

Economic and Social Research
Council

Innovation Centres Impact Case Study – Final report

Contents

Section	Page
Executive summary	i
1 Introduction.....	1
2 The ESRC Innovation Centres.....	2
3 Our conceptual framework	9
4 Our approach	14
5 Key findings.....	16

Executive summary

Background

This report has been prepared for the Economic and Social Research Council (ESRC) to summarise the key findings of a project undertaken between August 2007 and January 2008 to investigate the impacts arising from the Council's long-term investments of over £13 million in three Innovation Centres.

The three Centres covered by the project are:

- the ESRC Centre for Research on Innovation and Competition (CRIC) which was established at the University of Manchester and UMIST (which merged in 2004), with strong links to PREST (a specialist centre focusing on science and technology policy and strategy at Manchester Business School). CRIC's research focused on understanding the links between competition and innovation, especially in the relation to service activities, new forms of 'distributed' organisation and the role of consumption practices. During its lifetime, CRIC pursued a number of different research themes including innovation in new technologies, medicine, services and new media and the relationships between innovation and competitiveness, consumption and sustainability as well as knowledge growth as a driver for innovation and the implications for innovation in economic development. CRIC merged with PREST in 2007 – after ESRC funding ceased - to form the Manchester Institute of Innovation Research;
- the ESRC Centre for Organisation and Innovation (COI) within the Institute of Work Psychology (IWP) at the Department of Psychology in the University of Sheffield. COI focused on researching how work organisation affects employee well-being and performance and how new technologies, techniques and management practices can be effectively applied. During its lifetime the Centre's research themes included the role of modern management practices, teamwork, new forms of work and creativity, innovation and learning in organisational performance. It also undertook a national human resource management performance study and specific work on customer service centres. Finally, the Centre maintained a Research and Consultancy Service (RCS) which was a self funding unit set up specifically to promote the wider impact of its research; and
- the ESRC Complex Product Systems Innovation Centre (CoPS) was formed as a collaboration between the Science Policy Research Unit at the University of Sussex (SPRU) and the Centre for Research in Innovation Management at the University of Brighton (CENTRIM). It was established to address the issue of innovation in high value, business-to-business capital goods or 'complex product systems'. The Centre's research themes included the changing innovation environment and measurement of the UK position, best practice in the management of innovation, the impact of embedded software products and processes, innovation policy in the UK and the European Union and conceptual and theoretical developments in innovation.

Objectives

The principal objectives of our project were to:

- trace the pathways through which each of the ESRC Innovation Centres has influenced policy formation and changes to professional practice within organisations;
- define, describe and, where possible, measure and value the resulting impacts;

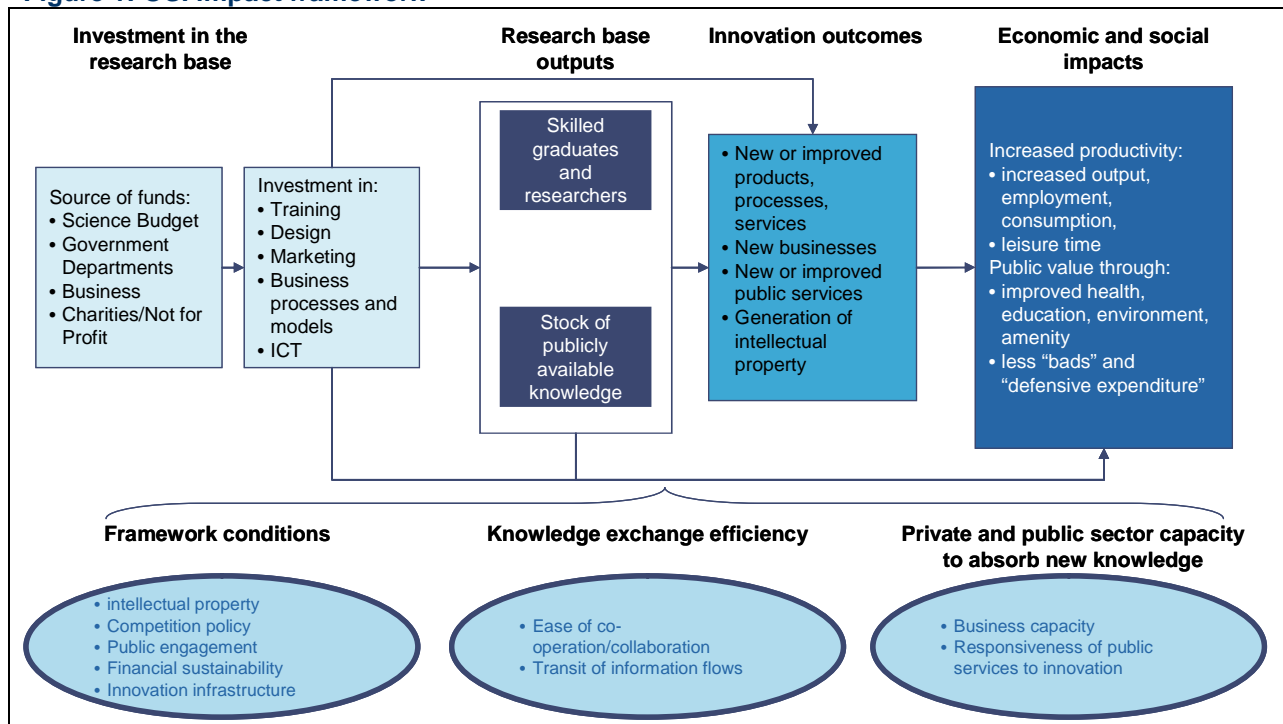
- undertake a critical reflection on the methods involved in impact assessment, focusing on the opportunities for the innovative use of these methods and the level of rigour behind them; and
- understand and capture the learning from the analysis of the impact of the three Centres.

Conceptual framework

The conceptual framework we have used to underpin this work has built on previous impact assessments that have been undertaken of ESRC investments¹ as well as broader work undertaken across the Research Councils and in Government Departments to develop and apply a framework for identifying and measuring the impacts of research investments².

A key element of our framework is a logic chain which builds on earlier work by the Office for Science & Innovation (OSI). The chain maps the inputs of resources to each of the Centres through to the shorter term outputs and, finally, the longer term outcomes (see Figure 1). In essence, the chain defines the potential pathways through which all of the Centres might be expected to create impacts. It also highlights some of the factors which are regarded as important in determining the likely efficiency with which investments in the research base can be expected to create (positive) impacts and outcomes. The framework establishes a set of hypotheses around which to examine the impacts of the ESRC Innovation Centres.

Figure 1: OSI impact framework



Our approach

Our approach to the project is summarised in Figure 1 below. The core elements of our approach to data collection have been:

- a desk based review of relevant literature, including each Centre's various publications and reports;

¹ Molas-Gallart et al, 2007, 'Policy and Practice Impacts of ESRC Funded Research, Case Study of the ESRC Centre for Business Research' and Wooding et al, 2007, 'Policy and practice impacts of research funded by the Economic and Social Research Council, A case study of the Future of Work programme'

Davies, et al, 2005, Approaches to assessing the non-academic impact of social science research, Report of the ESRC symposium on assessing the non-academic impact of research, ESRC

² Research Council Economic Impact Group, 2006, Increasing the economic impact of Research Councils and OSI impact framework.

- a series of depth interviews with the Directors and a sample of research staff from each Centre;
- a telephone survey of 40 direct ‘users’ of the research outputs based on contacts provided by each Centre; and
- a series of 10 depth interviews.

Although the steps are shown as sequential, in practice there have been important links between each of them which have meant that some were undertaken in parallel, particularly the user survey and depth interviews.

Figure 2: Our approach



Key findings

The key findings of our work are best summarised by reference to each of the key questions implied by the project objectives:

- What have been the impacts of the ESRC Innovation Centres?
- What have been the pathways through which each of the ESRC Innovation Centres has influenced policy formation and changed professional practice within organisations?
- How useful and how robust have the different methods involved in impact assessment been?
- What key learning points arise from our research and analysis around the impact of the three Centres?

We consider each in turn.

What have been the impacts of the ESRC Innovation Centres?

The Centres have generated two principal sets of impacts through their research base outputs:

- they have enhanced the skill base by providing education and training for students, especially at post-graduate level and students have been able to realise the value of these skills through higher earnings in the labour market; and
- through the Centres’ wider contribution to research which has the potential to enhance public services, including policy formulation, and improve productivity so creating economic benefit across the public and private sectors.

We consider each of these impacts below.

The supported Centres have made an important contribution to people and skills development. During the course of their funding from ESRC, the three Centres have supported over forty PhD students and provided input into the course material of over 150 MSc students. Besides the significant educational benefits associated with this learning, and the positive implications for each student’s personal development, these benefits can be expressed in economic terms as the lifetime earnings premia that individuals with a PhD or an MSc can earn as a result of the qualification. We estimate that the gross lifetime value of this premium is of the order of £8 million.

Our survey of users – including students - suggests that the qualifications they obtained through their links with the Centres played an important role in securing their jobs: 75% of former students believed

that the qualification they obtained was critical to obtaining their current job. On the other hand, not all of the Centres ran MSc courses or made a contribution to them. Moreover, even where they did, some concerns were raised about the extent to which the curricula of the courses were regularly updated to reflect the learning from the current research.

The ESRC investment has also supported the creation of a body of knowledge and capability covering diverse aspects of innovation that has been accessed regularly by policy professionals. The long term funding provided by the ESRC enabled the three Centres to develop a significant stock of knowledge. This is reflected in the scale of their research outputs.

This knowledge base has been established in both codified form, through publications and articles written by Centre staff, and tacit form, as the supported researchers have developed expertise in their areas of research and have interacted, formally and informally, with potential users or beneficiaries. The stock of codified knowledge has provided value to policy makers by generating the evidence that underpins policy papers and proposed policy changes. The stock of tacit knowledge has been used by some policy professionals as researchers have provided advice on an ad-hoc basis.

Whilst all the Centres have proactively attempted to influence policy, often providing a significant input in several different areas, the extent of additionality in actual policy decisions is more difficult to identify. Feedback from various sources suggests that the research outputs of the Centres were largely regarded as 'new' or original. In particular, the work of CoPS on Complex Product Systems was noted as being the most obviously 'new' work because of its departure from the existing fields of research. Our depth interviews indicated that the influence of research on policy is complex and, at best, the results of new research creep into policy decisions. Furthermore, given the complexity of the policy making process and the number of stakeholders frequently involved, the evidence suggests that it is extremely difficult to isolate the influence of one organisation.

Based on our research, practice impacts appear to be less significant than policy ones. They may also have a lower level of additionality. Fewer than three out of ten interactions with the Innovation Centres were with businesses and the depth interviews suggest that achieving impact has proved to be much more difficult. In general, there appear to be significantly stronger barriers to overcome, primarily around instigating a major change within a private sector business and the limited traction of some academic research.

The Centres have also been involved in commercial consultancy projects and contract research both during and after their ESRC funding. This generated revenues and supported their sustainability. Whilst the revenue stream may be a reasonable proxy for the value of this work, consideration needs to be given to the extent of additionality and, specifically, whether or not the Centres' have effectively served only to displace other prospective providers. The evidence from research suggests that, to the extent that the Centres were trading on new knowledge derived from their research, displacement was less of a concern.

What are the pathways through which each of the ESRC Innovation Centres has influenced policy formation and changed professional practice within organisations?

Our research has identified four broad pathways through which the Centres have generated impacts on both policy makers and professional practice in other organisations. These are consistent with the conceptual overview of impact pathways (see Figure 1):

- the research activities have resulted in enhancements to the stock of knowledge around innovation;
- the diverse dissemination activities have facilitated knowledge transfer to beneficiaries/users in the public, private and third sectors;
- specific, largely tailored, consultancy services that the Centres have been able to provide to their customers; and
- the wide range of teaching and learning activities for students attached to MSc and other courses, for Research Assistant's and PhD students attached to the Centres and to the Centres' staff

themselves.

Our user survey results suggest that the Centres have been proactive in making their work accessible to a wider audience: approximately half of respondents had been approached by one of the Centres. The role of networks appears to be important for the Centres with a quarter of all interactions being generated in this way. The Centres work with both the public and private sector, with just under a third of relationships being with private sector institutions. The length of relationship with the Centres is generally relatively short (less than two years), although around a third of all interactions with the Centres have lasted between three and ten years.

The evidence from the user survey also provides valuable insight into how the pathways have worked in practice. Satisfaction with the services provided by all the Centres is generally very high. The results compare favourably with those from the User Satisfaction Survey for both ESRC and the Research Councils as a whole. This suggests that users have had a positive experience with the Centres. Key areas of satisfaction were Centre staff knowledge, professionalism and understanding of users needs. The levels of satisfaction for research projects were also relatively high scoring. This suggests particular strengths of the Centres. The level of satisfaction with respect to policy advice was closer to the benchmarks, with the exception of COI, whilst for teaching and training provision satisfaction was generally high and consistent with the ESRC benchmark. Given the difficulties of attributing impacts and changes to the Centres directly in policy and practice terms, this evidence provides reassurance around impact.

How useful and how robust have the different methods involved in impact assessment been?

Much of our research and analysis has focused on identifying and, where possible, seeking to measure and value the gross impacts of ESRC's investments in the three Innovation Centres. Despite applying several different approaches, it has been difficult to establish the net impacts of ESRC funding in an unambiguous way. In large part, this reflects two broad groups of factors:

- the difficulties in establishing unambiguous links between the activities of each Centre and the ultimate beneficiaries and, thus, being able to determine the gross impacts; and
- the formidable challenges involved in assessing additionality to determine the net impacts of investments in the research base.

On the former point, the two key issues highlighted by our approach are:

- the difficulties in establishing the link(s) between each Centre's (research) activities and their impact on policy or practice/organisation: in the case of policy development, our research has highlighted the challenge of isolating the influence of a Centre's work from that of other stakeholders who are also seeking to influence and shape policy (or have been asked to input). In many cases, it is difficult to do more than establish a consistency between the evidence provided by a Centre and the policy decision; and
- the time lags involved before the (final) outcomes and impacts are evident: by their nature, the expected benefits of a Centre's activities will accrue over a long period of time whether they are those which arise from the exploitation of the knowledge base to shape policy or organisational behaviour or those which enhance workforce skills. The implication is that any assessment of impact is effectively an appraisal that relies on a forward look at expected benefits. This introduces a further set of challenges associated with the uncertainties around projecting into the future.

Understanding the net impacts of the Centres (or, indeed, any investment in the research base) depends on being able:

- to establish the counterfactual (or reference case): this requires a view as to what would have happened without ESRC investment in each of the Centres. For example, might the resources, especially those which are leveraged, have been used in a different way but with a similar effect?
- to attribute an identified impact to the activities of the Centres: especially in the area of policy

formation, the Centres have usually been only one of several organisations which have shaped policy which means it is difficult to disentangle the influence of ESRC funding from that of other factors;

- to determine deadweight: this requires an assessment of how far the individuals engaged in each of the Centre's would have undertaken some or all of the research activities anyway. Evidence from some of the depth interviews suggests that deadweight is high yet the user survey results suggest greater additionality; and
- to assess the extent of displacement and substitution: this requires an assessment of how far the activities of the Centres affect other organisations which are capable of providing the same outputs and achieving similar outcomes. Such displacement is a particular issue where the Centres have been engaged in providing what is effectively tailored consultancy support and may be displacing other potential providers not supported by ESRC. On the other hand, where the Centre has been involved in long-term research to develop the knowledge base in a way which private sector organisations may have been unwilling to do for reasons of risk – as all have been – the risk of displacement will be lower.

In practice, there are at least two key implications which arise from these difficulties:

- there is a clear trade-off between tracking the preconditions for impact and measuring the impacts: during our interviews, we noted that methodologies such as bibliometric analysis were seen as valuable in understanding the breadth of research dissemination but did not go far enough to provide insight into the outcomes and impacts of research with the result that there was a significant risk that a focus on using these techniques (to the exclusion of others) could fail to determine the ultimate impact of research funding. On the other hand, several consultees felt that the measurement of impact was so difficult that an approach which monitored the transmission mechanisms for impact would be much more pragmatic and, therefore, useful; and
- there is also a trade-off between 'robust' methods and demonstrating impact: some individuals felt that assessing the impact of investment in the research base could never be an exact science and, as a consequence, a balance was required between a methodology that is theoretically robust and one that provides a measure of the impact of a particularly important activity of a Centre even if the methodology is subject to a degree of error.

What key learning points arise from our research and analysis around the impact of the three Centres?

Finally, we have examined what can be learnt from the pathways through which the Centres have generated positive impacts. Both the user survey and depth interviews have provided some important learning points:

- Interventions that have been sustained have generated the most significant impacts. In those instances where the Centres and their staff sustained contacts with users, the levels of satisfaction and impact were generally most positive. In particular, the action-research approach adopted by CoPS was cited as an approach which helped to facilitate impacts.
- Project management arrangements could be improved. Whilst there was generally a very high degree of satisfaction with the Centres, our work also highlighted that in some of these interactions the project management arrangements could have been improved. It was noted that projects often began with a significant amount of energy and enthusiasm but this waned as the projects moved towards completion. On one occasion it was noted that time delays were common and projects had sometimes moved beyond the original scope. Some consultees felt that improved project management would be beneficial.
- Change barriers are a significant hurdle, in particular in terms of practice impacts. We found several examples where, despite significant activity and evidence gathering, the research interactions had failed to generate much impact within user organisations. Although the sample was small and the businesses in question were all very large, some interviewees suggested that this made it difficult for researchers to interact directly with senior decision makers. Furthermore,

the context of the industry sector also affects impact: the depth interviews suggested that greater impact was achieved in sectors which were expanding rather than those industries which were in decline.

- Translation of research and knowledge transfer is an issue. Our evidence suggests that the most effective pathway is direct contact with the Centres and their staff. Other research outputs and publications often need to be 'translated' before they are readily absorbed by their target audiences. This suggests that there may be a role for intermediaries to support effective translation of research for policy makers and managers.
- Teaching and learning could be leveraged more effectively to achieve enhanced policy and practice impacts by allowing more junior research staff to engage at an earlier age with prospective users in industry, government and the third sector. Sometimes, it was felt that these junior staff were being held back although they had interesting research ideas which were being missed.
- There is a lack of systematic monitoring of performance measures which would be relevant to impact assessment. The information and reporting arrangements which were used to capture the activities of the Innovation Centres were seen as unlikely to present even a partial picture of impact. Although research quality is rightly emphasised, they could be extended to cover dissemination of research and potential beneficiaries. This would enable the collection of longitudinal datasets throughout the life of the research Centres which could then be used to provide a greater sense of impact. This approach is being used increasingly widely in other public sector institutions. Furthermore, our discussions with the Centres suggested an appetite to collect some of this information.
- Defining success. It is important to define and measure the desired impacts in policy and practice terms in a way which also recognises the transmission mechanisms or the pathways. This suggests it is important to monitor fruitful interaction and knowledge transfer with potential users as well as research outputs and impacts where these can be determined.

1 Introduction

This report has been prepared for the Economic and Social Research Council (ESRC) to summarise the key findings of a project undertaken between August 2007 and January 2008 to investigate the impacts arising from the Council's long-term investments of over £13 million in three Innovation Centres.

The three Centres covered by the project are:

- the ESRC Centre for Research on Innovation and Competition (CRIC);
- the ESRC Centre for Organisation and Innovation (COI); and
- the ESRC Complex Product Systems Innovation Centre (CoPS).

Objectives of research

The principal objectives of the project were:

- to trace out the pathways for and impacts from the three ESRC Innovation Centre investments, including:
- highlighting the ways in which each of the Innovation Centre's has achieved impact, including economic impact, through their dissemination, networking, research and other activities;
- identifying the impacts resulting from the funded research and related activities including specific examples of impact achieved and a special focus on how the Centres' work has influenced policy formation and development and how the Centres' work has influenced changes in professional practice within the public and private sector;
- to undertake a critical reflection on the methods involved in impact assessment, focusing on the opportunities for the innovative use of these methods and the level of rigour behind them; and
- to understand and capture the learning from the three Centres' and the lessons in policy terms for ESRC's knowledge transfer team and in methodological terms for the future use of (economic) impact assessment approaches.

Report structure

Our report is structured in four further sections:

- Section 2 describes the structure and work of each of the three ESRC Innovation Centres;
- Section 3 outlines the conceptual framework which has shaped our approach;
- Section 4 summarises our approach, especially to the data collection; and
- Section 5 brings together the key findings from our work against each of the objectives.

2 The ESRC Innovation Centres

The ESRC made a significant investment in innovation research over 10 years ago through the introduction of three Innovation Centres. Since their inception these Centres have received over £13 million of ESRC core funding which has been supplemented by support in cash and in-kind from their host institutions and other bodies. This significant investment in innovation was made to enable the research community to help organisations to succeed through innovation, which is increasingly recognised as being critical for competitiveness and sustaining economic growth.

In this section we have provide a summary of the structure and activities each of the Innovation Centres as well as the potential areas of impact based on interviews with Centre staff.

ESRC Centre for Research on Innovation and Competition (CRIC)

CRIC was established as a Centre across the University of Manchester and UMIST (which merged in 2004). Throughout the time of ESRC funding CRIC also had strong links with PREST (a centre of study into questions surrounding science and technology policy and strategy at Manchester Business School). Indeed, the two Centres merged in 2007 to form the Manchester Institute of Innovation Research.

The management structure of CRIC consisted of an Executive Director and three other Professorial Directors. All of these posts were funded by the University of Manchester. An Advisory Board played a central role in guiding and supporting the research programme of the Centre.

CRIC's research aimed to cast new light on the role that innovation plays in the competitive process. The Centre was particularly concerned with exploring this theme in the context of service activities, new forms of 'distributed' organisation for innovation, and the role of consumption practices in relation to innovation. During its lifetime, CRIC pursued a number of different research themes all related to the area of innovation. These included innovation in new technologies, medicine, services and new media, the relationship between innovation and competitiveness, consumption and sustainability as well as knowledge growth as a driver for innovation and the implications for innovation in economic development.

The indicative quantifiable inputs from the ESRC and other sources and the quantifiable outputs from the Centre are highlighted in Table 1 below.

Table 1: Overview of CRIC funding and activities

Inputs	Quantifiable activities/outputs
£5.2 million of ESRC Core Funding was received over ten years; With a gearing of 80% of other funding compared to core funding over the last five years, which represents a substantial increase from the early years of Centre's existence at around 30%; and Five staff supported from the ESRC Core Funding during 2003/06 (with 7.5 supported	Academic research: Academic publications: 518 Conferences 513 Conference Papers
	Applied Research (Consultancy/'Advisory to Government/other bodies/ companies) Grey Publications: 122 Media appearances (2003-2006): 44 Memberships in Committees and networks (2003-2006): 73
	Capacity Building/Career development:
	(Empty cell)

Inputs	Quantifiable activities/outputs
from 97-2000); ten Research staff in total plus four Directors were funded by their host institution.	PhD Supervision and career development of researchers 18 PhD Students in total were supported during the provision of ESRC funding and 10 are still registered at 2006; there is no CRIC M.Sc. but the host innovation teaches innovation within another M.Sc. programme 42 Academic Visitors (2003-2006) came to the Centre
	Primary acknowledged dissemination vehicles: Website: 20,241 downloads, with 74% of users being academics Significant informal relationships and contact with policy makers, journalists and private businesses.

Table 2 below provides an overview of the lines of enquiry that emerged from the literature review. These were addressed in the initial interviews.

Table 2: Avenues for investigation of CRIC's impact from literature

Research themes	Application
Innovation and competitiveness	Strong relationship with former DTI on innovation and competitiveness. former DTI Working Paper: "Competing in the global economy – the innovation challenge" reflecting CRIC's theoretical approach to innovation.
Innovation in new technologies	Application of innovation theory to bioinformatics and genomics Non-food crop policy report to government-industry forum referred to in DEFRA work plan 2004 and Government strategy for non-food crops
Innovation in medicine	Understanding uneven patterns of innovation in medicine: ophthalmology, cardiology case studies
Innovation in services	Advice to EU Commission and Portuguese government on innovation in services and science policy (Howells and Metcalfe)
Knowledge growth as driver for innovation	Understanding R&D as knowledge intensive business service, exploring the role of outsourcing and networking in R&D: Recent pharmaceutical contacts to explore R&D strategy BP research reinforced development of theoretical concepts Help companies on their strategy for developing and exploiting new technology (Rolls Royce, BP, Unilever, BNFL)
Consumption and innovation	Role of trust in food production; changing relations between food producers and consumers and different systems of regulation and norms influence quality and perceptions of food safety Changes in eating patterns and convergence of consumption in globalisation. Much media attention. Co-evolution of consumption practices and technology and integration of harmful practices in daily behaviour to inform achievement of policy goals
Innovation in new media	Consumer led innovation in new media services Differing modes of provision, regulation and norms also explain levels of piracy and counterfeiting
Innovation and sustainability	Application of theory of innovation to sustainability
Innovation and implications for economic development	Application of evolutionary approach and notion of complexity to development: UNIDO report, catch up network, conferences, UNESCO funding to shape research agenda

During the interviews, the following areas for further investigation were highlighted:

- the impact on health policy and, thus, potentially on the wellbeing of the population through the Centre's work to increase understanding of the drivers behind innovation in medicine. In addition, this area will also provide insights into the first three research themes because all of them are able to shed more light on the workings of the transmission mechanisms. Initial more theoretical research on complexity and the role of knowledge in innovation (2000-2003) was applied to explain the uneven growth of medical knowledge (2003-2004). Bibliometric information, patent

data and data on social networks served as empirical tools used to show how medical knowledge grew according to patterns predicted by concepts of complexity developed earlier. Moreover, involvement in several networks such as NEXUS and the UK complexity society was considered to be instrumental in advancing understanding. Seven years later, the findings of this research have led to several further projects, consultancy activities and research funding, for example for the Department of Health, the NHS innovation hub, for Cancer Research UK and a joint UK - Finnish study on innovation in medical schools;

- the influence of the Centre's work on policy makers. CRIC's thinking was reflected in the DTI report on innovation and competitiveness and, thus, potentially affected UK businesses. Similarly, their research into innovation in the biotechnology sector, in particular on non-food crops, was considered to have influenced the DEFRA report on non food policy, lead to an ESRC workshop on genomics and was also seen to be influential to companies such as Unilever and GSK. The variety of audiences was considered to illustrate the relevance of this topic across a broad spectrum. It might also be of interest to consider how this long standing and fruitful involvement in the biotechnology sector was stimulated from a simple request for advice on evidence based science policy rather than a well defined (and budgeted for) research programme, with potential connotations for the advantages of core ESRC funding.

The impact on the private sector, in particular R&D in the pharmaceutical sector and on sustainability policy adopted in the retail sector (Tesco). These two areas are very recent developments and consultees commented that these might illustrate a greater lag in impacting upon the private sector.

ESRC Centre for Organisation and Innovation (COI)

The ESRC Centre for Organisation and Innovation (COI) was a designated research body from 1996 to 2006.

COI operated as part of the Institute of Work Psychology (IWP) within the Department of Psychology at the University of Sheffield, which provided the infrastructure for the COI operation. IWP continues to research many of the issues explored within COI amongst others.

The management structure of COI consisted of an Executive Director and two other Deputy Directors. All were supported directly through the University of Sheffield rather than the ESRC. The Centre also had an Advisory Committee which played an important role in supporting the research programme and providing advice and guidance.

The focus of COI's research was on how work organisation affects employee well-being and performance and how new technologies, techniques and management practices can be effectively applied. During its lifetime, the Centre pursued a number of different research themes including the role of modern management practices, teamwork, new forms of work and creativity and innovation and learning in organisational performance. It also undertook a national human resource management performance study and specific work on customer service centres and engagement with policy makers. Finally, the Centre maintained a Research and Consultancy Service (RCS) which was a self-funding unit within COI set up specifically to promote the wider impact of its research.

The indicative quantifiable inputs from the ESRC and other sources and the quantifiable outputs from the Centre are highlighted in Table 3 below.

Table 3: Overview of COI funding and activities

Inputs	Quantifiable activities/outputs (2003-2006)
£4.2m ESRC Core Funding was provided to the Centre over ten years.	Academic research: 15 Books; 62 chapters in books, 87 refereed journals, 16 non refereed journals;
The gearing was 100% other funding (excluding the University of Sheffield input) compared to core funding over the lifetime, slightly higher in the early years and lower towards the end of	Conferences 141 Conference Papers 2 conferences organised,
	Applied Research (Consultancy/'Advisory to Government/other bodies/

Inputs	Quantifiable activities/outputs (2003-2006)
grant's lifetime. Eight Core staff were funded from 1997-2000 and then five were supported from 2000-03 with one from 2003-06	companies) 32 other publications (Former DTI, Cisco, ...), 95 reports to collaborating organisations/sponsors (industry). One media appearance 14 staff hold 46 memberships in Committees and networks
	Capacity Building: M.Sc./ PhD Supervision and career development of researchers 11 PhD Students; 54 M.Sc. graduates; and 6 Academic Visitors
	Primary acknowledged dissemination vehicles: Website Informal relationships and contacts through action learning research methods with policy makers and private businesses.

Table 4 provides an overview of lines of enquiry that emerge from the literature review which served as probes in the interviews.

Table 4: Avenues for investigation of COI's impact from literature

Research themes	Application
Modern management practices and organisational performance: National HRM performance study	In cooperation with AIM to establish broadest longitudinal study evaluating effectiveness of management practices (Total quality management, supply chain integration etc.)
New forms of work	Expert panel and case study to examine key issues and impact of E-business informing former DTI policy and strategy
Customer service centres	Examination of human resource management in call centres Cooperation with UK Call Centre Association within Global Call Centre Project connecting 17 international academic studies on the subject Intervention study in Health Care Service Centre revealing importance of positive relation between social networks and quality
Teamwork	Various surveys of organisations to assess virtual teamwork, innovation in teams and work meetings
Creativity, innovation and learning at work	Studies to assess organisations for employee creativity. Creativity Retreat Centre evaluation Surveys evaluating effectiveness of training and knowledge management practices Evidence in former DTI innovation review
Engagement with policy makers	Report to former DTI on changes to employment relations law Report on encouraging women to return to work to Parliamentary Under Secretary for Women and Equality Reports on nanotechnology to ESRC Membership of various advisory bodies, e.g. Working for Health Task Force
Research and Consultancy Service (RCS) – a self-funding unit within COI set up specifically to promote a wider impact of its research	Applying measures and survey and diagnostic methods developed in COI for clients and in turn providing further research opportunities and data to COI

During the interviews, the following areas were identified as highlighting the impact of COI research:

- a longitudinal study of the effectiveness of management practices was seen by most interviewees as seminal and enabled by the long-term funding of COI without which such a huge time series of evidence would not have been collected. Whilst it was felt that the majority of the impact,

especially on companies, was yet to come, it might be worthwhile to confirm views of the impact with a broader audience;

- the projects carried out by COI's Research and Consultancy Service (RCS) and by COI researchers in cooperation with the Pearn Kandolla consultancy should also provide a useful gauge of the wider applicability of COI research, in particular its influence on the business practices of the consultancies' clients;
- work to influence the former DTI's innovation strategy in its UK Productivity Initiative and thus potentially private businesses. This was a concerted effort coordinated by the Advanced Institute of Management (a multi-council initiative involving ESRC and EPSRC) through a series of workshops and events and thus illustrates how policy thinking is often defined in cooperation;
- COI's work on capturing employees ideas for improvements and its scenario tool methodology helping businesses to evaluate future risks and strategy in a more realistic way was used in interventions with various businesses;
- a PhD to evaluate the DTI's creativity centres (Future Focus) methodology, essentially a brainstorming retreat for companies, was supervised by COI researchers;
- as regards the Call Centre work and research on Health in the workplace, it would be very useful to see to which extent the COI's findings have impacted upon actual practice; and
- during COI's lifetime, about 150 M.Sc. students graduated and it would be worthwhile following up with the alumni on the effect that their training has had on their current work and their employability.

ESRC Complex Product Systems Innovation Centre (CoPS)

CoPS was a collaboration between the Science Policy Research Unit at the University of Sussex (SPRU) and the Centre for Research in Innovation Management at the University of Brighton (CENTRIM).

The management structure of COPS involved two Co-Directors from SPRU and CENTRIM respectively and 12-17 other Professors and Research Fellows, around two thirds of whom came from SPRU and one third from CENTRIM.

CoPS was established to develop a new innovation research field of both intellectual and practical importance. The Centre addressed the issue of innovation in high value, business-to-business capital goods or 'complex product systems' (CoPS). The Centre pursued a number of different research themes including the changing innovation environment and measurements of the UK position, best practice in the management of innovation, the impact of embedded software products and processes, Government innovation policy in the UK and the European Union and conceptual and theoretical developments in innovation.

The indicative quantifiable inputs from the ESRC and other sources and the quantifiable outputs from the Centre are highlighted in Table 5.

Table 5: Overview of CoPS funding and activities

Inputs	Quantifiable activities/outputs (1997-2001, 2002-2006)
£3.8 million ESRC Core Funding was provided over ten years	Academic research: 12 Books; 69 chapters in books, 135 refereed journals Conferences 164 Conference Papers
Contracted co-funding in CoPS and related innovation areas amounted to a total of £5.9 million	Applied research (Consultancy/advice to Government/other bodies/ companies)
Ten Core staff were funded from 1996/7-2000/01, then eight were funded between 2000-03 and one was supported	Around 215 other publications (Policy contributions, reports to sponsors and other work) Seven media appearances (1997-2000)

Inputs	Quantifiable activities/outputs (1997-2001, 2002-2006)
between 2003-06.	Annual membership to between 12 and 33 Committees and networks
	Capacity Building: M.Sc./ PhD Supervision and career development of researchers 12 PhD Students; Around 120 M.Sc. graduates 320 staff development days
	Primary acknowledged dissemination vehicles: Website Informal relationships and contacts Research activities themselves Media and publications in public press

Table 6 provides an overview of the key lines of enquiry that emerged from our literature review and our interviews with Centre staff.

Table 6: Avenues for investigation of CoPS' impact

Research themes	Application
1. The changing innovation environment/measurements of the UK position	Integrated Solutions (IS) research work and publications UK Forth Community Innovation Survey (CIS), former DTI 'The myth of Biotech', Nightingale Work on supply chain relationships in CoPS products, Flowers International OECD Innovation comparisons of CoPS products
2. Best practice in the management of innovation	Managing Integrated Solutions, Davies Learning from Mega Projects, Brady & Davies Mental models project teams, Marshall Co-located versus dispersed team working in CoPS projects, Sapsed and Slater Other research - Exploration and production of Oil and Gas - Acha
3. The impact of embedded software products and processes	Buyer capabilities in IT-intensive CoPS, Flowers Intelligent outsourcing capabilities, Flowers Outlaw Innovation, Flowers Software, IT and Project Management, Davies and Hobday Managing Intellectual Property Rights in shared digital environments.
4. Government policies in the UK and European Union	The innovation gap, NESTA The benefits from publicly funded research, OSI, Gatsby Foundation, Tang and Martin What drives European Competitiveness, EC Use of CoPS in drug discovery, Nightingale and Martin & Press and Media Policies for e-Government, Tang Impact of Intellectual Property Law on technical innovation, Tang Molas Gallart and ISDEFE, Spain, Economic and technological impact of Spanish investments in defence & R&D.
5. Conceptual and theoretical developments	Project enterprise theory, 'The Business of Projects', Davies and Hobday Models of learning in CoPS, Capacity building model, Davies and Brady Learning from 'mega' projects, looking at business-led learning Conceptualising systems-level integration, Hobday

During our interviews with CoPS staff, the following additional areas were identified or emphasised as highlighting the impact of CoPS research:

- private sector contacts in a variety of companies with whom Centre staff worked on a variety of research projects, including telecoms, financial services, pharmaceuticals, heavy industry and

manufacturing, construction and technology. The methodology adopted by CoPS was case study based, working with firms to understand innovation around the 'complex product systems' and the resulting findings were presented back to firms with a set of recommendations for improvements which, if adopted, could have generated an impact;

- public sector policy contacts in OGC, the former DTI, Wired Sussex, OSI and NESTA as well as representatives from Demos: various research projects have contributed to public policy activities and the Centre recognised the impact on public sector audiences as being strong; and
- a selection of former students who have graduated from the Centre either with an MSc or DPhil; and
- two academics with a particular interest in and experience of impact assessment.

Summary

The ESRC Innovation Centres were set up to provide high quality research into innovation and to assist organisations to successfully innovate. Whilst the Centres were set up to cover the same broad subject area, they have approached it in variety of ways focusing on a range of different areas of potential impact.

3 Our conceptual framework

Introduction

In this section we discuss the key conceptual questions which underlie the project requirements drawing on important recent work in similar areas. We consider:

- what are the relevant potential impacts of the three ESRC Innovation Centres;
- how these impacts arise from the activities of the Centres;
- what is an appropriate framework for reporting the impacts of the Centres; and
- how the impacts might be measured and valued.

We also outline the implications of these for the method used in the project to assess the impacts of the ESRC Innovation Centres.

What are the relevant potential impacts of the ESRC Innovation Centres?

The conceptual framework which we have used to underpin our work builds on earlier impact assessments that have been undertaken of research base investments³. This includes previous work that the ESRC has undertaken to investigate the pathways and processes to impact as well as the eventual outcomes⁴. It also considers more recent work by the Research Councils as a whole in the Worry Report⁵ and the (former) Office of Science & Innovation (OSI).

A key challenge is to develop an accepted definition of what is meant by impact. The Worry report used a definition based on HM Treasury's Green Book which aims to encompass all of the Research Council activities but recognises that each of the Councils is likely to contribute disproportionately to different elements reflecting their distinct focus areas⁶. Furthermore, we are aware from our recent work with other Research Councils and from discussions with OSI and others that there is, as yet, no consensus on how to measure this.

One of the key questions is whether the emphasis should be on a relatively narrow 'instrumental' definition of impact which emphasises the potential economic use of the research to directly or indirectly affect GDP or a broader definition which recognises the 'conceptual' use of research, for example changes in the levels of knowledge, understanding and attitude⁷ and/or wider 'intrinsic' benefits which affect (economic) welfare through quality of life effects as well as other intrinsic effects⁸. The attraction of the 'instrumental' definition of impact is that, arguably, it lends itself more readily to the application of

³ Molas-Gallart et al, 2007, 'Policy and Practice Impacts of ESRC Funded Research, Case Study of the ESRC Centre for Business Research' and Wooding et al, 2007, 'Policy and practice impacts of research funded by the Economic and Social Research Council, A case study of the Future of Work programme'

⁴ Davies, et al, 2005, Approaches to assessing the non-academic impact of social science research, Report of the ESRC symposium on assessing the non-academic impact of research, ESRC

⁵ Research Council Economic Impact Group, 2006, Increasing the economic impact of Research Councils.

⁶ An action or activity has an economic impact when it affects the welfare of consumers, the profits of firms and/or the revenue of government. Economic impacts range from those that are readily quantifiable, in terms of greater wealth, cheaper prices and more revenue, to those less easily quantifiable, such as effects on the environment, public health and quality of life.

⁷ Huberman, 1992

⁸ RAND, 2004

metrics whereas the inclusion of other categories of impact creates difficulties in terms of quantification and valuation although it is more comprehensive.

For this project we have sought to focus on the broader definition of impact recognising that it may not always be possible to measure and value all the effects of the activities of the ESRC's Innovation Centres' although it will often be possible to identify and describe them. Thus, the resulting framework considers the broad output categories which have been identified within other recent studies but also allows for consideration of the 'intrinsic' and 'conceptual' impacts.

Another key question is the scope of the impacts to be examined both temporally and spatially. At one level, investment in the research base has the potential to create a benefit stream in terms of knowledge which lasts in perpetuity. Thus, the framework needs to be able to anticipate benefit streams far into the future as well as those which are more immediate. Similarly, some of the impacts may accrue outside the UK: HM Treasury's Green Book suggests that, in these cases, the focus should be on those impacts which accrue to UK organisations and individuals but recognises that it may be legitimate to reflect broader spatial impacts.

How do the impacts arise?

The second aspect of the conceptual framework describes the pathways through which potential impacts might be expected to arise.

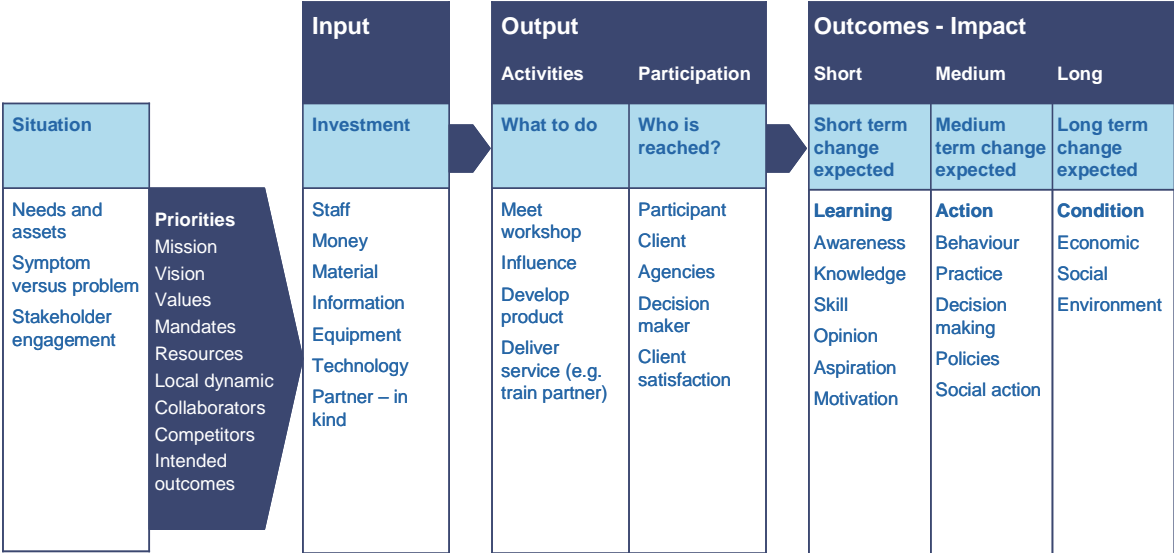
Although the activities of the Innovation Centres address the common theme of innovation, analysis indicates the heterogeneity of the Centres: they involve multiple disciplines working on many projects addressing varied topics in disparate locations. The various documents and reports which describe the activities of the Centres illustrate this picture. There are, however, some important common themes which link the seemingly disparate activities of the Centres. Like other Research Council spending, the Centres have devoted their resources to four inter-related groups of activities:

- research;
- knowledge transfer, although increasingly this is being thought of as an integral part of research;
- training, especially the development of post-graduate skills; and
- public engagement.

Our approach needs, therefore, to emphasise the similarities between the Centres as much as it does the differences. It needs to be flexible enough to recognise these differences and the implications they have for the likely transmission mechanisms. This implies balancing effort between understanding common issues which reflect key elements of funding and seeking to demonstrate the impact of all activities.

We recognise from our previous work with other Research Councils that it is vital to understand clearly the mechanisms by which the activities of the Centres lead to impact. We believe that the best way of doing this is by developing a logic framework, such as that illustrated in Figure 3. Such a logic chain provides a valuable way of conceptualising the key relationships and demonstrating the causal links although it is important to avoid implying inappropriate degrees of linearity in relationships since experience shows that they are dynamic with critical feedbacks and interdependencies. One of the advantages of logic chains is that they can also help to understand the additionality associated with Research Council funding.

Figure 3: Tracing the impacts of the ESRC’s Innovation Centres’ activities



Developing and applying logic chains is also broadly consistent with the ‘return on investment’ or ‘research payback’ methods for assessing the impacts of investments⁹. They can be used to identify the categories of outputs/impacts which might be generated for the research. They have also been used successfully by ESRC in previous impact assessments.

What is an appropriate reporting framework?

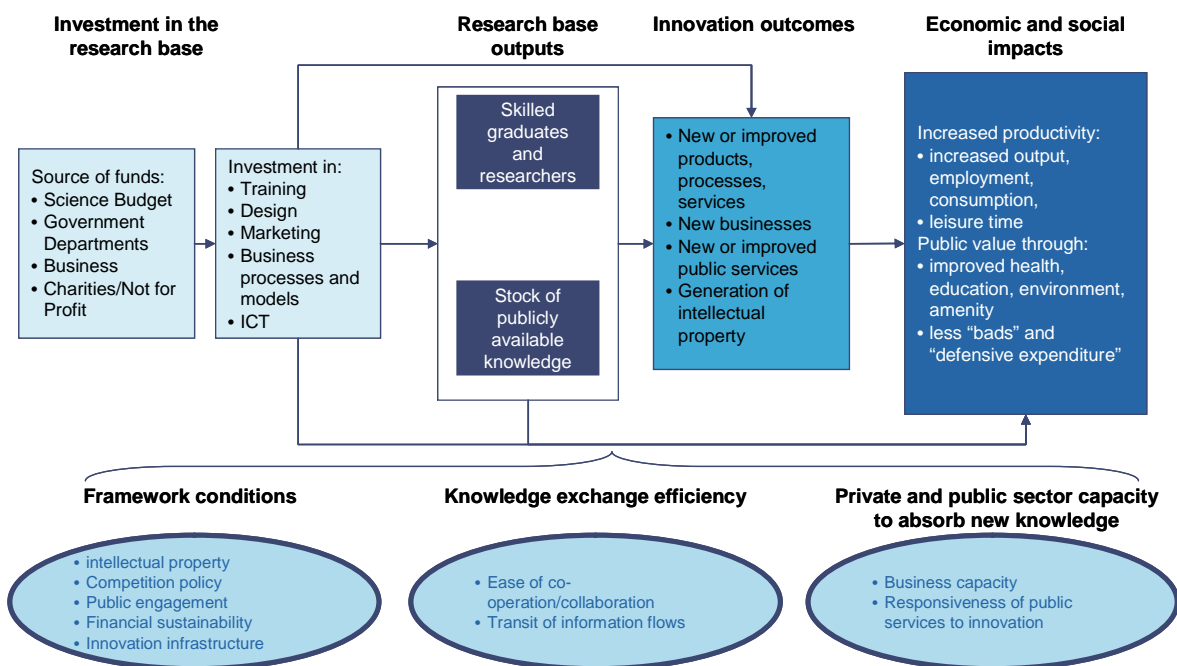
The third element of our framework effectively brings together the first two elements to describe a basis for reporting the impacts of investment in the Innovation Centres. Our framework is intended to reflect the logic chain approach by recognising but distinguishing between outputs and outcomes that might be expected to arise from each of the Centre’s activities. In recent years, considerable effort has been devoted to developing and implementing a set of indicators of outputs of research investment in the context of the 10-year Science and Innovation Framework. The OSI’s economic impact reporting framework (see Figure 4) attempts to move closer to measuring the outcomes that flow from the key research outputs. It emphasises five key potential ‘innovation outcomes’:

- creating new businesses;
- creating new products and processes;
- improving public services and policy;
- attracting and retaining investment; and
- training people for the labour market.

These outcomes are broadly consistent with the ‘payback’ methods but, although they represent a welcome move beyond some of the current output indicators, it is arguable whether they fully capture the potential long-term outcomes represented in the logic framework and which we believe are relevant to a comprehensive assessment of impact. We believe that this project needs not only to capture the insights required to respond against the innovation outcomes, but also to go beyond to capture any wider impacts.

⁹ Buxton and Hanney, 1996; Hanney et al, 2002; Wooding et al, 2004

Figure 4: Impact reporting framework



We believe that the reporting framework needs to understand and, where possible, quantify the level of additionality. This is critical to an assessment of impact since it has the ability to significantly influence the conclusions of the work. In practice, this understanding is best gained through detailed discussions with users or beneficiaries of the research and these depth interviews can then be supplemented with other tools and techniques.

How can the impacts be measured and valued?

The final aspect of the framework relates to the measurement and valuation of the impacts.

Usually, when appraising the impact of an investment, we would seek to value the impacts. In the case of some impacts, for example the profits earned from additional sales of a new product or the introduction of a new process, there should be more or less readily available market based measures of impact. As we have noted, however, not all of the activities of the ESRC's Centres for Innovation are likely to have led directly to outputs which are traded; instead, they manifest themselves in less direct and tangible forms.

There are some well established methods for measuring and valuing these less tangible impacts which HM Treasury's Green Book recognises as legitimate. They include:

- stated preference techniques which seek to understand individuals' willingness to pay for a benefit or to accept compensation for not receiving a benefit;
- revealed preference techniques, such as hedonic pricing, where the value of a given benefit is revealed by analysis of market prices;
- avoided cost or replacement cost measures; and
- multi-criteria analysis (or weighting and scoring) which avoids the need for valuation by determining weights to be attached to different types of impact and derives an overall impact index.

Some of these techniques such as stated preference approaches and avoided cost measures can potentially be applied in the context of the Centres' research outputs, for example by asking users or beneficiaries how much they would have been willing to pay for the output or for access to the results (or what costs the existence of the work has helped them to avoid).

There are also a variety of approaches which can be used to gather, analyse and interpret the evidence of impacts of research investments (see Table 7). All have their strengths and weaknesses. In this project, we have sought to explore a range of potential options recognising that key constraints are likely to be the availability of data, resource and the robustness of the application in some contexts.

Table 7: Alternative approaches to impact evaluation

Obtaining information and data	Analysing information and data	Interpreting the results of the analysis
<ul style="list-style-type: none"> • Literature and document reviews • Financial and monitoring data • Action learning • Partner consultation • Case studies • Experimental/non-experimental surveys of researchers • Longitudinal surveys • Surveys of users/non-users • Trend/cross-sectional data analysis • Secondary data 	<ul style="list-style-type: none"> • Meta-evaluation/analysis • Descriptive analysis • Statistical analysis 	<ul style="list-style-type: none"> • Benchmarking • Expert panels • Cost-effectiveness analysis • Cost-benefit analysis

4 Our approach

In this section we briefly explain the approach we have used to address the key conceptual questions within the framework described in the previous section.

The process and activities undertaken within our approach to complete this study are described briefly below. An overview of this approach is provided in Figure 1. Although the steps are shown as sequential, in practice there were important links between them which meant that some were undertaken in parallel, particularly the user survey and depth interviews.

Figure 5: Our approach



Our data collection methods are described below:

- the first stage involved a desk based review of relevant literature in relation to each of the Centres and methods of impact assessment;
- the second stage involved consultations with the Centre Directors and a sample of the research staff involved in the Centres: the list of interviewees is provided in Table 8;

Table 8: Interviewees at each Centre

Centre	Consultees
ESRC Centre for Organisation and Innovation (COI)	Professor Toby Wall, Professor Stephen Wood (Directors) Carolyn Axtell, Dr Kamaljit Birdi, Dr David Holman (Research Fellows)
ESRC Complex Products Systems Innovation Centre CoPS (COPS)	Professor Mike Hobday and Howard Rush (Co-Directors) Dr Tim Brady (Deputy Director), Dr Paul Nightingale, Dr Andrea Prencipe, Dr Virginia Acha, Dr Jonathan Sapsed, Stephen Flowers, Dr Nick Marshall, Dr Jordi Mollas-Garrat (Research Fellows)
ESRC Centre for Research on Innovation and Competition (CRIC)	Professor Jeremy Howells (Executive Director) Professor Stan Metcalfe, Professor Ian Miles, Professor Alan Warde (Co Directors) Dr Shu-Li Cheng, Dr Davide Consoli, Dr Andrew McMeekin, Dr Ronnie Ramlogan, Dr Sally Randles, Dr Jason Rutter (Research Fellows)

- the third stage involved a telephone survey of 40 direct ‘users’ and partners of each of the Centre’s using contacts provided to us by each of the Centres themselves: whilst we recognised the potential bias in such a sample selection it represents the only practical course of action for these contacts and indeed is consistent to the approach taken within other case study assessments commissioned by the ESRC. These telephone interviewees included members of the Advisory Committees and other Centre partners, policy makers at various levels, practitioners spanning a wide range of sectors and other ‘user’ groups, such as employers, training providers

and development agencies. Our approach to the survey was consistent across the Centres to enable comparability. We also included some of the same questions around user satisfaction that were used for the survey of user satisfaction across the Research Councils¹⁰ so that the results could be benchmarked; and

- the fourth stage involved 10 depth interviews with beneficiaries of the Centres' work (see Table 9): these were designed to understand the impacts generated and the pathways and antecedents to these impacts.

Table 9: Depth interviews

Centre	Research theme	Contacts/lines of enquiry	Policy/practice
CRIC	Innovation in Medicine	Director of Technology & Product Innovation, National Innovation Centre (NHS Institute)	Policy
	Innovation and competitiveness	Senior civil servant, DIUS	Policy
	Innovation in pharmaceuticals	Academic, University of Nottingham,	Practice
	Innovation and implications for economic development	Senior official, UNIDO	Policy
COI	Research studentship	Former PhD student	Practice
	Modern management practices and organisational performance	Academic, University of Cranfield	Policy
	Research and Consultancy Service (RCS)	Academic/entrepreneur	Practice
CoPS	The changing innovation environment/measurements of the UK position	Senior official/civil servant, NESTA and DIUS	Policy
	Government policies in the UK and European Union	Retired senior civil servant	Policy
	Best practices in the management of innovation	Senior businessmen	Practice

¹⁰ See <http://www.rcuk.ac.uk/news/warry.htm>

5 Key findings

Introduction

The key findings of our work are best summarised by reference to each of the key questions implied by the project objectives:

- What have been the impacts of the ESRC Innovation Centres?
- What have been the pathways through which each of the ESRC Innovation Centres has influenced policy formation and changed professional practice within organisations?
- How useful and how robust have the different methods involved in impact assessment been?
- What key learning points arise from our research and analysis around the impact of the three Centres?

We consider each question in turn drawing, as appropriate, on the evidence of our interviews with Centre staff, our depth interviews with users/beneficiaries and our telephone survey of users.

What have been the impacts of the ESRC Innovation Centres?

The Centres have generated two principal sets of impacts through their research base outputs:

- they have contributed to enhanced public services, including policy formulation, and improved productivity through their research and dissemination activities: this has created economic benefit across the public and private sectors; and
- they have enhanced the skill base by providing education and training for students, especially at post-graduate level: one of the ways that students have realised the value of these skills is through higher earnings in the labour market.

We consider each of these impacts below whilst Box 1 provides some of the highlights from our depth interviews as part of the case studies.

Box 1: Impacts of the Innovation Centres - case study highlights

Whilst ... the work conducted by CRIC provided a very useful stock of evidence and background research for the recipients, it was felt that many of the issues and ideas ... were not entirely new. Of far more significant value was the fact that the work was seen as expert and independent, reflecting both the reputational value of the Centre's staff as experts in this area, something that the ESRC support may have contributed to significantly, and the need of policymakers for good quality, independent research which provides evidence to support policy changes.

Director of Technology and Product Innovation at the National Innovation Centre (NHS Institute)

The case study suggested that CRIC had made a positive contribution to policy development although it was seen as difficult to gauge additionality between the University of Manchester and CRIC, which lacks a strong corporate identity. It was noted, however, that without CRIC, its predecessor PREST would have gone into a more specialist niche or an academic policy consultancy, without the broader reach of CRIC. CRIC was also seen as having had a significant role in developing researchers (which DIUS amongst others had used).

Senior civil servant, Department for Innovation, Universities and Skills (DIUS)

Tracing the impact of the interaction between the Centre and GSK is difficult ...
... but the longer term impact of disseminating research materials provided by CRIC to managers and colleagues within GSK could be felt through new products and services produced by GSK and released onto the market, creating economic and health benefits.

Academic, University of Nottingham (formerly GlaxoSmithKline (GSK))

... the Centre provided a stimulating environment for pursuing his research studies and allowed the development of expertise, which continues to be developed at the University of Manitoba ...

... the concentrated body of researchers and the international legacy of research conducted at Sheffield prior to ESRC funding helped to 'amplify' the impacts of the Centre during its existence ...

Former PhD student, Institute of Work Psychology

... full and quantifiable measurement of the impacts would be difficult to make, primarily because of the attribution issues both for AIM and for the use of the outputs provided by the former COI staff by DTI policy staff ...

Academic, Cranfield School of Management

The biggest area where Innovation Centres, such as COI, can add value to the private sector is conducting long-term research, which cannot be conducted by the private sector.

Academic/entrepreneur

The work has allowed NESTA to enter the innovation debate amongst other stakeholders and whilst some policy makers would probably assert that there is nothing inherently new in this document, it was felt to be valuable for them as an organisation in that it provided all the academic material and established knowledge in one place. It also established NESTA as an organisation that had something to say on the subject.

'The opportunity to learn alongside the researchers was almost as useful as the report itself'

Senior official/civil servant, NESTA and Department for Innovation, Universities and Skills

ESRC funded research has had a significant impact on the making of innovation policy in the DTI. For example the benchmarking of UK innovation performance drew heavily on the numerical results of academic research and the 2003 Innovation Report adopted a National Innovation Systems approach whose structure and details reflected a variety of academic research. Decisions on subjects such as intangible assets and measurement standards drew on specific pieces of commissioned research.

The main learning that was gained through the interactions was not around discrete projects but came through informal meetings and contact. For policy professionals this will remain the main channel for dissemination.

Retired senior civil servant

The CoPS methodology of action research produced a very high degree of interaction with research subjects which developed some very strong relationships between the research team members at CoPS and the business individuals.

The success of the interaction process was largely due to the research methodology adopted and also the individuals involved, reflecting the importance of personal relationships. A further benefit was the fact that the individuals involved in most instances all had previous business experience which made them different to some of the academics that the business partners had worked with in the past.

Senior businessmen

The ESRC investment has supported the creation of a body of knowledge and capability covering diverse aspects of innovation that has been accessed regularly by policy professionals. The long term funding provided by the ESRC enabled the three Centres to develop a significant stock of new knowledge. This is partly reflected in the scale of their research outputs.

This knowledge base has been established in both codified form, through publications and articles written by Centre staff, and tacit form, as the supported researchers have developed expertise in their specialist areas and have interacted, formally and informally, with potential users and beneficiaries. The stock of codified knowledge has provided value to policy makers by generating the evidence that underpins proposed policy changes. The stock of tacit knowledge has been used by some policy makers as researchers have provided advice on an ad-hoc basis.

Whilst all the Centres have proactively sought to influence policy, often providing a significant input in several different areas, the extent of additionality in actual policy decisions is more difficult to identify and, certainly, to quantify and value. Feedback from various sources suggests that the research outputs of the Centres were largely regarded as 'new' or original. In particular, the work of CoPS on Complex Product Systems was noted as being the most obviously 'new' work because of its departure from existing fields of research. Our depth interviews, however, indicated that the influence of research on policy is complex and, at best, the results of new research tend only to creep into policy decisions. Furthermore, given the complexity of the policy making process and the large number of other stakeholders frequently involved, it is extremely difficult to isolate the influence of one piece of research or, indeed, organisation.

Based on our research, practice impacts appear to be less significant than policy ones. They may also have a lower level of additionality. Fewer than three out of ten interactions with the Innovation Centres were with businesses and the depth interviews suggest that achieving impact has proved to be much more difficult because there are significantly higher barriers to overcome, primarily around instigating change within organisations and the limited traction of some academic research.

Many of the Centre staff emphasised recent activities that have taken place since ESRC funding ended. In many cases, they attributed the resultant impacts to ESRC investments stating that without the funding for the Centres, they would not have been able to build the reputation and contacts that they have now. Much as in business, Centres take a long time to become established institutions in their recognised fields, especially internationally.

The Centres have also been involved in commercial consultancy projects and contract research both during and after their ESRC funding. This has generated revenues and supported their sustainability. Whilst the revenue stream may be a reasonable proxy for the value of this work, consideration needs to be given to the extent of additionality and, specifically, whether or not the Centres may have effectively displaced other prospective providers. The evidence from our research suggests that displacement was less of a concern where the Centres were trading on new knowledge derived from their research.

The supported Centres have made an important contribution to people and skills development. During the course of their funding from the ESRC, the three Centres have supported over forty PhD students and provided input into the course material of over 150 MSc students. Besides the significant educational benefits associated with this learning, and the positive implications for each student's personal development, these benefits can be expressed in economic terms as the lifetime earnings premia that individuals with a PhD or an MSc can earn as a result of the qualification. Based on other work we have undertaken to estimate the returns to different qualifications, we estimate that the gross lifetime value of this premium is of the order of £8 million.

Our survey of users included students who suggested that the qualifications they obtained through their links with the Centres played an important role in securing their jobs: 75% of former students believed that the qualification they obtained was critical to obtaining their current job. On the other hand, not all of the Centres ran MSc courses or made a contribution to them. Moreover, even where they did, some concerns were raised about the extent to which the curricula of the courses were regularly updated to reflect the learning from the current research.

What are the pathways through which each of the ESRC Innovation Centres has influenced policy formation and changed professional practice within organisations?

Throughout this assignment we have considered the pathways through which the Centres have generated impacts. The results from the telephone survey and depth interviews have provided some important insights. In particular, our research has identified four broad activities which have generated

impacts on both policy makers and professional practice in other organisations. These are consistent with our conceptual overview of impact pathways (see Figure 1):

- the research activities have resulted in enhancements to the stock of knowledge around innovation;
- the dissemination activities have facilitated knowledge transfer to beneficiaries/users in the public, private and third sectors;
- specific, largely tailored, consultancy services that the Centres have been able to provide to their customers; and
- the wide range of teaching and learning activities for students attached to MSc and other courses, for Research Assistant's and PhD students attached to the Centres and to the Centres' staff themselves.

Our user survey results suggest that the Centres have proactively made their work accessible to a wider audience: approximately half of respondents had been approached by one of the Centres. The role of networks appears to be important intermediaries for the Centres with a quarter of all interactions being generated in this way. The Centres work with both the public and private sector, with just under a third of relationships being with private sector institutions. The length of relationship with the Centres is generally relatively short (less than two years), although around a third of all interactions with the Centres have lasted between three and ten years.

Our interviews with Centre staff and with users have highlighted the complex array of pathways through which the ultimate impacts of the Centres' research have materialised or are expected to do so. At one extreme, some pathways have been relatively direct. For example, the consultancy services provided by some of the Centres have led more or less directly to benefits for users, either organisations adopting new practices or, less directly, to policy makers seeking to develop better policy with superior outcomes for society as a whole. At the other extreme, we identified pathways which were much more complex because the ultimate beneficiary was more removed from the Centre in time, distance or the number of intermediate transactions. For instance, there were sometimes significant time lags between research being initiated, the results being available and the findings being disseminated and acted upon before taking effect. This was especially so where the research fed into the policy development process which, in turn, took time to be reflected in changes in policy and then to (say) business decisions and performance.

The evidence from the user survey also provides valuable insight into how well the pathways have worked in practice. Satisfaction with the services provided by all the Centres is generally very high. The results compare favourably with those from the user satisfaction survey for both ESRC and the Research Councils as a whole. This suggests that users have had a positive experience with the Centres. Key areas of satisfaction were Centre staff knowledge, professionalism and understanding of users needs. The levels of satisfaction for research projects were also relatively high scoring. This suggests particular strengths of the Centres. The level of satisfaction with respect to policy advice was closer to the ESRC and Research Council benchmarks, with the exception of COI, whilst for teaching and training provision satisfaction was generally high and consistent with the ESRC benchmark. Given the difficulties of attributing impacts and changes to the Centres directly in policy and practice terms, this evidence provides some reassurance around the impact of the Centres.

How useful and how robust have the different methods involved in impact assessment been?

Much of our research and analysis has focused on identifying and, where possible, seeking to measure and value the gross impacts of ESRC's investments in the three Innovation Centres. Despite applying several different approaches, it has proved difficult to establish and quantify the net impacts of the ESRC's funding of the Innovation Centres in an unambiguous way. In large part, this reflects three broad groups of factors:

- the difficulties in establishing unambiguous links between the activities of each Centre and the

ultimate beneficiaries and, thus, being able to determine the gross impacts;

- the formidable challenges involved in assessing the various elements of additionality to determine the net impacts of investments in the research base; and
- the difficulties both conceptually and practically of assigning a value to the net impacts of the Centres' activities.

Identifying the gross impacts

Our approach has highlighted two related issues with respect to the identification of the gross impacts of the ESRC's investments.

First, there have been difficulties in establishing a clear-cut link(s) between each Centre's (research) activities and their impact on policy or practice/organisation. In the case of policy development, our research has highlighted the challenge of isolating the influence of a Centre's work from that of other stakeholders who are also seeking to influence and shape policy (or have been asked to input). In many cases, it is difficult to do more than establish a consistency between the evidence provided by a Centre and the policy decision although there were instances where a Centre was seen by key observers as having made a distinct contribution to policy thinking. Unless this evidence is so distinct that it can only have come from one source, its impact on the direction and shape of policy cannot easily be isolated.

This attribution challenge is made more significant by the evidence from our work which shows that the outputs of the research of a Centre are usually only able to 'creep' into policy ideas in a very diluted form. The distinction between those activities which can be directly linked to the ESRC investment and those which cannot is often unclear, for example because they occurred some time after ESRC funding was finished. Our research suggests that ESRC funding provided an important – in some cases, vital - foundation for the Centres which allowed them to focus their activities on research rather than being diverted to pursue other funding support, and to concentrate their research activity in one area to create a recognised body of work and expertise. In turn, this enabled them to generate a greater impact.

Second, and linked to the previous point, the time lags involved before the (final) outcomes and impacts of a Centre's activities are evident add to the difficulty of defining the gross impacts¹¹. By their nature, the expected benefits of a Centre's activities will accrue over a long period of time whether they arise from the exploitation of the knowledge base to shape policy, change organisational behaviour or enhance workforce skills. At one extreme, new knowledge could generate a positive economic impact in perpetuity. By implication, this means that any assessment of impact effectively becomes either an appraisal that relies on a forward look at expected benefits or needs to be undertaken far into the future.

These issues give rise to some important practical issues which affect researchers' ability to determine the gross impact of investments in the research base such as the Innovation Centres:

- if the impact assessment is undertaken before the full impact of the research activities has manifested itself, there are a further set of methodological challenges associated with the uncertainties around projecting impacts into the future; and
- if the impact assessment is undertaken long enough after the research activities have been completed for them to have had the opportunity to have an impact, it can be difficult to identify and reach beneficiaries within a timeframe which allows for a reasonable recollection of these activities and the decision making processes which resulted in the impacts: in some instances, potential 'users' of the Centres' research have moved on from their previous roles and responsibilities whilst in others their recollection may be impaired by the passage of time. This risk was highlighted in the difficulties we experienced reaching our target sample of beneficiaries for our telephone survey. It is also consistent with previous research findings¹².

¹¹ Jacobsson, 2002

¹² Davies et al, 2005

Assessing additionality

There is a second set of issues associated with understanding the net impacts of the Centres (or, indeed, any investment in the research base) since this depends on being able to address various aspects of additionality.

First, it is important to establish a clear counterfactual (or reference case). This requires a view as to what would have happened if the ESRC had not invested in each of the Centres. For example, would the resources, especially those which are leveraged, have been used in a different way but with a similar effect? If so, how should these effects be allowed for? In practice, this requires investigation of the ESRC's funding strategy to determine how it would have allocated its funds differently in the absence of the Innovation Centres. At the time, it requires a clear understanding of how the decisions of those responsible for establishing the Centres would have been different without ESRC funding. Moreover, it is quite possible that the different views of the different stakeholders will not be consistent with each other. As a consequence, any impact may need to consider the implications of several alternative scenarios. These factors add to the complexity (and resource) required to generate convincing evidence.

Second, it is important to determine the extent of deadweight by assessing how far the individuals engaged in each of the Centre's would have undertaken some or all of the research and dissemination activities anyway. Evidence from the depth interviews suggests that deadweight is high in some areas, yet the user survey results suggest greater additionality. The practical implication of this is that a robust assessment of the extent of deadweight potentially requires a case by case investigation of each of the activities of the Centres.

Finally, consideration needs to be given to the extent of displacement and substitution. This requires an assessment of how far the activities of the Centres have affected other organisations which are capable of providing the same outputs and delivering similar outcomes. Displacement is a particular issue where the Centres have been engaged in providing what is effectively tailored consultancy support to a set of public and private sector customers. In these cases, there is a risk that they will have displaced other potential providers of similar services who have not been supported by ESRC. Our depth interviews, in particular, highlighted a number of instances where this appears to have been the case. Such effects need to be offset against the gross impacts.

On the other hand, where the Centre has been involved in long-term research to develop the knowledge base in a way which private sector organisations may have been unwilling to do for reasons of risk – as all have been – the risk of displacement will be lower. Evidence to this effect was cited in a number of the depth interviews.

Again, understanding of the nature and extent of substitution requires consideration to be given to the identity of prospective alternative suppliers. There are practical challenges in doing this since it implies consulting either users, about the alternative providers they might have considered (and the additional value provided by the Centres), or competitors, some of which be based outside the UK, with no certainty that will be possible to prove the negative.

Quantifying and valuing the net impacts

The case studies of the three Innovation Centres have highlighted the formidable challenges associated with quantifying and valuing the net impacts of their activities. In large part these challenges are shaped by the difficulties of determining the gross impacts and assessing additionality (see above). Putting these issues to one side, however, it is evident from our work that there are other conceptual and practical obstacles including:

- the absence of an agreed basis for measuring the outputs of investments in the research base, although the OSI's impact reporting framework provides a useful starting point: in practice, however, gathering the data required to populate the various metrics implied by this framework requires a more extensive process of data gathering than has been possible as part of this work;
- where the impact of the Centres is on public policy development, then all the challenges associated with policy evaluation apply: from a practical perspective, a key issue is whether an impact assessment can draw upon other evaluation work looking at the impact of new policy

developments;

- where the impact is on an organisation (in the private sector or the public sector), the challenge is to assess the impact on the beneficiary organisation's performance; and
- the small numbers of students who have benefited from learning at the Centres means that it is very difficult to isolate the impact on their earnings potential given the need to take account of the (many) other factors which influence earnings: moreover, some would question whether earnings adequately measures the economic and other benefits of learning.

Implications for future research

In practice, several key implications arise from these three groups of difficulties.

First, there is a clear trade-off between tracking the pre-conditions for impact and measuring the ultimate impacts. During our interviews, we noted that methodologies such as bibliometric analysis were seen as valuable ways to understand the breadth of research dissemination but did not go far enough in providing insight into the likely outcomes and impacts of research. We believe, however, that there is a significant risk that reliance on these techniques (to the exclusion of others) could fail to capture the ultimate impact of research funding. On the other hand, several consultees felt that the measurement of ultimate impact was so difficult that an approach which monitored the transmission mechanisms for impact would be much more pragmatic and, therefore, potentially useful. This implies that consideration needs to be given to an effective and efficient way of tracking impacts over the lifetime (and beyond) of an Innovation Centre. Experience suggests that such an approach ought to cover not only the direct impacts of the Centre's activities but also perceptions of the conditions which enable or deter effective dissemination of new knowledge, for example as reflected in the impact reporting framework.

Second, there is a trade-off between applying 'robust' methods and simply demonstrating impact. Some interviewees felt that assessing the impact of investment in the research base would never be an exact science. As a consequence, they felt that a balance was required between a methodology that was theoretically robust and one that provides a measure of the impact of a particularly important activity of a Centre even if the methodology is subject to a margin of uncertainty. The implication of our work is that there needs to be greater acceptance of the latter approach.

Third, there is a need to get beyond zero impacts. Previous case study policy and practice assessments have highlighted the need to move beyond 'zero impacts' to understand the significance of the difference between one research output and another and the extent to which they are unitary or not. In terms of outputs such as publications and research articles this is difficult to do, but bibliometrics might provide an indication of the use of the research and, if these could be applied in a meaningful way across the appropriate publications, there may be opportunities to scale these outputs between one another.

Finally, the 'scalability' of results is another important issue. Our research has confirmed that research and innovation processes are not linear and that the pathways through which research generates impact are frequently different¹³. As a result, the impacts of research in one area can very rarely be extrapolated to other areas to determine the overall impact on the population since the latter itself is rarely well-known and understood¹⁴. This suggests that there may be trade-off between a resource intensive case study approach and a broader survey based approach which seeks to understand impacts across the population of actual and potential beneficiaries.

In conclusion, previous ESRC impact case studies have taken a broad view but have not succeeded in identifying and quantifying impacts although they have managed to describe them. This has also been the experience of our study. In particular, our depth interviews and case studies have highlighted a broad range of impacts very few of which lend themselves to quantifiable measurement. In some instances quantifiable measurement approaches and economic tools do exist, in the form of stated and revealed preference approaches, but there have always been major barriers and caveats to their application which limit the robustness of the final results. This implies that the ESRC, its funders and the wider research community need to agree whether and how these approaches should be used given their limitations.

¹³ Dodgson et al, 2005

¹⁴ Warry report, 2006

What key learning points arise from our research and analysis around the impact of the three Centres?

Finally, we have examined what can be learnt from the pathways through which the Centres have generated positive impacts. Both the user survey and depth interviews have provided some important learning points. Box 2 highlights some of the key suggestions from the depth interviews as part of the case studies.

<p>The impact of the Innovation Centres could only be increased by building and maintaining stronger links with private sector organisations ...but this will be challenging against a background of ever increasing focus in private sector organisations on outputs, therefore the innovation Centres will need to ensure that the output they produce is carefully targeted and aimed at the correct audience.</p> <p style="text-align: right;"><i>Academic, University of Nottingham</i></p>
<p>To increase impact, the Centre needs to improve dissemination of research materials, using researchers who both understand research and can build strong links with outside organisations.</p> <p style="text-align: right;"><i>Former PhD student, Institute of Work Psychology</i></p>
<p>Networking and personal interaction were considered to be critical to generating impacts amongst policy makers. However, it was felt that the Innovation Centres could enhance their impact by providing introductions to policy makers at all levels and allowing more junior researchers, often an undervalued and underutilised resource by policy makers, to gain more direct interaction with these individuals by facilitating introductions.</p> <p style="text-align: right;"><i>Academic, Cranfield School of Management</i></p>
<p>One of the key challenges faced by the research centres is that of effective dissemination of their work, especially outside of the academic community. Pearn Kandola has run a number of seminars with their clients to attempt to disseminate COI's work within the private sector.</p> <p style="text-align: right;"><i>Academic/entrepreneur</i></p>
<p>... more effort needs to be made to bring policy-makers and academics together and improve communication between them</p> <p>... the ESRC could do more to understand the total stock of knowledge in this and other areas, how much of it they are funding and how widely it is being used. This would also help to inform their investment decisions.</p> <p style="text-align: right;"><i>Retired senior civil servant</i></p>

The provision of a certain stream of foundation funding was seen as an important contributor to the success of the Centres. It allowed them to form a greater critical mass through co-funding with universities which, in turn, enabled highly qualified researchers to be attracted (for example, some of the Directors) and a strong brand and reputation for the Centres to be built which acted as a catalyst for attracting other funding. Furthermore, the funding gave greater freedom to the researchers from the pressures of obtaining short term funding with applications consuming up to 30% of a researcher's time. Moreover, in the case of COI, the long term funding allowed the Centre to undertake significant, valuable longitudinal research.

The mix of core and short term funding was also seen as creating a mutually reinforcing cycle whereby the practical application of theoretical research was explored and subsequently used to refine and develop theoretical concepts and models. This was seen as a competitive advantage over institutes such as PREST which were funded from short term grants with the result that their researchers sometimes did not have the time to carry out basic research. As such, they were seen to have developed less of a reputation than CRIC.

Although consultees recognised that less prescriptive conditions on core funding created a higher risk for ESRC, it was emphasised that this kind of freedom was valuable. Moreover, it was consistent with new models of research and innovation which suggest that the process cannot be entirely prescribed at the outset and is rarely linear in nature. For example, CRIC's biotechnology research was developed in response to a request from the former DTI for advice. Similarly, the counterfeiting research was developed following a conversation with a patent lawyer at a conference. Furthermore, researchers at

CRIC mentioned that the reduced teaching load enabled by core funding allowed researchers to operate more flexibly and have shorter turn-around times for delivery of contracted research.

In both COI and CRIC, it was recognised that there were issues around the sustainability of the Centres following the end of ESRC core funding, for example through losing key researchers to other Centres and therefore losing the brand and reputation. Whilst these difficulties might be transitional, it was felt that more thought should have been given to an exit strategy at the outset and other funding models developed more completely. For example, the funding could have been made conditional on the university taking on the (partial) funding of researchers on a long term basis. Similarly, alternative models such as executive education were currently being explored by CRIC.

Activities that are sustained have generated the most significant impacts. In those instances where the Centres and their staff sustained contacts with users over a period of time, the levels of satisfaction and impact were generally most positive. For example, the action-research approach adopted by CoPS was cited as an approach which helped to facilitate impacts. It engaged with users from the outset to establish specific case studies for research. This ensured that the needs and desires of users were recognised throughout the research process in a relationship which was very similar to a commercial business relationship between customer and supplier in which there was an exchange of time for knowledge and information rather than financial reward. This built a strong relationship between the two groups which appear to be predominantly personal rather than organisational. In several instances, these relationships continued after the research finished and the research also appears to have been greeted more favourably by the user audience. Although this methodology will not be appropriate to all forms of research, involving users in the research process itself was seen to be a major factor in ensuring research has 'impact'.

Change barriers are a significant hurdle, in particular in terms of practice impacts. We found several examples where, despite significant activity and evidence gathering, the dissemination of the research had failed to generate much impact within user organisations. For example, several of the research staff at CoPS noted that even when research was done well, reached its audience in a comprehensible format and was greeted positively, it could still be ignored. Some interviewees suggested that, in part, this was due to the difficulty researchers had interacting directly with senior decision makers although this conclusion is based on a small sample of very large businesses. This indicates that, whilst good research can provide a blueprint for change and evidence of potential benefits, it cannot create the burning platform to facilitate that change. Furthermore, the context of the industry sector also affected impact: the depth interviews suggested that greater impact was achieved in sectors which were expanding rather than those industries which were in decline. Ultimately, impact is only generated when the research is used to leverage value and the research itself cannot do any more than generate the opportunity for this to happen.

Whilst there were numerous examples of strong engagement with potential users of research, some researchers suggested that this was stronger amongst public sector beneficiaries than amongst private sector ones. The reasons for this were numerous but the overarching point raised by several researchers at CoPS, where some the level of engagement with the private sector appears to have been amongst the strongest, was that it was much more challenging to engage with the private sector since there were often fewer established contacts and introductions through networks were more difficult since they were less well developed and inter-firm rivalry was an issue.

Networks based largely on personal relationships and interactions were a key pathway to benefit. Several examples were provided where Centre staff had been contacted by former students or business partners to get involved in a new project based on the relationships developed through their work. In some instances researchers had accessed users through a 'broker' such as industry associations which were seen as having a greater appetite for research outputs and activities that can provide broad support for a sector. Working with such brokers provided research staff with potential access to wider networks, especially in the private sector where consultees considered there to be much less well established than, for example, those linking academia and the public sector.

Existing incentives did not always encourage impact. Some consultees noted that one reason why their impacts were modest in some areas was that the current focus of the Research Assessment Exercise and other performance management systems used in the higher education sector emphasised

research quality through a peer review process. As a result, activities geared towards heightening impact were not recognised and not enough incentive was provided to do them.

Translation of research and knowledge transfer is an issue. There was a broad consensus amongst those we consulted that research needs to be publicly available and well understood for its impact to be maximised. Our evidence suggests that the most effective pathway is direct contact with the Centres and their staff. Other research outputs and publications often need to be 'translated' before they are readily absorbed by their target audiences albeit there is a risk that the messages are diluted and lose some of their impact. For instance, CoPS researchers noted that their colleagues in the private sector often challenged them to make their research more comprehensible. As a result, a group of research staff at SPRU had set up a small business which provided this service to other academics. Other consultees felt that this 'translation' process could result in research findings being simplified to the point where much of the value would be lost. This suggests that there may be a role for intermediaries to support effective translation of research for policy makers and managers.

Teaching and learning could be leveraged more effectively to achieve enhanced policy and practice impacts by allowing more junior research staff to engage at an earlier age with prospective users in industry, government and the third sector. Sometimes, it was felt that these junior staff were being held back although they had interesting research ideas which were being missed. Moreover, whilst the role of teaching and learning activities was seen as a very significant form of impact within the Centres, it was emphasised that this teaching needed to reflect more completely the lessons from the research activities. Some individuals felt that the research needed to be integrated more regularly and formally into the Centres' teaching activities and that ESRC should make more effort to ensure that this happens.

Project management could be improved. Whilst there was generally a very high degree of satisfaction with the Centres, our work also highlighted that the project management arrangements in some of these interactions could have been improved. It was noted that projects often began with a significant amount of energy and enthusiasm but this waned as the projects moved towards completion. On one occasion it was noted that time delays were common and projects had sometimes moved beyond the original scope. Some consultees felt that improved project management would be beneficial.

There is a lack of systematic monitoring of performance measures which would be relevant to impact assessment. The information and reporting arrangements which were used to capture the impact of the activities of the Innovation Centres were seen as likely to present only a partial picture of impact. Although research quality was rightly emphasised, they could be extended to cover dissemination of research and potential beneficiaries. This would enable the collection of longitudinal datasets throughout the life of the research Centres which could then be used to provide a greater sense of impact. This approach is being used increasingly widely in other public sector institutions. Furthermore, our discussions with the Centres suggested an appetite to collect some of this information. Linked to this, it is important to define and measure the desired impacts in policy and practice terms in a way which also recognises the transmission mechanisms or the pathways. This suggests it is important to monitor fruitful interaction and knowledge transfer with potential users as well as research outputs and impacts where these can be determined.

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