equipment projects) and after allowing for imports, supported 19,600 jobs in the UK economy. Roughly half of these jobs (9,900) were directly supported by the expenditure of SRIF2006-08 funds. The remaining 9,700 jobs were supported in the supply chains to these activities. Most of the direct jobs (8,600) were supported in the construction industry; this is partly because the bulk of expenditure took place in buildings projects but also because manufacturing companies typically require more expenditure per job supported than construction companies do, as they are more resource-intensive and less labour-intensive. Out of the total of 19,600 jobs supported in the UK economy, we estimate that 15,900 were in companies in England.

Table 5.8 Summary of gross jobs

	Jobs (000s)				
	UK	England	Scotland	Wales	NI
Construction	8.6	6.9	0.9	0.7	0.2
Manufacturing	0.5	0.4	0.0	0.0	0.0
Distribution	0.9	0.7	0.1	0.1	0.0
Supply Chain	9.7	7.9	0.9	0.7	0.2
Total	*19.6*	*15.9*	*1.9*	*1.4*	*0.4*

Source: Office for National Statistics (Input-Output analysis, Workforce Jobs dataset); PACEC

5.7.5 The gross additional impact of the SRIF2006-08 funding includes the jobs which were dependent upon the £298m additional investment from other sources which would not have been made available without SRIF2006-08 funding. The employment impact of this total of £1.37bn in funding (directly from SRIF2006-08 and additionally levered in by SRIF2006-08) is estimated using the impact model to be 25,100 jobs in the UK. The cost per net additional job is therefore £54,600.

5.7.6 The **cost benefit balance sheet,** Figure 5.8, presents an overview of the costs and benefits associated with SRIF2006-08 The costs include both capital and recurrent costs. The quantified benefits include the 25,100 one-off jobs associated with construction/refurbishment of premises and manufacture of equipment. It also shows the gross additionality (30%) of current project related jobs in the HEIs. The qualitative component of the balance sheet focuses on the positive outcomes of SRIF2006-08 as reflected in a wide range of 'intermediate benefits' and the frequency with which they are cited by project managers. It is important that they are recognised for the role they play in underpinning increased innovation, competitiveness and productivity in the UK economy.

Figure 5.8 Cost-benefit balance sheet with benefits indicated as % of project managers reporting a benefit with a high or medium impact

Costs

(a) Capital Costs

SRIF3:	£1.08 bn	*Other:*	£0.91 bn	*Total:*	**£1.99 bn**

(b) Recurrent Costs

53% of projects with recurrent costs: annual median expenditure £20000: Mean £122,000

Benefits: an additional 25,000 jobs from the construction/refurbishment of premises and manufacture of equipment + additional average 30% of total research staff employed by project

Outputs	Impact High	Impact Med
Increased quality of research	67%	27%
Opening up new areas of research	65%	24%
Increased student/staff morale	64%	26%
Increased research productivity	62%	33%
Improved quality of research training for students	57%	29%
Increased quantity of research	56%	32%
Increased quantity of research training for students	36%	37%
Increased external organisation access to cutting-edge research capability	30%	14%
Increased number of staff recruited	24%	29%
Improved external user access to equipment and research infrastructure for innovation	22%	14%
Other	10%	0%

HEI Benefits	Impact High	Impact Med
Improved reputation of the department	70%	23%
Improved ability to attract research funding	57%	31%
Increased collaboration between academic disciplines	45%	34%
Improved staff research skills	42%	37%
Engage more effectively in knowledge exchange	36%	39%
Strengthening existing external partnerships	29%	32%
Increased the quality of staff recruited	28%	31%
Improved staff retention	26%	32%
Generation of new external partnerships	26%	30%
Other	10%	0%

External User Benefits	Impact High	Impact Med
Enhanced networks between academics and industry	21%	17%
Enhanced skills and capabilities	18%	20%
Increased willingness to collaborate for innovation	18%	19%
Developed new products/processes	16%	12%
Improved overall business performance	11%	19%
Reduced costs of innovation activities	9%	14%
Shared risk of R&D / innovation investments	8%	12%
Other	5%	2%

Wider UK Benefits	Impact High	Impact Med
Increased global competitiveness of UK research	48%	30%
Improved innovation capabilities	43%	28%
Increased ability of research to meet national strategic priorities	41%	41%
Increased flow of knowledge into the economy	28%	42%
Increased ability of research to meet the needs of UK industry	27%	37%
Development of new technologies	22%	31%
Improved public sector efficiency and effectiveness	20%	25%
Increased ability to meet the needs of the third sector	20%	26%
Improved ability of the public sector to deliver its policies	14%	24%
Other	5%	1%

6 Outputs and Impacts on Internal Users of SRIF2006-08 Projects

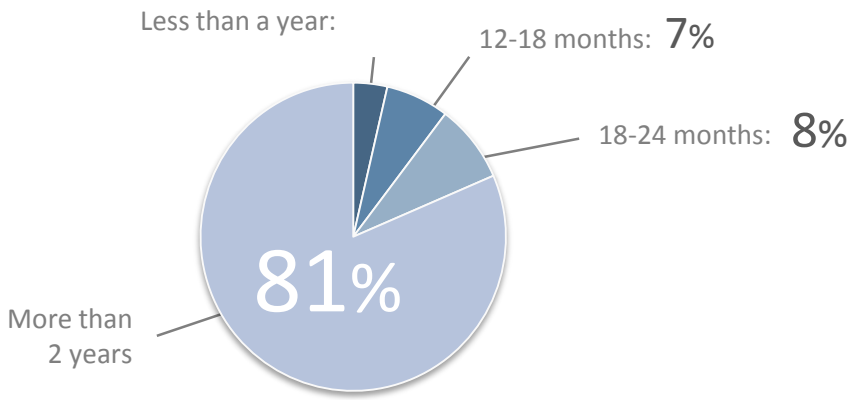
6.1 Introduction

6.1.1 This chapter presents further evidence of the impact of SRIF2006-08 by focusing on the perceptions by the users of the research capital in the HEIs. It thus provides the perspective of the impact of SRIF2006-08 on a wide variety of academics with direct experience of using the new and upgraded research facilities. The user survey breaks new ground and just under two hundred (194) academics responded to the online survey questionnaire. The respondents covered a wide range of individuals of different levels of seniority and research experience, including PhD students, post-doctoral students, research assistants, lecturers, readers, and professors. As a result it reflects the views of a diversity of researchers with different needs and objectives.

6.2 Usage and types of use of research infrastructure

6.2.1 Four years after the end of SRIF2006-08 funding, most of the current users have already been using the infrastructure for longer than two years (Figure 6.1). Moreover new users are continuing to emerge, with over 10% of users only first accessing the equipment or facilities since the start of 2011.

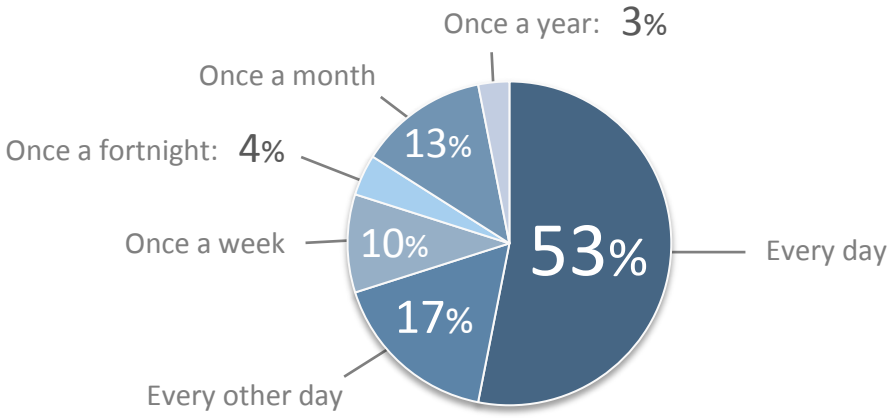
Figure 6.1 Length of usage of SRIF2006-08 infrastructure by internal users



Source: Internal User Survey Response rate: 194

6.2.2 Due to the diverse range of projects funded by SRIF2006-08, there is a great deal of variation in the nature of the use reported and the frequency with which they are used. Just over one half (53%) of users reporting usage did so on a daily basis, with a further 17% reporting usage every other day; but 10% used the research facilities once a week, others once a month, or even yearly, as shown in Figure 6.2.

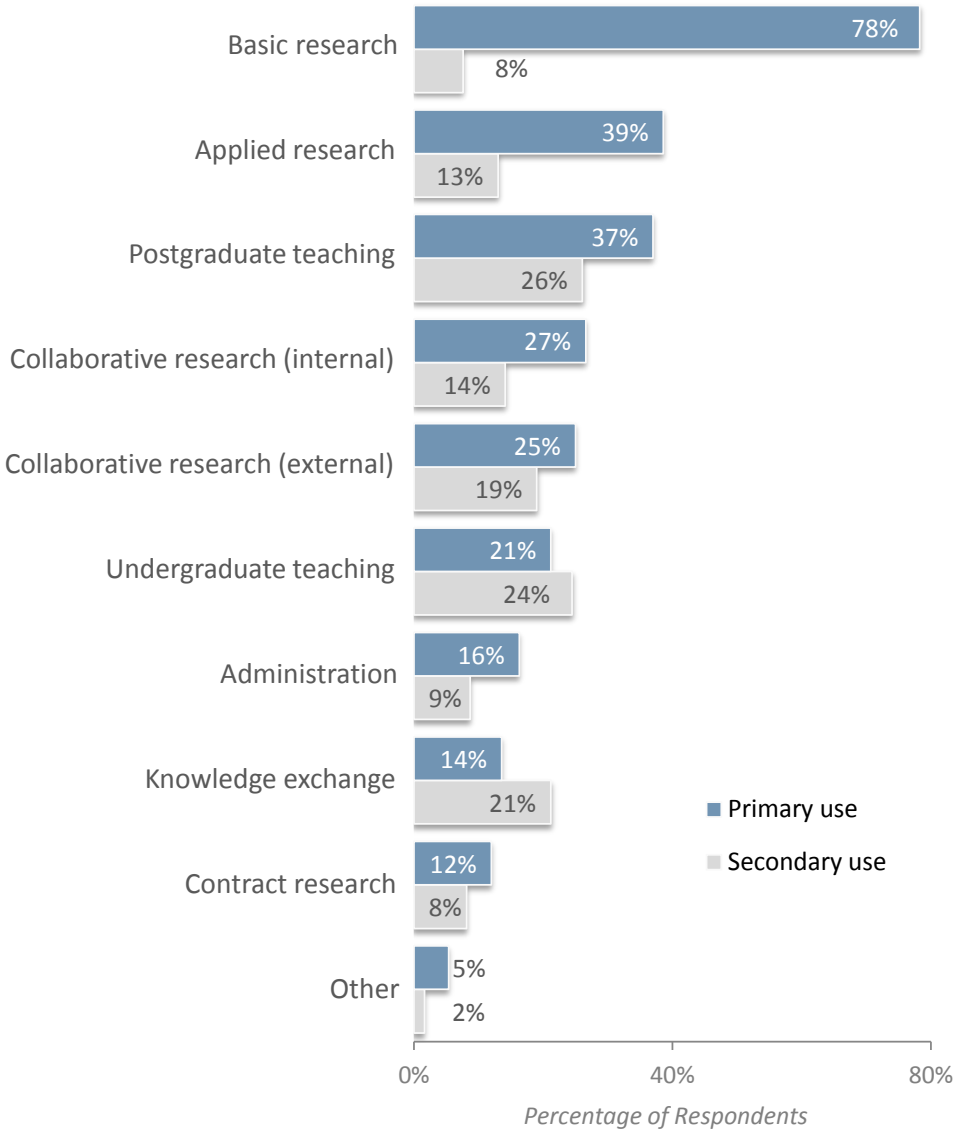
Figure 6.2 Frequency of use of SRIF2006-08 infrastructure by internal users



Source: Internal User Survey Response rate: 194

6.2.3 The SRIF2006-08 funded infrastructure supports a wide range of uses. Figure 6.3 below shows the different activities that the SRIF2006-08 funded infrastructure is being used for. Basic and applied research are, unsurprisingly, the top two primary uses – although it is notable that SRIF2006-08 infrastructure is twice as likely to be used for basic research as it is for applied research. Postgraduate teaching and collaborative research are other major primary uses, whilst contract (or user-led) research appears relatively low. The diverse nature of the infrastructure and multiplicity of its uses are demonstrated by the grey bars recording the 'secondary' uses of the buildings and equipment, with around a quarter being used for undergraduate teaching and a fifth for knowledge exchange events, such as conferences and seminars. This reflects both that there is no clear separation, particularly between teaching and research, and that facilities can benefit both teaching and research.

Figure 6.3 Purpose of use of SRIF2006-08 infrastructure by internal users



Source: Internal User Survey Response rate: 184

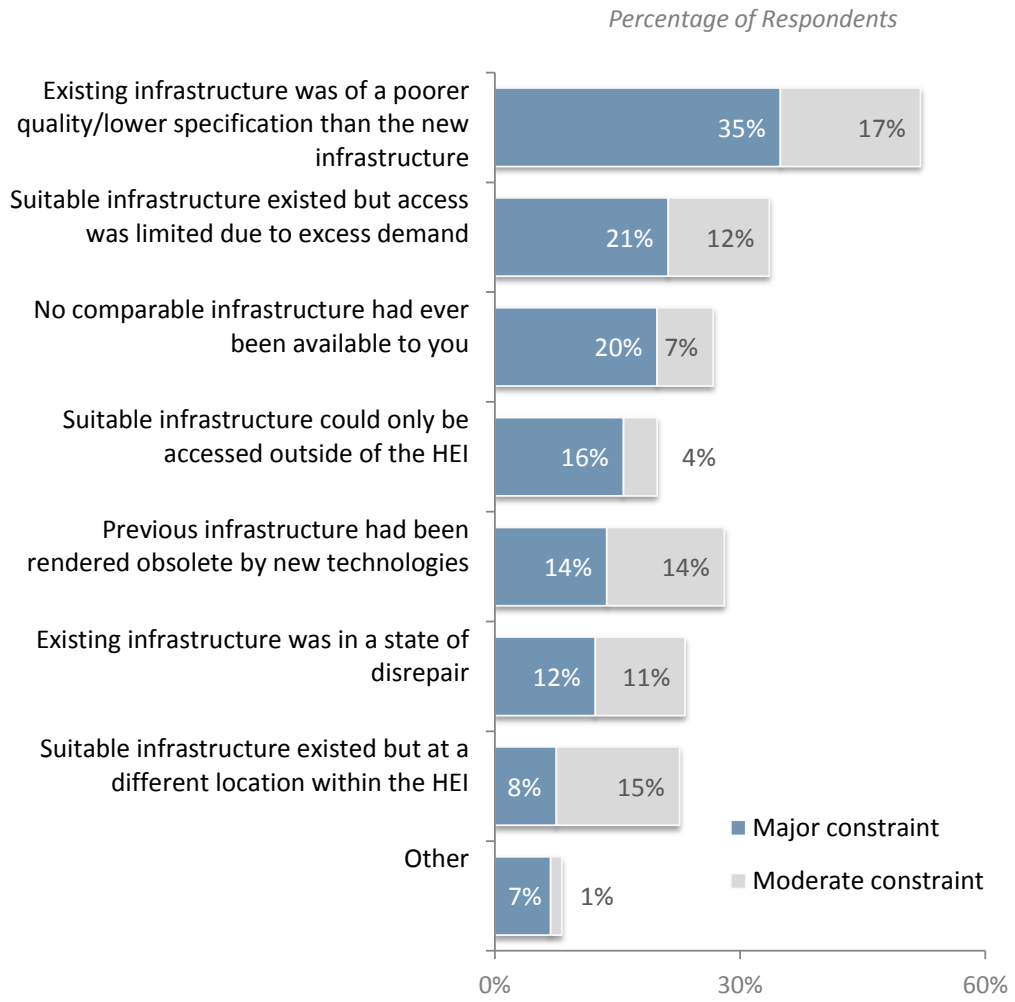
6.3 Constraints

6.3.1 Users were asked to indicate what major constraints they faced in achieving their research objectives prior to the availability of the SRIF2006-08-funded infrastructure in order to ascertain precisely which problems SRIF2006-08 has helped to address.

6.3.2 With regards to buildings, just over one half (52%) of users reported that a major or moderate constraint was the sub-standard quality or lower specification of the existing buildings compared with the new buildings. If prior to SRIF2006-08 premises were suitable for use by respondents, one third nevertheless reported major or moderate constraints owing to limited access because of excess demand (Figure 6.4). A major or moderate constraint confronted just over one quarter (27%) of users in the past

where no comparable premises to those funded by SRIF2006-08 were available to them.* In other cases, users were having to use buildings located either elsewhere within the HEI or outside of the HEI itself, or buildings had simply fallen into disrepair.

Figure 6.4 Past constraints faced by internal users (buildings)

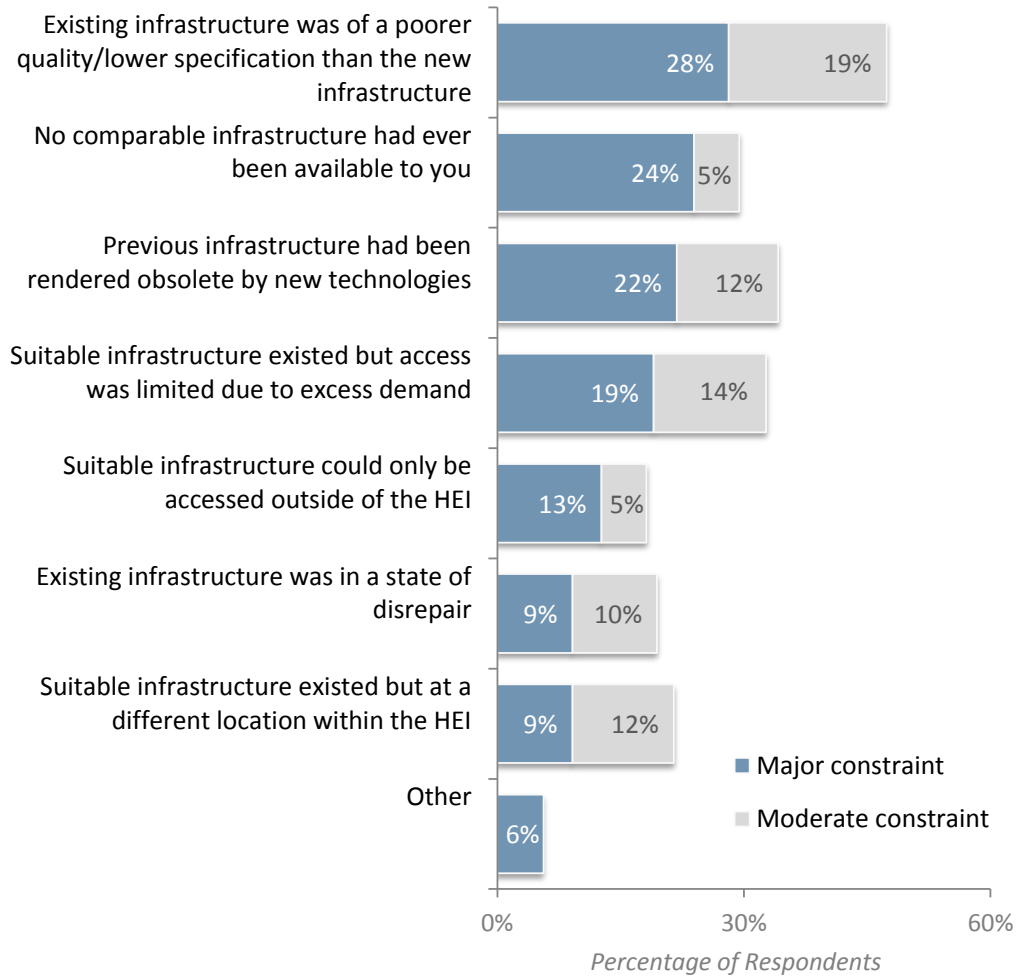


Source: Internal User Survey Responses: 146

6.3.3 There is a similar picture for SRIF2006-08 funded equipment (Figure 6.5). The relatively poor state of equipment existing in some HEIs prior to SRIF2006-08 is apparent in that major or moderate constraints were faced by respondents as a result of past equipment being:

- Poorer quality/lower specification (47%)
- Rendered obsolete by the emergence of new technologies (34%)
- In a state of disrepair (19%)

Figure 6.5 Past constraints faced by internal users of equipment



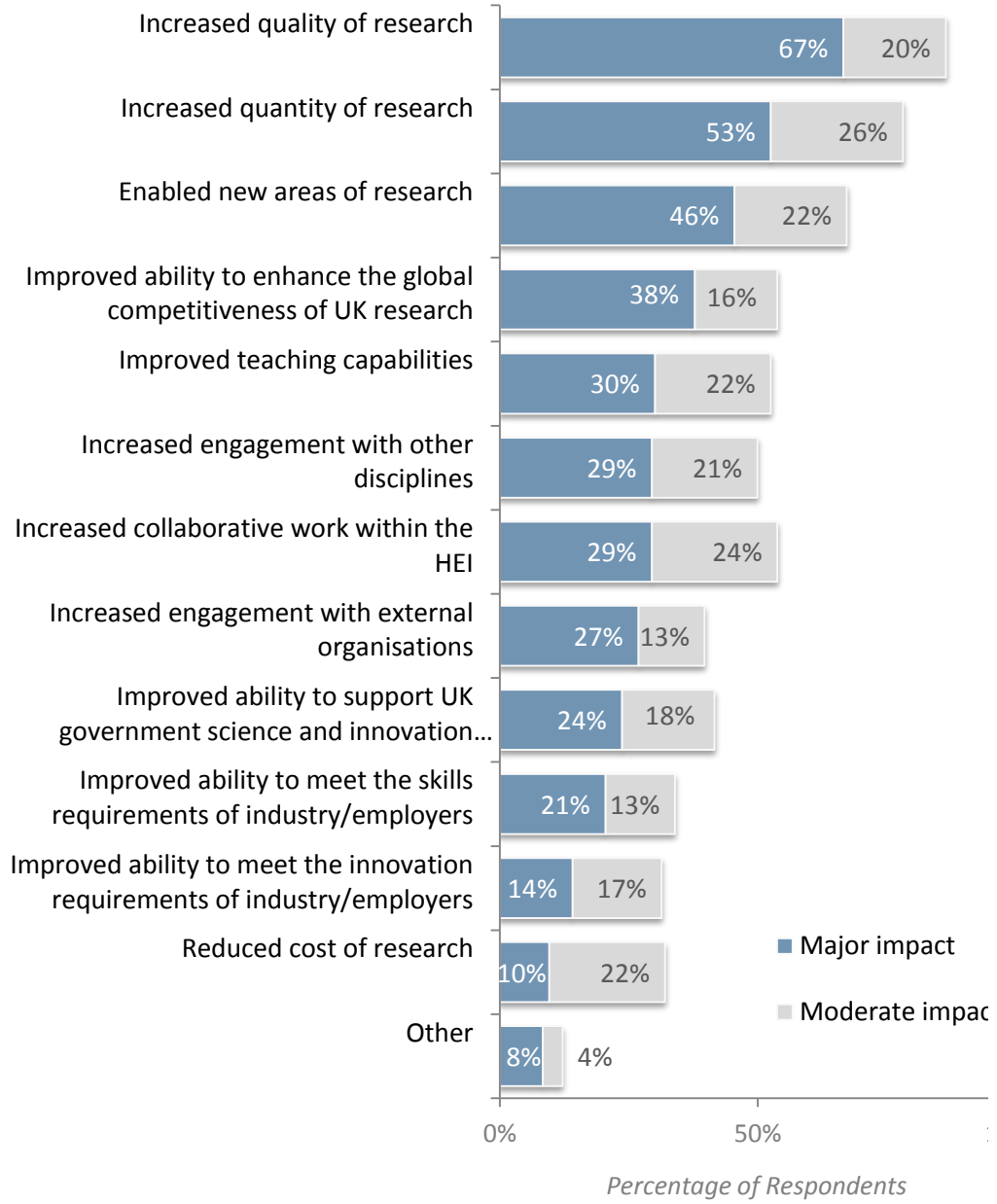
Source: Internal User Survey Responses: 142

6.4 Impacts

6.4.1 Users noted a wide and diverse range of impacts having been realised through the use of SRIF2006-08 funded infrastructure (Figure 6.6). With regards to buildings, almost all respondents noted that access to the new infrastructure had at least moderately increased the quality and/or quantity of their research. Just over two-thirds (68%) of respondents pointed to the impact of new/refurbished buildings in enabling new areas of research to be pursued.

6.4.2 Almost half of respondents claimed that SRIF2006-08 buildings had had a major impact through the opening up of new research areas. Significant impacts were also felt with respect to increasing collaborative and multidisciplinary work, and increasing engagement with external organisations. Consequently, around a quarter of users thought the infrastructure had had a major impact upon their ability to support UK government science and innovation policy, whilst over a third observed a major impact upon the overall competitiveness of UK research.

Figure 6.6 Impacts of new/refurbished buildings on output of internal users

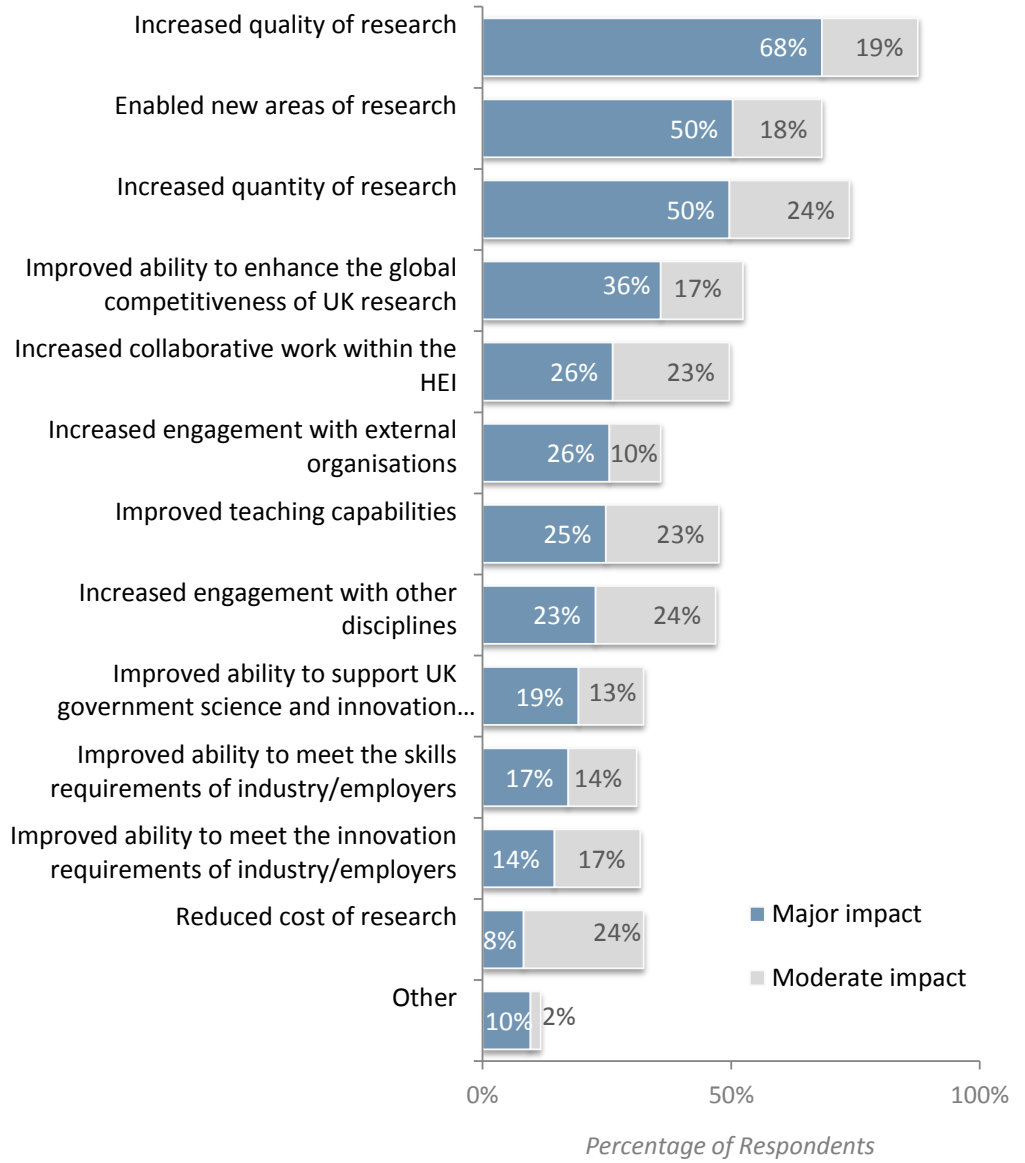


Source: Internal User Survey Responses: 156

6.4.3 Once again, a similar picture is observed in relation to the SRIF2006-08 funded equipment (Figure 6.7). The quality of research remains the biggest impact area, with between two-thirds and three-quarters of respondents noting at least moderate impacts upon the quantity of research and the opening up of new research areas.

6.4.4 New equipment appears slightly less likely to stimulate multi-disciplinary research, or to enhance teaching capabilities or improve the ability of the HEI to satisfy the skills requirements of industry. This is understandable, however, as new research equipment is likely to be more focussed on a specific research area. Research buildings, on the other hand, are more likely to be multi-purpose pieces of infrastructure that are better placed to foster multi-disciplinary, collaborative research.

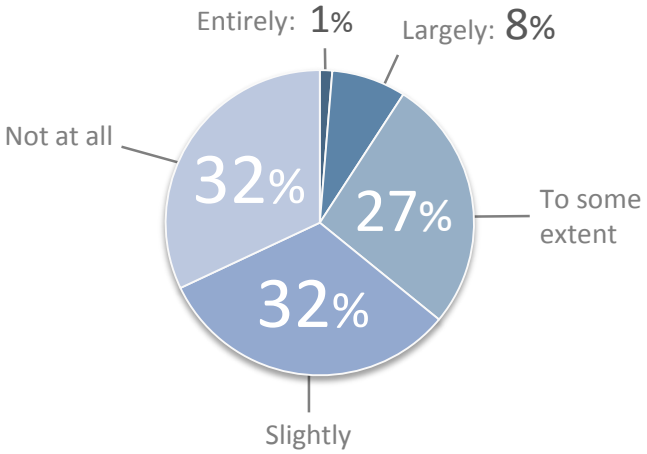
Figure 6.7 Impacts of new equipment on output of internal users



Source: Internal User Survey Response rate: 156

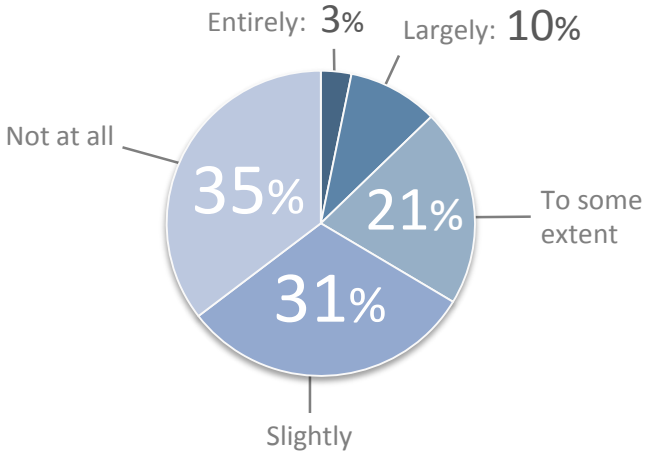
6.4.5 Figure 6.8 and Figure 6.9 show the respective counterfactual estimates for both buildings and equipment funded by SRIF2006-08. Users were asked the extent to which the impacts described above might have been realised had they not had access to SRIF2006-08 funded infrastructure. The picture is largely the same for both types, with around two-thirds believing the impacts would either only slightly have been realised or would never have been realised at all without SRIF 2006-08 funding.

Figure 6.8 **Counterfactual: the extent to which impacts would have been realised without access to SRIF2006-08 infrastructure (buildings)**



Source: Internal User Survey Response rate: 153

Figure 6.9 **Counterfactual: The extent to which impacts would have been realised without access to SRIF2006-08 infrastructure (equipment)**

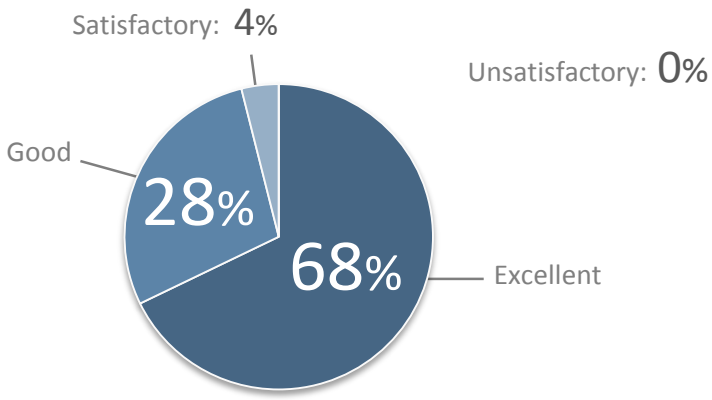


Source: Internal User Survey Response rate: 158

6.5 Satisfaction, experience and constraints in using the infrastructure

6.5.1 Overall, over two-thirds of respondents said they had had an 'excellent' experience in using the SRIF2006-08 funded infrastructure, with no users claiming to have had an unsatisfactory experience (Figure 6.10)

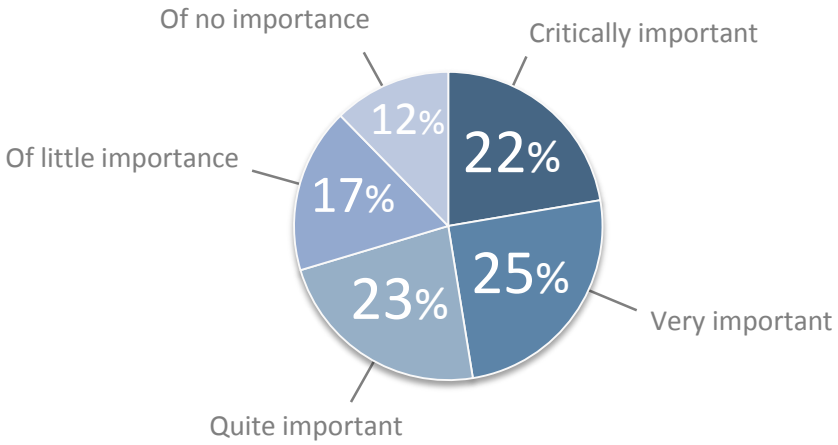
Figure 6.10 Overall satisfaction



Source: Internal User Survey Responses: 180

6.5.2 The importance of SRIF2006-08 infrastructure in attracting staff and students to an HEI, and in retaining existing staff, is reflected in Figure 6.11. Almost half of respondents claimed that the existence of this infrastructure alone had been either 'very important' or 'critically important' in their decision to either join or remain at the HEI. The great significance of the quality of infrastructure in staff recruitment and retention demonstrated here may have substantial consequences for future investment decisions in developing the international competitiveness of UK higher education.

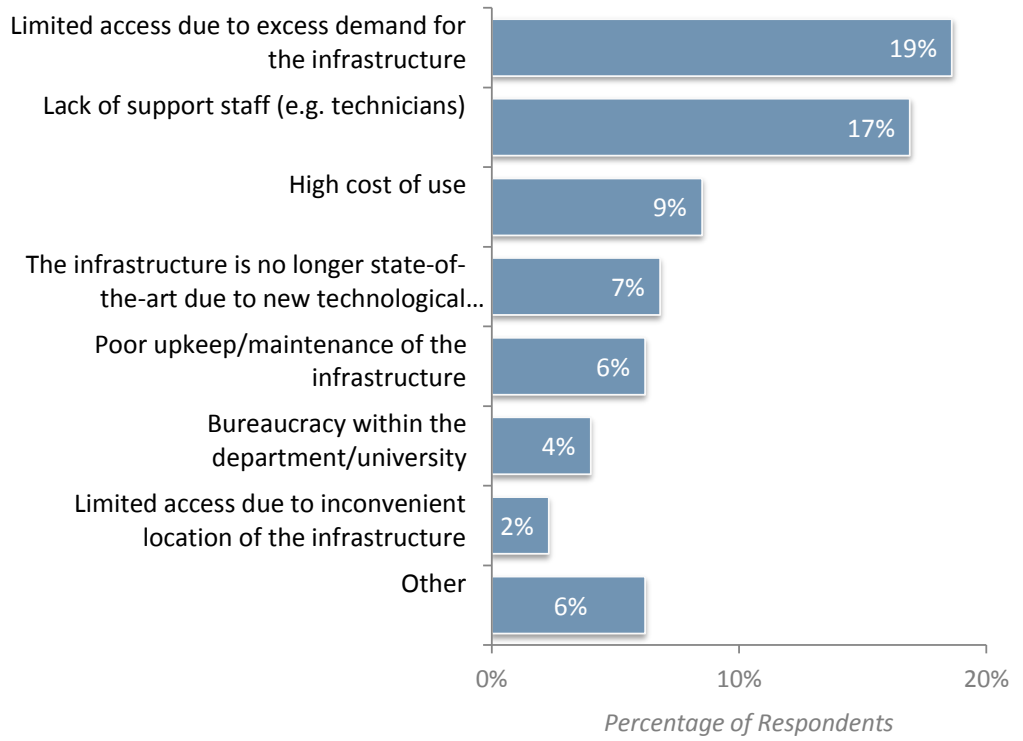
Figure 6.11 Importance of SRIF2006-08 infrastructure in influencing user decision to either join or remain at the HEI



Source: Internal User Survey Responses: 179

6.5.3 Figure 6.12 shows the constraints faced by users. Unsatisfied demand for high quality infrastructure continues to be an issue, limiting access to SRIF2006-08 funded infrastructure in around one in five cases. A similar proportion of users complained of a lack of support staff (such as technicians) to facilitate engagement with the infrastructure. A small percentage of users noted that the infrastructure had either been poorly maintained or had fallen behind the state-of-the-art due to technological advancements since the end of funding four years ago.

Figure 6.12 Constraints



Source: Internal User Survey Responses: 156

6.6 Conclusions

6.6.1 The evidence from users appears to suggest a high level of satisfaction with SRIF2006-08 funded infrastructure, and a wide range of positive impacts are being realised four years on from the end of the funding period. Most users have noted major impacts upon the quantity and quality of their research, and user views on the counterfactual situation suggest that SRIF2006-08 has generated a great deal of additionality. Whilst a substantial number of users claim that the investments made in 2006-08 are already having a major impact upon the international competitiveness of UK research, the full socio-economic impacts of these investments will take many years to materialise.

6.6.2 Whilst poor maintenance and upkeep does not appear to be as significant a problem as it may have been in the past, great care needs to be taken in future to ensure that the requisite supporting technical staff are provided in order to make the most of the infrastructure, as a relatively large share of users are encountering notable constraints due to this shortcoming.

6.6.3 The availability of high quality infrastructure appears to be a major factor in attracting and retaining high calibre staff at UK HEIs, and subsequently in driving high quality, multi-disciplinary research, and the wider competitiveness of the UK research base. With this in mind, the message from users that limited access due to unsatisfied demand continues to be a substantial issue suggests that there remains plenty of room for further investment in UK research infrastructure.

7 External User Survey

7.1 Introduction

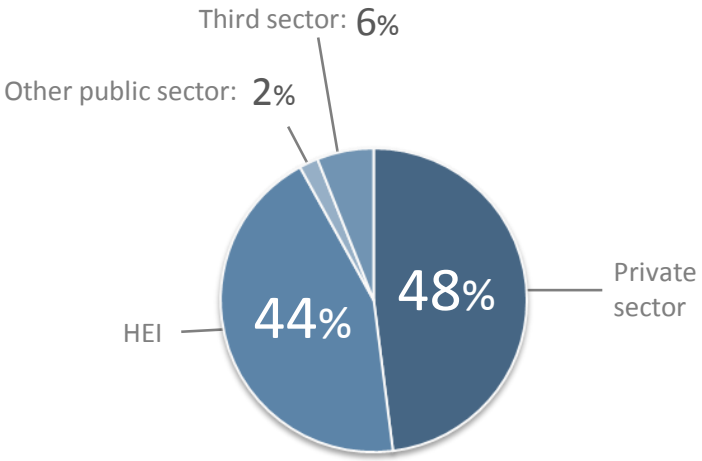
7.1.1 The experience of external users as reported by project managers was presented in Chapter 5 above. In this chapter, we present a survey of the external users themselves to ascertain their perceptions of the experience of using research infrastructure funded by SRIF2006-08. This not only widens the analysis of the impact of SRIF2006-08 to incorporate the views of external users but also permits a comparison of their views with those of the project managers.

7.1.2 The sampling frame was derived from contacts of external users provided by the project managers and a telephone- and web-based survey was undertaken. 50 useable responses were achieved.

7.2 External user profiles

7.2.1 The external users interviewed were split roughly half and half between private sector users and other HEI users, along with a small number of third sector and other public sector users (Figure 7.1).

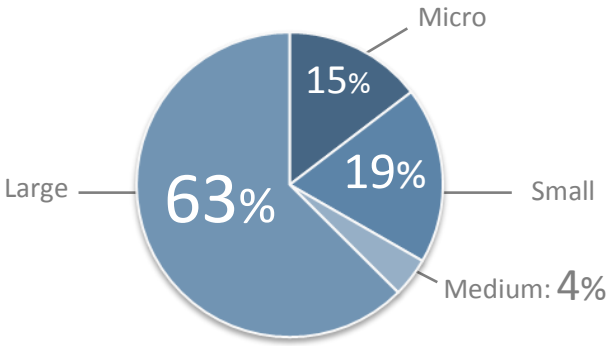
Figure 7.1 External users of SRIF2006-08 infrastructure by type



Source: External User Survey Response rate: 50

7.2.2 A disproportionately high number of the external users are large organisations with over 250 employees, making up almost two-thirds of all external users (Figure 7.2). Whilst the high number of HEIs accessing the infrastructure largely drives this figure, large organisations also accounted for 46% of the private sector organisations shown in Figure 7.1, confirming their disproportionate share amongst users.

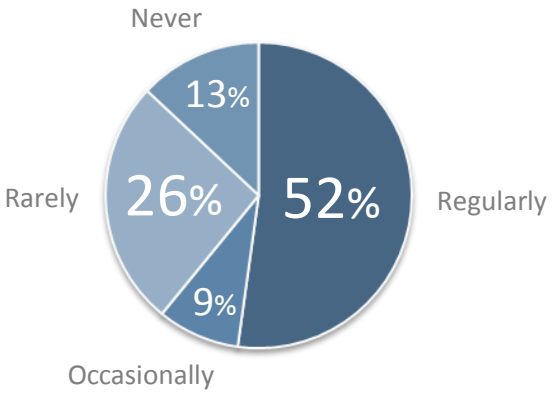
Figure 7.2 External users of SRIF2006-08 infrastructure by size



Source: External User Survey Response rate: 48

7.2.3 Furthermore, over half of the users had already made regular use of HEI infrastructure in the past (Figure 7.3), whilst the majority of external users initially became aware of the availability of the SRIF2006-08 funded infrastructure through existing relationships with HEIs (Figure 7.4). Only 12% of external users obtained information about the infrastructure from other organisations, such as customers, competitors, suppliers or other sources, and only 13% had never made use of HEI infrastructure in the past. Private and public sector organizations were similar in their frequency of use of HEI infrastructure, with 54% of private sector users stating that they had used HEI infrastructure regularly in the past.

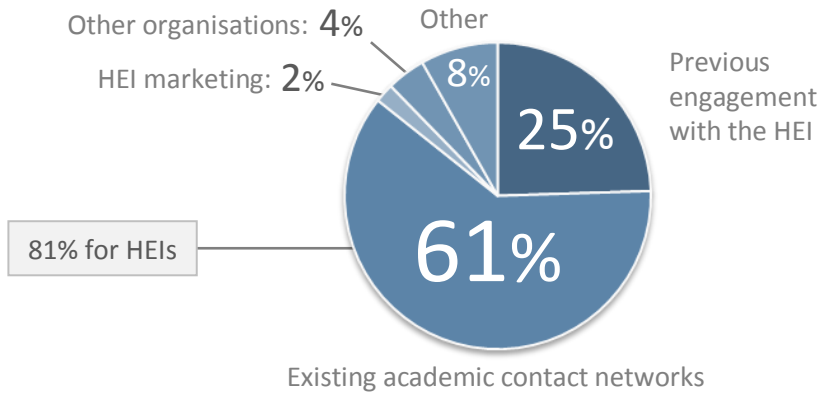
Figure 7.3 Extent of previous use of HEI infrastructure



Source: External User Survey Response rate: 46

7.2.4 Whilst this may be indicative of barriers to access by new organisations, it may also be the case that the nature of the facilities and equipment funded by SRIF2006-08 is such that their users are naturally inclined to have a history of HEI engagement, particularly in research-intensive STEM fields.

Figure 7.4 Sources of information on the availability of SRIF2006-08 infrastructure

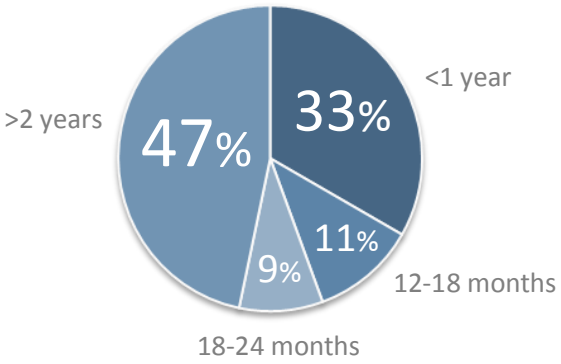


Source: External User Survey Response rate: 49

7.3 Activities

7.3.1 Four years after the end of the SRIF2006-08 funding period, new external users continue to emerge, with a third of the external users interviewed having only first gained access to the facilities or equipment within the last year (Figure 7.5). This said, almost half of the external users had been using the infrastructure for over two years, suggesting that access by external users is often on a repeated basis, rather than a one-off engagement. Private sector users were more likely to have used the equipment or facility for over two years (64% of private sector respondents).

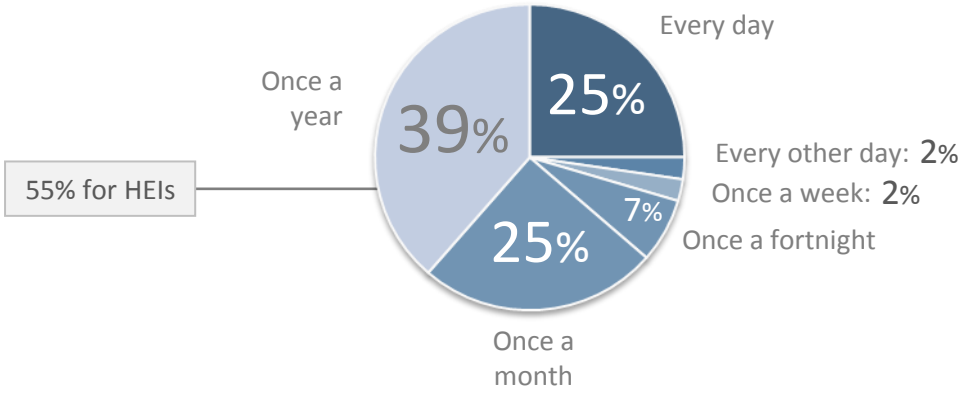
Figure 7.5 Length of use of SRIF2006-08 infrastructure



Source: External User Survey *Response rate:* 45

7.3.2 As well as the wide range of new and old users, there is a great deal of variation in the frequency of use of different types of infrastructure, ranging from a quarter of users who access the infrastructure every single day, to almost two-fifths of external users who only make use of the infrastructure once a year (Figure 7.6). 35% of private sector external users stated that they used the infrastructure every day.

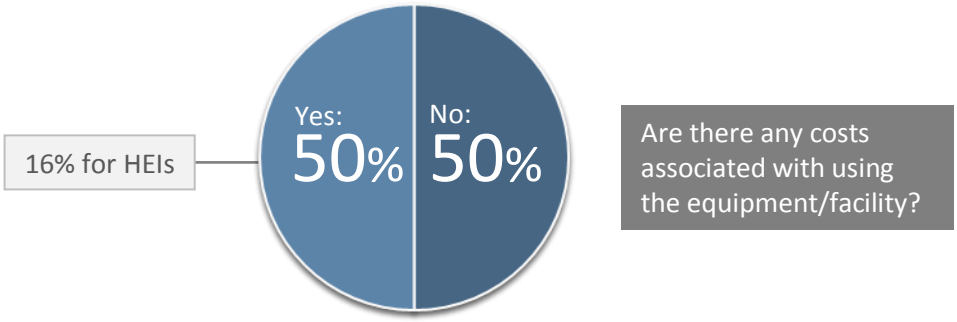
Figure 7.6 Frequency of use of SRIF2006-08 infrastructure



Source: External User Survey *Response rate:* 44

7.3.3 Across the sample, there was a fifty-fifty split between external users who paid to access the infrastructure and those that did not (Figure 7.7).

Figure 7.7 Charged for usage of SRIF2006-08 infrastructure



Source: External User Survey *Response rate:* 46

7.3.4 Fee paying was far less regular amongst HEIs, however, with 78% of private sector users but only 16% of external HEIs having to pay to access SRIF2006-08 funded infrastructure.

Table 7.1 Charged for usage of SRIF2006-08 infrastructure

	Percentages of all respondents			
	Total	HEIs	Businesses	Other
Yes	50	**16**	**78**	50
No	50	**84**	**22**	50
Number of respondents	*46*	*19*	*23*	*4*

Source: External User Survey Responses: 46

7.3.5 Table 7.2, Table 7.3 and Figure 7.8 show the infrastructural constraints that were previously faced by external users in achieving their research objectives. Table 7.2 look specifically at in-house infrastructure, Table 7.18 looks at equipment, whilst Figure 7.8 looks at other external infrastructure.

7.3.6 In the case of the former, insufficient scale was by far the most common constraint faced. Over 60% of all respondents (including three-quarters of private sector respondents) said that they previously had in-house facilities that were not of a sufficient scale, whilst a further 26% had simply been unable to develop in-house facilities. With respect to equipment, 61% of external users had previously depended upon equipment that also lacked the desired scale, whilst poor quality or lower specification equipment or facilities were also significant problems for 19% of users.

7.3.7 Use of other external infrastructure was more limited, as evidenced by Figure 7.8, with many respondents claiming that no comparable infrastructure existed off-site. This suggests that SRIF2006-08 may have encouraged a degree of resource sharing that was not previously witnessed, allowing for more efficient use of scarce resources.

7.3.8 In the cases where external infrastructure had been available prior to SRIF2006-08, the main complaint recorded by the users was that of the infrastructure being inconveniently located, particularly in the case of facilities. Excessive cost of access or usage was also noted in a number of cases, whilst 'other' complaints included bureaucracy and administrative issues, or a lack of skilled support personnel able to operate externally available equipment.

Table 7.2 Constraints relating to in-house infrastructure prior to availability of SRIF2006-08 infrastructure rated as "severe" facilities

	Percentages of all respondents			
	Total	HEIs	Businesses	Other
Insufficient scale	62	47	**76**	33
Poorer quality/lower specification than the SRIF2006-08 infrastructure	15	27	9	0
Infrastructure in a state of disrepair/degradation	5	13	0	0
Infrastructure rendered obsolete by new technologies	0	0	0	0
Development of in-house infrastructure infeasible due to cost	26	20	30	33
Development of in-house infrastructure infeasible due to lack of skills/human capital	8	7	9	0
Number of respondents	*39*	*15*	*21*	*3*

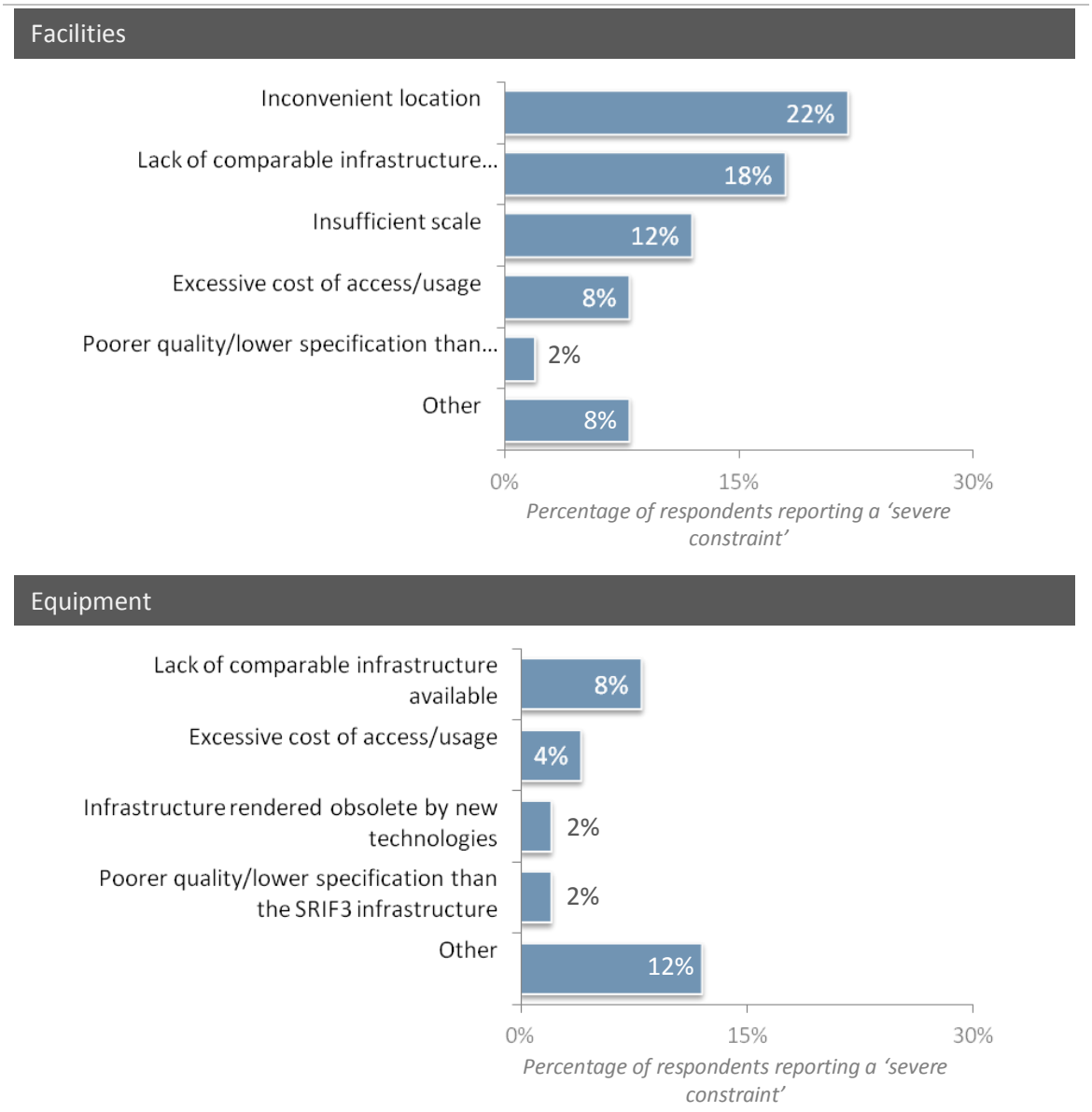
Source: External User Survey Responses: 39

Table 7.3 Constraints relating to in-house infrastructure prior to availability of SRIF2006-08 infrastructure rated as "severe" equipment

	Percentages of all respondents			
	Total	HEIs	Businesses	Other
Insufficient scale	61	42	76	50
Poorer quality/lower specification than the SRIF2006-08 infrastructure	19	25	19	0
Infrastructure in a state of disrepair/degradation	3	8	0	0
Infrastructure rendered obsolete by new technologies	0	0	0	0
Development of in-house infrastructure infeasible due to cost	10	8	14	0
Development of in-house infrastructure infeasible due to lack of skills/human capital	6	0	12	0
Number of respondents	*31*	*12*	*17*	*2*

Source: External User Survey Responses: 31

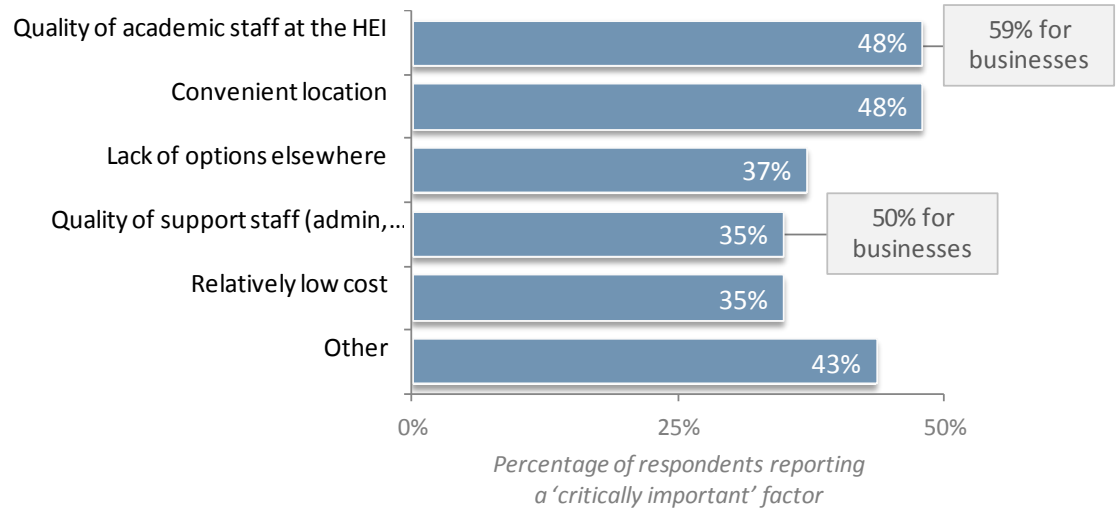
Figure 7.8 Constraints relating to externally available infrastructure prior to availability of SRIF2006-08 infrastructure



Source: External User Survey *Response rate:* 50

7.3.9 The leading motivations for external users engaging with SRIF2006-08 funded facilities and equipment were the quality of academic staff at the relevant HEI and the convenience of location, with around a half of all respondents claiming these to have been 'critically important' factors (Figure 7.9). Beyond this, the quality of support staff, low cost of access or usage, and the simple lack of options elsewhere were also critical factors in many cases.

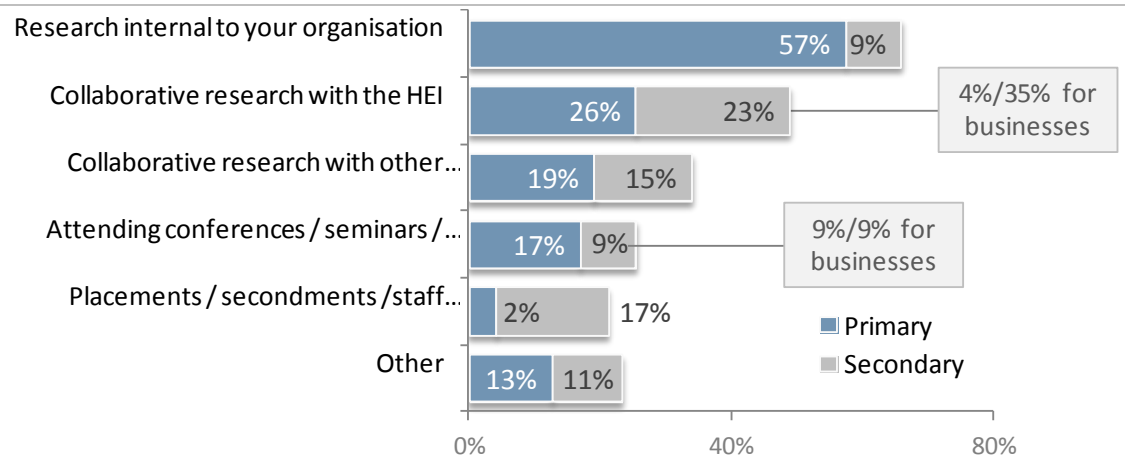
Figure 7.9 Motivations for choosing SRIF2006-08 infrastructure over other options



Source: External User Survey *Response rate:* 46

7.3.10 The most common primary purpose of accessing SRIF2006-08 funded infrastructure was the conduct of research wholly internal to the organisation in question, with collaborative research being more of a secondary concern in many cases (7.3.10). This said, collaborative research between the external user and the HEI housing the SRIF2006-08 funded infrastructure, or with other organisations, was also claimed to be a primary use in around a quarter of cases (though only 12% of private sector users). Knowledge exchange events, such as conferences, seminars and workshops, were also fairly common.

Figure 7.10 Primary and secondary uses of SRIF2006-08 infrastructure



Source: External User Survey *Response rate:* 46

7.4 Outcomes and impacts

7.4.1 Whilst collaborative research was only a primary objective in around a quarter of cases, almost half of all external users claimed that their engagement with SRIF2006-

08 funded facilities has had a major impact upon the level of collaboration with HEIs, whilst a quarter claimed that an improved understanding of the current research being carried out at UK HEIs was one of the major outcomes of their engagement (Table 7.4). This increased collaboration and understanding is not, however, limited to the bilateral HEI-user relationship, with almost a quarter of all users experiencing a substantial increase in their level of collaboration with other external organisations. For private sector external users, 42% stated that enhanced workforce skills and human capital were major impacts..

7.4.2 Other key outcomes identified by external users included major increases in workforce skills and human capital, as well as the development of new products and processes, both of which were felt by almost a third of all external users.

Table 7.4 Outcomes associated with facilities

	Percentages of all respondents			
	Total	HEIs	Businesses	Other
Development of new products or processes	30	**12**	37	**75**
Enhancement of innovative capabilities	20	6	32	25
Enhancement of workforce skills/human capital	30	**12**	42	50
Improvement of management skills/business processes	10	0	16	25
Reduced cost of research	13	12	16	0
Establishment/expansion of networks	20	12	16	**75**
Increased collaboration with HEIs	45	35	47	75
Improved understanding of current research in HEIs	25	24	26	25
Increased collaboration with other organisations	23	24	26	0
Improved ability to support UK government science and innovation priorities	23	18	26	25
Improved ability to enhance the global competitiveness of UK research	30	29	32	25
Other	35	29	37	50
Number of respondents	*40*	*17*	*19*	*4*

Source: External User Survey Responses: 40

7.4.3 Table 7.5 shows a similar picture for outcomes associated with the use of specific pieces of SRIF2006-08 funded equipment, albeit with 42% of users recording a major impact upon their level of collaboration with HEIs. Only 7% of HEIs saw enhancement of their innovative capabilities as a major impact.

Table 7.5 Outcomes associated with equipment

	Percentages of all respondents			
	Total	HEIs	Businesses	Other
Development of new products or processes	27	14	29	**100**
Enhancement of innovative capabilities	27	**7**	41	25
Enhancement of workforce skills/human capital	27	14	35	25
Improvement of management skills/business processes	6	0	12	0
Reduced cost of research	18	14	24	0
Establishment/expansion of networks	24	21	18	**100**
Increased collaboration with HEIs	42	43	41	25
Improved understanding of current research in HEIs	24	21	29	0
Increased collaboration with other organisations	21	14	29	0
Improved ability to support UK government science and innovation priorities	27	21	29	25
Improved ability to enhance the global competitiveness of UK research	33	43	24	25
Other	45	36	53	75
Number of respondents	*33*	*14*	*17*	*2*

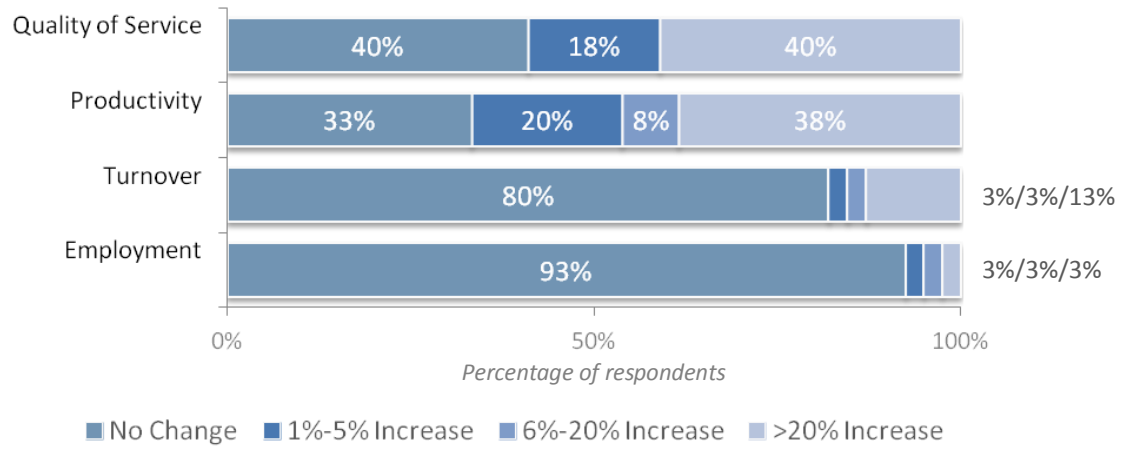
Source: External User Survey Responses: 33

7.4.4 For external users accessing both facilities and equipment, an increased ability to support UK innovation and the competitiveness of UK research overall was also noted as a major impact area in around a third of cases.

7.4.5 Figure 7.11 moves from outcomes to impacts, illustrating the ultimate effect that the outcomes set out in Table 7.4 and Table 7.5 have on the overall performance of the external organisation. In a large number of cases, no effect has yet been recorded on the turnover or employment of the external organisation in question. This, however, will be an impact area limited by the fact that around half of all external users come from other HEIs that are not primarily seeking to improve either employment or turnover when accessing SRIF2006-08 funded infrastructure.

7.4.6 Furthermore, in a number of industries, accessing SRIF2006-08 funded infrastructure for research purposes is only likely to have an impact upon turnover and employment many years down the line. As such, the greatest observable impacts at this stage are upon productivity and quality of service – in both cases, around 40% recorded an increase of over 20% as a direct consequence of utilising SRIF2006-08 funded infrastructure. Small- and medium-sized businesses were the most likely to have observed increases of over 20% upon productivity and quality of service (58.3% and 50% of respondents respectively). However, none of the differences between businesses, HEIs, and other organisations in terms of the levels of impacts were statistically significant.

Figure 7.11 Impacts associated with the use of SRIF2006-08-funded infrastructure

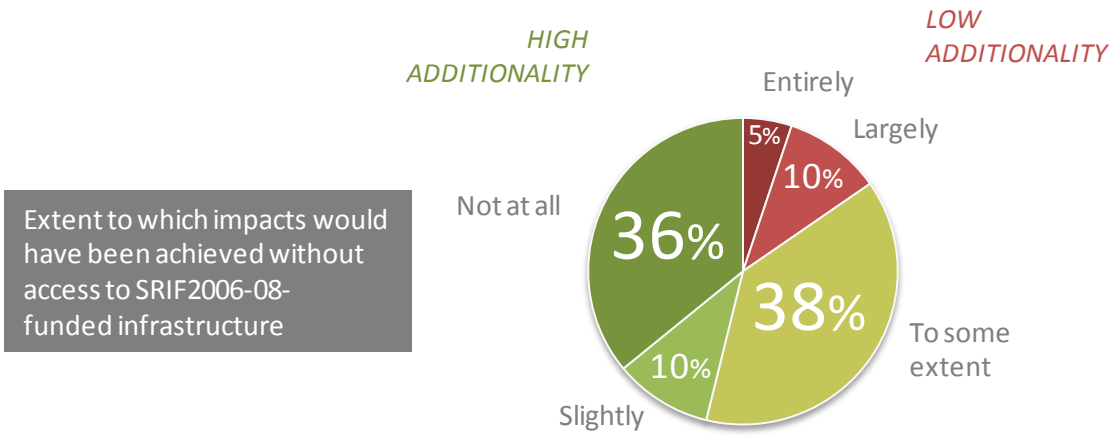


Source: External User Survey *Response rate:* 43

7.5 Additionality and counterfactual

7.5.1 In order to ascertain the level of impact additionality represented by the SRIF2006-08 investments, we asked external users to estimate the extent to which the impacts shown in 7.4.6 could have been realised in the counterfactual situation of never having had access to SRIF2006-08 funded infrastructure.

Figure 7.12 Additionality of impacts derived from the use of SRIF2006-08 funded facilities

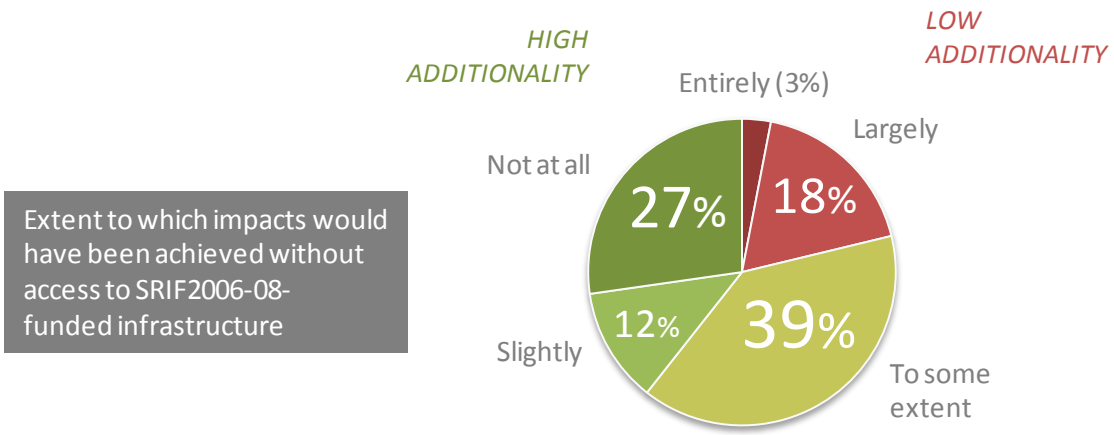


Source: External User Survey *Response rate:* 39

7.5.2 Figure 7.12 and Figure 7.13 show that in most cases only a small proportion of the impacts described above could have been realised without access to SRIF2006-08 funded infrastructure, and in many cases none of the impacts could have materialised. This is consistent with the lack of appropriate alternative infrastructure noted in Table 7.2 and Figure 7.8, above. Only in a very small number of cases did external users claim that they could have achieved similar results by other means,

implying a high degree of impact additionality in the SRIF2006-08 portfolio. Impact additionality is slightly higher for users of facilities (Figure 7.12) rather than specific equipment (Figure 7.13), with the share of engagements that would not have achieved any of their impacts in the absence of SRIF2006-08 being 36% in the former case, compared to 27% in the latter. This is to be expected, as investment in entire facilities tend to be much larger than investment in specific machinery or equipment, and so users are less likely to have alternative means of achieving their objectives.

Figure 7.13 Additionality of impacts derived from the use of SRIF2006-08 funded equipment



Source: External User Survey *Response rate:* 33

7.6 Overall satisfaction and constraints faced

7.6.1 The external users surveyed registered a very high degree of satisfaction with the SRIF2006-08 funded infrastructure, with almost two-thirds claiming to have had an 'excellent' experience of engagement with the relevant HEI's equipment or facilities (Table 7.6). Another third of users registered a 'good' experience, whilst only one user interviewed claimed to have been unsatisfied with their experience, due to issues that stemmed from a lack of adequate support staff to operate the infrastructure in question. 68% of businesses reported an "excellent" experience, as against 59% of HEIs – however, this difference is not statistically significant at the 95% confidence level.

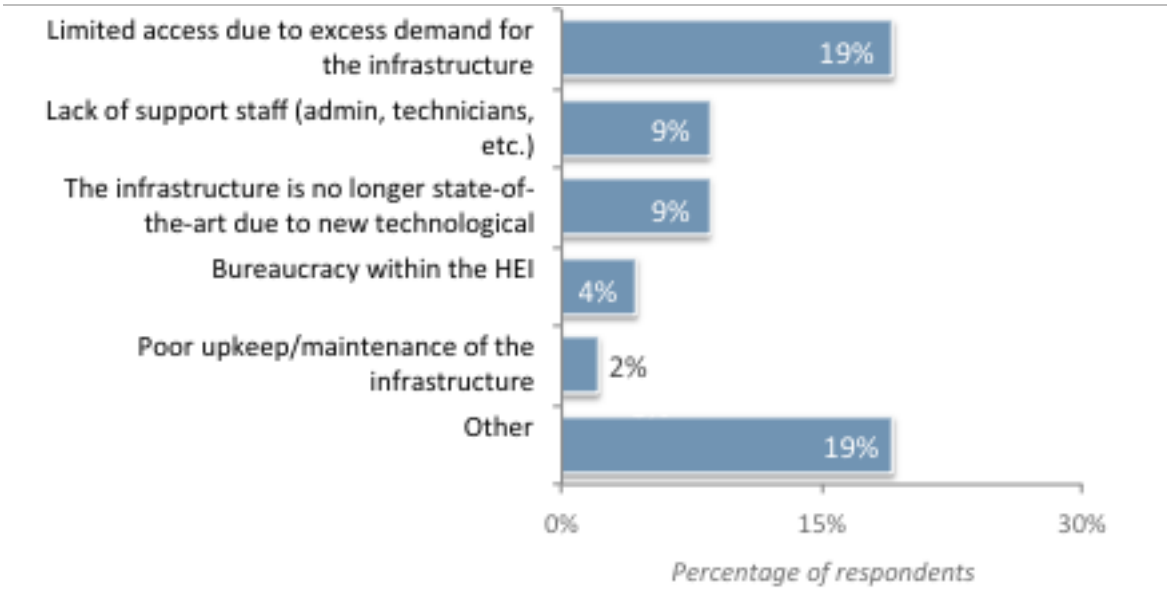
Table 7.6 Overall satisfaction with the experience of using SRIF2006-08 funded infrastructure

	Percentages of all respondents			
	Total	HEIs	Businesses	Other
Excellent	63	59	68	50
Good	35	36	32	50
Satisfactory	0	0	0	0
Unsatisfactory	2	5	0	0
Number of respondents	*48*	*22*	*22*	*4*

Source: External User Survey Responses: 48

7.6.2 The lack of adequate support staff is an issue common to many large-scale infrastructure projects, and indeed one that has not gone unreported with regards to the SRIF2006-08 portfolio, although less than 10% of external users noted it as a significant constraint faced in using the infrastructure (Figure 7.14). More significantly, limited access to infrastructure due to unsatisfied demand continues to be an issue, with some 19% of external users flagging this problem up. Furthermore, in around one in ten cases the infrastructure is already falling behind the state-of-the-art due to technological advancements, just four years after the end of the funding period.

Figure 7.14 Constraints faced in the use of SRIF2006-08 funded infrastructure



Source: External User Survey *Response rate:* 47

7.6.3 'Other' constraints included criticisms of academics lacking the experience or skills demanded by industry, as well as some minor administrative and bureaucratic issues.

7.6.4 Finally, external users were invited to offer any further comments on their experience with SRIF2006-08. Many external users took this opportunity to praise the fund and to call for increased government investment in future, claiming it to be essential in supporting the international competitiveness of UK research and industry. Many

reiterated the point that there remains unsatisfied demand and insufficient access to the types of facilities and equipment supported by SRIF, whilst a lack of alternative funding sources makes it extremely difficult to secure the capital investments required by the research base by other means. Finally, it was again pointed out that some of the infrastructure is already falling behind the state-of-the-art, and that continued investment is therefore required.

7.7 Conclusions

7.7.1 The external users of SRIF2006-08 funded infrastructure are disproportionately made up of HEIs and large companies with a history of previous HEI engagement, although a significant degree of SME activity is also observed. Free access to infrastructure is often granted between HEIs, but whilst private sector users are more often than not required to pay access fees.

7.7.2 Whilst most engagements are motivated by the internal research agenda of the external user, one of the most significant outcomes of engagement with SRIF2006-08 infrastructure has been to increase the level of collaboration between users and HEIs, as well as between users and other external partners. Significant impacts upon the turnover and employment of external users are yet to be realised, although this is to be expected given the nature of the research being carried out. Large improvements have, however, already been achieved in the productivity and quality of service of external organisations in many cases, and further impacts are expected to accrue over time. A relatively high degree of impact additionality has been observed, particularly with respect to the larger facilities, and overall user satisfaction rates are high.

7.7.3 Finally, the importance of continued research capital funding is clear, in order to alleviate problems of unsatisfied demand and to maintain and enhance UK competitiveness.

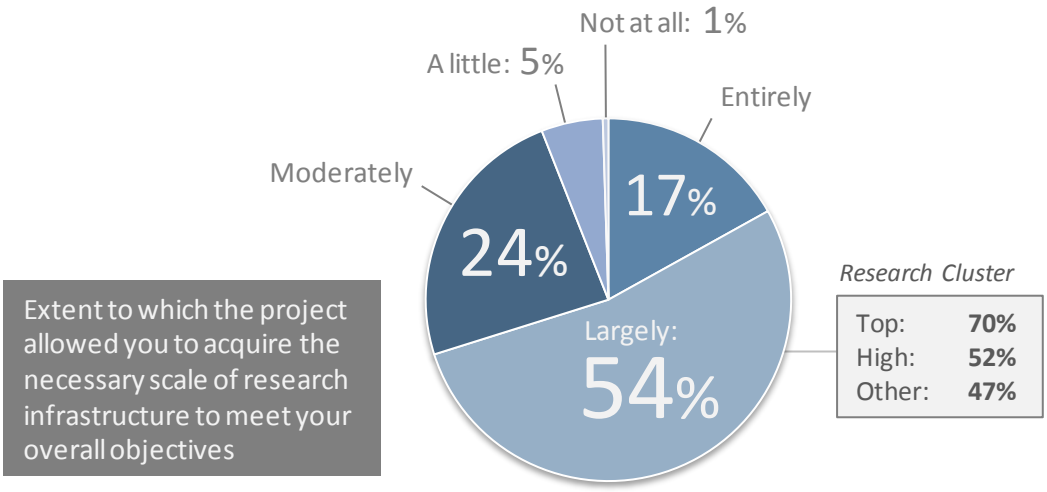
8 Legacy and Sustainability

8.1 Introduction

8.1.1 This chapter looks at the sustainability of the SRIF2006-08 investments. One of the principal aims of this evaluation is to assess the extent to which the investments have not only enabled the HEIs to acquire the necessary research infrastructure, but also whether the investments made are sufficient (in themselves) to ensure the continued (future) use of the infrastructure. In other words, we are interested to know to what extent the SRIF2006-08 funded projects continue to meet the research capital needs of the HEIs. Although the responses relate to the contribution of SRIF2006-08, it is highly likely that some of the perceptions of project managers will be informed by the current situation of HEIs and their research capital needs. Consequently, the chapter begins by considering to what extent the projects funded by the investments have enabled the HEIs to acquire the necessary research capacity. The discussion is extended to look in particular at whether (and how) the SRIF2006-08 projects are helping (or have helped) the HEI to meet the backlog of investment in their research infrastructure. The related issues of whether SRIF2006-08 projects continue to meet the research capital needs of HEIs and whether any major capital investment will be required in the coming years are then addressed.

8.1.2 The legacy of the SRIF2006-08 investments may be considered to include the acquisition of new research infrastructure and/or the refurbishment of existing infrastructure. The evidence from the survey of project managers indicates that SRIF2006-08 has enabled only a minority of the HEIs to acquire the necessary scale of research infrastructure that completely meets their overall objectives. As can be seen from the survey, fewer than one in five of the projects (17%) have enabled the HEIs to entirely meet their research objectives in the discipline areas covered by the projects. However, more than half (54%) indicated that the investment had enabled them to meet those objectives to a large extent, and around a quarter (24%), to a moderate extent.

Figure 8.1 Acquiring the necessary scale of research infrastructure



Source: Project Manager Survey Respondents: 200

8.1.3 Three-quarters of project managers in STEM disciplines report that SRIF2006-08 has enabled them to entirely or largely secure the necessary scale of investment to meet their overall objectives.

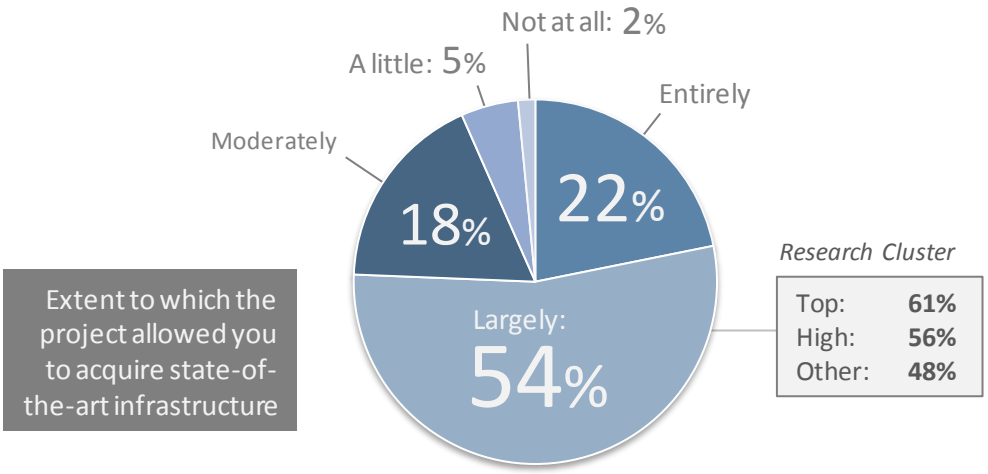
Table 8.1 To what extent has the SRIF2006-08 project(s) allowed you to acquire the necessary scale of research infrastructure to meet your overall objectives

	Percentages of all respondents (see §1.4 for details)			
	Total	STEM	Non-STEM	HEI Wide
Not at all	1	0	3	0
A little	5	5	3	11
Moderately	24	**20**	33	26
Largely	53	56	45	63
Entirely	17	20	17	0
Number of respondents (rate=%)	*200*	*139*	*41*	*9*

Source: PACEC Survey of project managers, 2011 (Q16)

8.1.4 Perhaps even more importantly, the investment has enabled the majority of the HEIs to acquire modern, state-of-the-art research infrastructure. Indeed, more than a fifth of the managers (22%) claimed that their projects have helped fulfil this need entirely. Again, more than half (54%) of the projects appeared to have facilitated, to a large extent, acquisition of state-of-the-art research infrastructure

Figure 8.2 Acquiring state-of-the-art infrastructure



Source: Project Manager Survey Respondents: 197

8.1.5 Here too, Figure 8.2 shows that more HEIs in the 'Top' cluster (61%), compared with the rest, were significant beneficiaries of SRIF2006-08 through acquisition of state-of-the-art infrastructure.

8.1.6 STEM disciplines are more likely to have acquired state-of-the-art infrastructure than non-STEM disciplines, with 84% of the former respondents reporting that they have entirely or largely met their requirements compared with 63% of the latter.

Table 8.2 To what extent has the SRIF2006-08 project(s) allowed you to acquire state-of-the-art research infrastructure

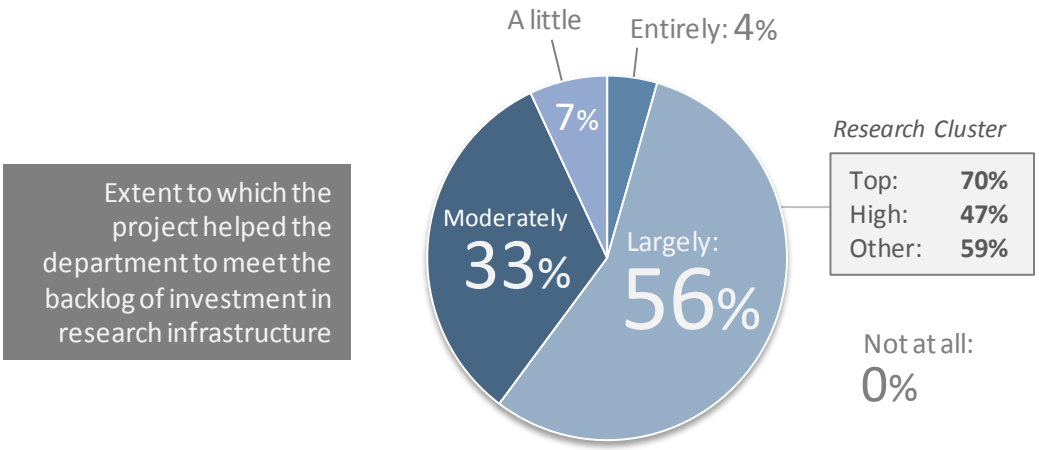
	Percentages of all respondents (see §1.4 for details)			
	Total	STEM	Non-STEM	HEI Wide
Not at all	2	1	3	11
A little	5	**2**	9	22
Moderately	18	**14**	25	27
Largely	54	**60**	44	41
Entirely	22	24	19	0
Number of respondents (rate=%)	*197*	*137*	*40*	*9*

Source: PACEC Survey of project managers, 2011 (Q16)

8.1.7 Another potential legacy effect of the SRIF2006-08 investment is whether or not it has helped HEIs to address the issue of under-investment in research capital infrastructure. The survey asked the project managers to what extent the SRIF2006-08 projects had helped the HEI to meet the backlog of investment in research infrastructure. The evidence suggests that SRIF2006-08 has gone some way to address the gaps in research infrastructure funding. It is particularly noticeable from Figure 8.3 that fewer than one in twenty of the project managers (4%) believed that the SRIF2006-08 investment had helped alleviate the backlog of underinvestment completely in their discipline. It is gratifying, though, that almost three-fifths of the managers (56%) thought the gaps in investment have been largely alleviated in their

respective department/discipline, and a third (33%), moderately so. It is also important to point out here that none of the respondent managers indicated that SRIF2006-08 had not addressed the problem of underinvestment at all.

Figure 8.3 Alleviating the backlog of underinvestment

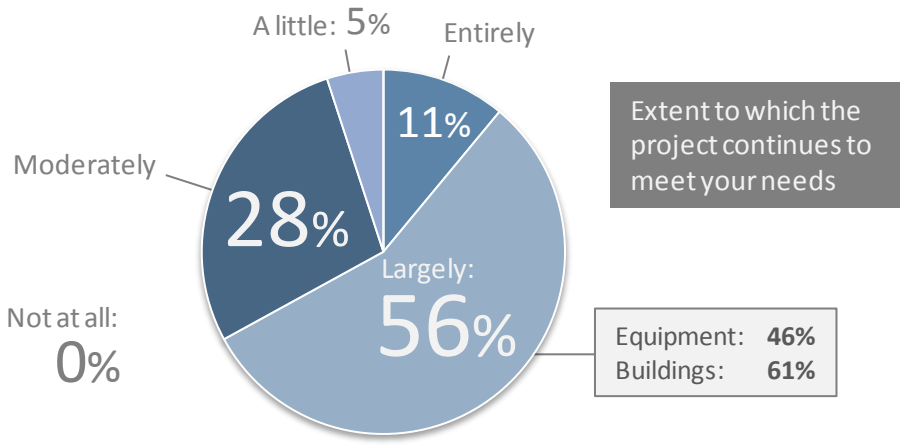


Source: Project Manager Survey Respondents: 201

8.1.8 The evidence from the survey confirms the importance of the SRIF2006-08 investment for the HEIs by continuing to help them meet their research needs. For about one in ten HEIs (11%), project managers reported that their needs appear to be met entirely by the projects funded. Again, almost three-fifths of the project managers indicated that the SRIF2006-08 investment has continued to largely (56%), and for almost 30%, to moderately, meet those needs. See Figure 8.4 below.

8.1.9 There was a sharp difference between building projects and equipment projects as to how they were helping HEIs to continue to meet their research needs. It is perhaps unsurprising that the impacts of building infrastructure are more readily assessed. In particular, new buildings infrastructure is likely to be designed to meet identified, specific research needs, not only now but also in the future. Consequently, around three-fifths of managers of buildings projects (61%), compared with fewer than half of equipment project managers (46%), claimed that the SRIF2006-08 investment has continued to enhance the ability of their HEI to meet its research needs.

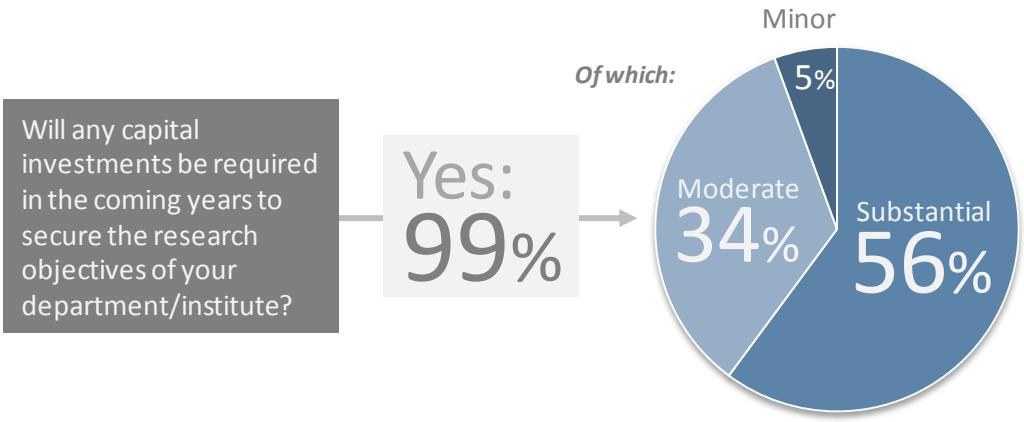
Figure 8.4 Continued ability to meet research needs



Source: Project Manager Survey Respondents: 201

8.1.10 Lastly in this section, the project managers were probed about whether or not any major capital investment would be required in the coming years to secure the research objectives of their institution. Almost without exception, the project managers were in no doubt that their HEI would continue to need further investments in order to fully meet their research objectives. Not only that, but almost three-fifths (56%) believed that the investment required is substantial. Around one in three (34%) thought the future capital requirement would be moderate. Only one in twenty managers (5%) opined that the capital investment required in the coming years to secure the research objectives of their HEI would be minor. See Figure 8.5.

Figure 8.5 Future capital requirements



Source: Project Manager Survey Respondents: 201

9 Conclusions

9.1 SRIF2006-08 and the wider HEI strategy

9.1.1 Research capital investment by HEIs supported by SRIF2006-2008 was undertaken against a background of considerable progress since 2001 towards meeting the challenge of reducing the backlog of research infrastructure investment which had built up over previous decades. Advances in information and communication technologies (ICT), new environmental considerations and overdue implementation of health and safety requirements emerging in the 1990s presented major challenges for those occupying premises built in the 1960s and 1970s. Progress in meeting the backlog of underinvestment has continued and poor quality research infrastructure has largely been replaced. With support from SRIF2006-08 and other funding sources, the backlog has been largely made up and is no longer a major constraint on high quality research being undertaken in UK HEIs.

9.1.2 Partly as a consequence of these achievements, there has been a shift in strategic priorities by some HEIs which potentially argues for a more distinctly focused research capital investment strategy (not only on the part of the traditional research intensive universities but also for those universities seeking often relatively small research capital funding) to establish a niche in a new research area. Today the priorities are perhaps more about maintaining state-of-the-art new buildings and new equipment to attract top research academics, and securing a critical mass of equipment, space and research-active academics to enable researchers to play on the world stage. More suitable spaces are required to support engagement and collaboration with external organisations and to exploit science with commercial potential. New equipment, including major expensive items of generic research infrastructure, is essential for enhancing research output and quality, for supporting interdisciplinary research and joint working, for training researchers and post-graduates and for use by external firms and organisations.

9.1.3 For many HEIs, particularly the more research intensive universities, a critically important element of the strategic framework is their research strategy, with its focus on research ratings and academic recognition and status. Where this strategy covers areas of research that involve outside players, such as private sector organisations, public sector organisations and charitable foundations, then these are incorporated into it. Similarly, where the strategy has an income earning potential from contract research, use of equipment or joint commercialisation of research outputs, then these are also brought in to it. A further element in the development is a premises strategy, which covers new build, refurbishment, replacement and reconfiguration.

9.1.4 These changes suggest an imperative need for HEIs to articulate a clear research capital strategy within their broader strategic framework[4], which could respond in a timely and flexible manner to shifting capital requirements and changing

[4] This was, in fact, the approach which the funding bodies adopted in the subsequent round of capital funding, the Capital Investment Fund 2008-09 to 2010-11.

circumstances. HEIs need integrated capital investment strategies covering all their requirements and to support all academic and other strategies.

9.2 Programme and project implementation

9.2.1 There was much support for the way that SRIF2006-08 funds were allocated and managed by the funding bodies (their generally light touch). It would be fair to say that a strong culture of rigour was established and accepted in both financial management and project management. The formula funding approach was liked and preferred to a bidding system. However, the need to ensure critical mass and for funding bodies to 'think large' was recognised by some senior HEI staff. Where items of capital equipment are costly and generic and it is not in the national interest to fund them in a large number of institutions, consideration should be given to the introduction of a competitive element to the research funding process.

9.2.2 Programme and project implementation of SRIF2006-08 would seem to have gone well. The common pattern within individual HEIs involved an invitation to bid made to science and engineering departments, bids then being considered by a specifically formed high level committee. Bidders were specifically asked for a business plan, also a statement of how the project would fit in with the overall strategy and plans of the university and make a contribution to the university as a whole. The government's broad aim of raising research capability in areas of national strategic priority were met and the focus on STEM subjects was realised, with STEM disciplines securing three-quarters of SRIF2006-08 funding.

9.2.3 It is clear that, within the framework of academic strategies, individual academics played a key role in the bidding process, either in desiring departmental upgrade in order to attract or retain talent (a senior researcher along with a coterie of fellow junior researchers moving en bloc), or to branch out into a new sub-area with new talent. Awareness of the national and international mobility of academic scientists was high, perhaps higher in pure and applied science than in other academic areas.

9.2.4 Many universities also used internal funds to support investment and it should be noted that there is considerable variation across HEIs in the available 'surplus' cash flow from commercial operations or other sources of income. Enhanced funding was also sought from the former Regional Development Agencies, other public bodies such as the National Health Service, and major national charitable foundations. In the current economic and financial circumstances such external sources are less likely to be as readily accessible as they were when SRIF2006-08 was introduced.

9.2.5 The importance of involving all interested parties in the planning and design of individual projects was given much emphasis in order to ensure minimum disruption to on-going research and to meet users' needs. Management of both procurement and construction generally went well, although some criticisms of the former were made. These criticisms focused on delayed purchases and centralised procedures adopted by universities,

9.3 Impacts, outputs and benefits

9.3.1 The government aim to promote and encourage collaborative partnerships was certainly met in a number of ways. First, through the provision of improved facilities for internal inter-disciplinary research. Second, as a consequence of engagement and collaboration with external organisations involving more than half the projects funded SRIF2006-08. These included the sharing of funded projects across HEIs, increased ties by HEIs with other public organisations such as NHS Foundations and Trusts, and the use of equipment and commercialisation of research by private sector firms.

9.3.2 Project impacts depended very much on the type and scale of projects in the programme. The refurbishment of older premises resulted in a wide range of improvements and ultimately benefits to the HEI, academic staff, external users and the wider national economy. For the HEI, the result was a more efficient use of space, lower running costs, lower future maintenance costs and better equipment for users. Some of these gains were partly offset by an increased requirement for more technical support staff and higher maintenance in cases where the HEI estate was expanded. Research capacity and capability related impacts were widespread and significant as a result of both improvements and additions to core facilities (e.g. computing, wet labs, clean rooms, scanners, and cabling and electrics) and new specific equipment.

9.3.3 SRIF2006-08 secured widespread increases and improvements in research and other research related outputs across the UK HE sector, including the quantity and quality of HEI research, HEI research training, academic staff retention and recruitment, and external user access to the upgraded facilities in HEIs. High impacts on the quality of research were reported by two-thirds of project managers and internal users, whilst over a quarter reported a medium impact. Over half reported a high impact on research output and more than one quarter a medium impact. SRIF2006-08 enabled better retention and recruitment of key academic scientific staff and in many cases this was seen as very important in maintaining or securing a critical mass of research excellence and the ability of different research teams to attract more research grants and contracts. The overwhelming evidence indicates that a significant proportion of these improvements would not have occurred without SRIF2006-08. The estimated gross additionality for the UK HE sector is approximately 40% for the quantity and quality of research outputs and quality of research, although it is somewhat higher for Wales and Northern Ireland than for England and Scotland (paragraphs 4.3.3 and 4.3.5). A similar picture emerges with respect to postgraduates trained as a result of improved research capital facilities, although additionality in Scotland emerges as relatively low.

9.3.4 A key conclusion of this report is that SRIF2006-08 has generated a diverse and wide-ranging set of benefits. Most importantly, it has raised the research capability, research capacity and the quantity and quality of research output, thereby stimulating and supporting innovation and thereby driving productivity and growth across the UK economy. However, disentangling the quantitative impact of SRIF2006-08 on the growth of UK Gross Value Added is an extremely complex and challenging exercise

and probably not possible. Neither has it proved possible to undertake a traditional project-based cost-benefit analysis in which both costs and benefits are monetised and discounted over the lifetime of the full portfolio of SRIF2006-08 projects. Many of the benefits are qualitative in nature, difficult to trace and of uncertain duration. Our approach has therefore been less ambitious. We have sought to identify the nature and extent of benefits to the HEI sector, to internal users (academic staff and postgraduates), to external users (private sector commercial firms and other public sector organisations such as the NHS) and to the wider UK economy.

9.3.5 **HEIs** have benefited from SRIF2006-08 in a variety of ways. High impacts on the reputation of the HEI are reported by 70% of project managers and medium impacts by a further 24% of project managers. For some less research-intensive institutions, SRIF2006-08 has been a lifeline that has enabled them meet their aspiration to make a step change that they want in science research. But SRIF2006-08 has also enabled some research-intensive institutions to establish well-funded laboratories, and collaboration between clinicians and scientists, which is important for producing translation research. Other frequently reported benefits to HEIs include an improved ability to attract staff, and more and improved engagement with external organisations. **Internal HEI users** of the improved research capital facilities also reported a wide range of benefits, including increased quality and quantity of research, and increased engagement with other disciplines and external organisations. Over 96% of internal users rated their overall level of satisfaction with the upgraded premises and equipment as excellent/good and 70% pointed to its importance in influencing their decision to join or remain in the institution. The testimony of a researcher interviewed for the case studies is instructive:

> *'For me personally, I had negotiated a position outside the country, and certainly one of the deciding factors for me staying was the facilities. So, very directly for me, it was eight months ago that I made the decision whether to stay or not. If you're trying to get the best people who have options to go elsewhere, then it [building and associated facilities] makes a difference for sure.'*

9.3.6 The experience of HEIs and business external users, as reported by both project managers and the external users themselves, was very encouraging, with both groups of organisations reporting a very high level of satisfaction. The most frequently reported impact was increased research collaboration (45% of total respondents and 47% of businesses). Just over one third (37%) of businesses also reported major impacts on the development of new products and processes and just under one third reported enhancement of their innovative capabilities.

9.3.7 The perceptions of project managers of the wider benefits to the **UK economy** are also very positive and frequently reported. A significant proportion of the project managers indicated that the research capital investments had a high impact on the global competitiveness of the UK economy. They pointed, in particular, to investments that have considerably improved the UK's innovation capabilities. With regards to external engagement, a large majority believed that the investments have

had at least a medium, but more importantly a high impact on the ability of their research to meet national strategic priorities.

9.4 Policy performance

9.4.1 The SRIF2006-08 programme has not only generated a diversity of benefits to a wide range of beneficiaries as indicated above, it has also been remarkably effective with over 90% of project managers reporting that they are entirely or largely satisfied with the outcome. Not only have the great majority of projects achieved their objectives but the backlog of underinvestment in the HEI overall research infrastructure has also been largely made up. However, substantial research capital investment will continue to be required if HEIs are to maintain a level and quality of research infrastructure sufficient to enable them to secure their research objectives and to secure the government's aims of maintaining an internationally competitive research base.

9.4.2 The number of jobs directly and indirectly generated by SRIF2006-08 through its impact on innovation and improved competitiveness of the UK economy is not estimated in the study for reasons already noted. However, it is possible to conclude that SRIF2006-08 expenditure does generate short run jobs through its building and equipment acquisition activities. It is estimated that the programme generated about 25,100 jobs at a cost per job of £54,600. The long-run job generation impact is likely to be substantially greater than this.