



Annual Report

April 2012 – March 2013



Technology Strategy Board
Driving Innovation

NESTA



Introduction

The Scientific and Knowledge Transfer Programmes

1.1 Major advances are expected in: advancing knowledge of a broad definition of innovation through high quality, independent, research which is fully engaged (i.e. co-produced) with policy and practitioner communities; ensuring the maximum impact of new knowledge on policy and practice, reaching out to all potential sources of and audiences for new knowledge; developing capacity, in terms of people, data and methods, for future research and knowledge exchange on broader innovation.

1.2 In order to achieve the advances set out above, the Research Centre will be expected to carry out a programme of interdisciplinary research and make significant contributions in the areas of: New modes of innovation; Innovation in services; the links between innovation, human capital, intellectual capital and business performance.

1.3 The Research Centre will be expected to carry out a programme of engagement with policy and practice communities and make significant contributions in the areas of: developing a dynamic and novel forum for stakeholder engagement, knowledge transfer and networking, within the field of broader innovation, working closely with policy and practitioner communities; drawing together research and other kinds of knowledge, within the UK and internationally, to strengthen the evidence base for broader innovation policy and practice; collaboration with communities of research, policy and practice.

Distributed Research Projects

The Centre Director with the Hub Director will be responsible for ensuring that the Principal Investigators of the second wave Distributed Projects have a full opportunity to work with the Knowledge Hub programme of the UK~IRC and that appropriate Knowledge Hub related activities can be co-developed.

1. Impact and Highlights

Examples of Impact

The UK~IRC follows best practice methods in using multiple pathways to impact based on the relevant academic research literature in this area (to which it has contributed) and relevant RCUK guidance and ESRC guidance. It has also completed a major recent review of evaluation theory and practice in the UK (Hughes and Martin, 2012). Academic publications may themselves take years to appear and policy impact outcomes may take many years to emerge. In the public policy arena identifying such impacts is also made complex because policy formation is a political process and policy outcomes are the result of multiple competing inputs of which social science evidence is one among many. Identifying causal connections in such circumstances involves detailed process analysis. Intermediate or pathway activities including publications are however essential to tracking ultimate final outcomes and we draw attention to two pathway contributions of this kind that we have made. One is in relation to policy formation and the other to industrial practice. We also highlight impacts in terms of service to the academic community and international collaborative impacts.

Policy Practitioner Impacts

- The UK~IRC developed a paper on how firms can best access university knowledge, which was published in a leading practitioner journal MIT Sloan Management Review. This paper provided the basis for a workshop with Imperial Business Partners session, with representatives from Shell, GSK, Rolls-Royce and others. It is also being used by Imperial College's corporate partnerships department to help them segment and manage Imperial's industrial collaborations.
- The UK~IRC policy analysis team submitted written evidence to the House of Common's Science and Technology Committee review on Bridging the Valley of Death. The report of the Committee which was published on 4th March 2013 contains several direct references to the UK~IRC in the text of the report and multiple citations to the work of Connell, Salter, Cosh, Hughes, and Mina in the supporting evidence and footnotes. In many other places UK~IRC evidence is cited, but not specifically referenced. The work of the UK~IRC and, in particular, Connell as well as Mina and Hughes was referred to in the major report of the Labour Party's Small Business Task Force which was also published in March 2013.

Service to the Academic Community Impacts

- The UK~IRC developed and launched a new doctoral and post-doctoral training programme on networks and innovation. This event was attended by 20 students from around the Europe and has helped to enhance the methodological training of early career researchers to explore the potential of using network analysis to develop a better understanding of the innovation process.
- Ammon Salter was elected representative-at-large for the Academy of Management Technology and Innovation Management division and is co-organising junior faculty consortia.

International Collaborative Impacts

- The UK~IRC (Ammon Salter) has been working closely with University of Berkeley, KGI and the University of Hasselt on a special issue for a leading field journal, Research Policy on open innovation. As part of these efforts we hosted a workshop with authors and solicited papers from scholars from around the world working on this topic. The Special Issue, which appear in late 2013, will provide forum for the latest research on this important topic.
- The UK~IRC (Alan Hughes) worked closely with colleagues at the University of Gothenburg and the Royal Institute of Technology (KTH) Sweden to hold a conference and then edit a special issue of the *Cambridge Journal of Economics (CJE)* on "Universities as Strategic Actors in the Knowledge Economy" (*CJE* Vol 36 No 3 May 2012). UK~IRC authors (Hughes, Kitson, Salter) also contributed to major reviews of science policy and university-industry links covering multiple universities and countries (Sutherland et al, 2012; Perkmann et al 2012) These publications provide important departure points for research in these areas.

These selected examples of the Centre's pathways to impact activities have taken place alongside the extensive involvement of UK-IRC team members in multiple high level formal and informal meetings, engagement and activities including many with our core sponsors at ESRC BIS TSB and NESTA and

strategic partners CIHE and CSaP. These are tracked and documented wherever possible through our KPI indicators.

The ultimate direct and indirect impact of this extensive pattern of interactions is complex. It will emerge with variable and typically long time lags and may depend critically on the complementary actions of many other players in the policy and practice domain. We have however been tracking the early stage reflections of those who have been involved with UK-IRC events and related activities using a survey instrument designed for the purpose. The initial outcomes are very positive and discussed under the Hub highlights below.

Highlights from the core research programme:

Over the past year, the research programme has made strong progress. Although the volume of research activities has declined in cash terms, we have managed to extend our original projects in new and unexpected directions with papers in a wide range of leading journals in management, economics and innovation policy. The research has also engaged policy-makers and practitioners, providing evidential inputs and advice.

- The Open Innovation project concluded its funded research programme in October 2012 and results from its survey are being developed into papers and a variety of case studies including open innovation practices in energy companies, the practices of technology consultancies, the link between geography and small form innovativeness. In the past year, we have had papers accepted for publication in leading outlets, including Academy of Management Review, Journal of Management Studies, Research Policy and California Management Review.
- In June 2012 the UK~IRC co-sponsored the Open Innovation: New Insights and Evidence Conference with the Garwood Centre of Corporate Innovation at University of California at Berkeley to develop a related special issue of Research Policy. Co-organised by Ammon Salter who is also a guest editor for the special issue, 80 people attended this 2-day conference. The special issue received 40 submissions. Final publication is expected late in 2013.
- The New Modes of Innovation project is focused on several sub-projects; the first examines the impact of individual's social capital on anticipating successful projects; the second studies the creation and decay of collaborative ties; the third looks at the effects of social capital on project success; and the fourth examines the effect of presentation and advertisement of projects when recruiting teams. This work has been presented at City University, the University of Amsterdam and the University of Grenoble. Insights from the New Modes of Innovation project were used in the UK~IRC's Networks and Innovation Training Programme held in November 2012.
- The Services project is preparing the launch of its survey looking at interaction between professional service firms, KIBs and the UK economy. The project also extended its analysis of the relationship between services and manufacturing and how servitisation may change the nature of manufacturing in the UK. Several conference and working papers are currently in development. Work from this project was published in the Journal of Economic Geography and Research Policy over the last year.
- The Evidence Base for Innovation Policy project has used inputs from the CIHE, HEFCE, EPSRC, BP, TSB and others to examine the value of R&D and its policy implications. Three substantive reports by the CIHE and UK~IRC have been published - 'Enhancing Impact: The Value of Public Sector R&D' (Hughes, A, Martin, B.R.); 'Enhancing Collaboration Creating Value Business interaction with the UK' (Mina A. Probert J.); 'Growing Value: Business-University Collaboration for the 21st Century' (Docherty, D., Eyton, D., Hughes, A., Pearce, S.). The Evidence Based policy project also resulted in the publication of the Cambridge Journal of Economics Special Issue: 'Universities and the Knowledge Economy', Volume 36, No 4 (developed from a UK~IRC workshop in 2011) co-edited by Alan Hughes and including papers by Hughes, Kitson, Salter, and leading international scholars.

Knowledge Hub Highlights:

The Hub has continued to engage in a wide range of knowledge exchange activities.

The Hub has hosted and sponsored a variety of events throughout the year including:

- The UK~IRC hosted a very successful Open Innovation Workshop at Imperial in June 2012. This one and half day conference was run in conjunction with the journal Research Policy for a special issue which will be published on “Open Innovation: New Insights and Evidence”. The special issue and the conference were run to mark the 10th anniversary of the publication of Henry Chesbrough's: ‘Open Innovation: The New Imperative for Creating and Profiting from Technology’.
- The UK~IRC's second Early Careers Researchers workshop was held in Jesus College, Cambridge in September. There was a very full two days programme with 19 papers being presented. The conference was coordinated by UK~IRC Research Fellows Elif Bascavusoglu and Antoine Vernet.
- The UK~IRC have been working with the Joint Research Centre (JRC) of the European Commission with their European Science Parks Initiative. Working with the UK~IRC's Cambridge team an EU delegation visited Cambridge to improve understanding of the role of place in the innovation system and inform future policy developments in Europe. The programme included discussions on 'Innovation' and the 'Cambridge Phenomenon', as well as visits local high technology venues. The EU delegation were looking to directly witness working practices and connectivity between research and industry in the Cambridge eco-system and in particular the developments linked to the University of Cambridge. This was the third meeting of the group looking into this area (the first meeting was held at the JRC in Brussels, Belgium in March 2012 and the second at the JRC in Ispra, Italy in June). As a result of these meetings the concept behind the JRC European Science Parks Initiative was updated and the project will be further implemented in 2013.
- A one day workshop to discuss research in the area of: ‘What is the future for regional innovation and competitiveness policy?’ was held on 15 November 2012 for a selected invited audience. Most of the papers presented were linked to a special Issue on the topic by the Cambridge Journal of Regional Economics, the papers spanned a wide geographical area including: EU, Canada, South America, the United States of America and the UK.
- An intensive 3-day training programme was held for the first time by the UK~IRC. It covered network analysis applied to the field of innovation studies. The workshop focussed on network theory and offered firsthand experience of empirical methods. There were 25 students from 8 European countries including Sweden, Germany, France, Italy and Poland. The course included 3 guest speakers – Corey Phelps from HEC Paris, Stefano Breschi from Bocconi and Martin Kilduff from UCL. The workshop proved so popular it is proposed to run the event again in 2013.
- The fourth annual UK~IRC's Innovation Summit was held in Manchester on 30 November. The theme this year was “Creative Industries and vibrant places”. The event

highlighted the important contribution that art and culture and creative people are making at all levels of society and in a variety of often intangible ways. Presentations drew widely from across the academic and practitioner communities and linked research commissioned by different research councils including work by UK~IRC members and by AHRC and which are being used by RCUK, BIS and others in relation to the development of science and innovation policy. A post event summary report was produced, along with podcast interviews with some of the presenters, a summary video on the topic and copies of selected presentations given are on the UK~IRC's events section of the website (<http://ukirc.ac.uk/newsandevents/events/article/?objid=8044>).

- Given the significance of R&D being formally incorporated into GDP in 2014 a co-sponsored event by the UK~IRC and ONS examined the challenges this raises. This event brought together academic researchers and policymakers, including ONS and other statistical agencies, to address some of the many questions this change raises. The research in this area, discussed at the conference, will translate directly into UK and international practice.
- The UK~IRC exhibited at Innovate UK in the 'Research' sector on 12 March 2013. This followed Alan Hughes, UK~IRC Director, taking part in a conference session entitled: "A great place to do research:- UK strengths in research and innovation" on the afternoon of 11 March.
- The Minister for Business, Innovation and Skills, Vince Cable launched the Government's industry and research strategy at Imperial College London and this event was hosted by David Gann (UK-IRC).

The Centre has produced more post event materials this year with event news feeds uploaded to the website on the day of the event, podcasts interviews and videos being available shortly after the events for a wider audience to appreciate. In several cases summary articles were produced and these were also circulated to media contacts.

There have also been a number of tailored smaller invitation only round table discussions held at the request of UK~IRC sponsors throughout the year. These included hosting a workshop on Studies of Governance of STI for Global Challenges on 30th October at Imperial College London. The event was organised by Keith Smith on behalf of the Department for Business, Innovation & Skills, the event united representatives from The German Development Institute, The Norwegian Ministry of Education and Research, Innovation Norway, the Royal Society and the OECD.

The Centre has also published a number of major policy and practitioner orientated reports this year which include:

- In May 2012 Bill Martin and Robert Rowthorn published a report: "Is the British economy supply constrained II? A renewed critique of productivity pessimism". The report developed the analysis by Bill Martin in his previous UK~IRC's report on this topic published in July 2011. The report received wide coverage in national and financial press, including FT and BBC online news pages.
- A Report was produced for the Department of Business, Innovation and Skills entitled "The Dual Funding Structure for Research in the UK: Research Council and Funding Council Allocation Methods and the Pathways to Impact of UK Academics" which will be

published in March/April 2013 and has already been used in policy discussion and development.

- The Centre has been pleased to continue its work in strategic partnership with Council for Industry and Higher Education (CIHE) on the Enhancing Value Task Force. The research carried out has highlighted the key challenges of building effective connections between global industries and the UK's outstanding university sector. As a result of the partnership a series of reports have been produced and presented at a series of breakfast briefings, seminars and conferences. All of the CIHE reports can be seen on the research section of the UK~IRC's website (<http://ukirc.ac.uk/research/CIHETaskforce/>).

It is important for the UK~IRC that those involved in its activities and events cover a wide audience of both policy makers and practitioner. We also attempt to present our work to individuals with high seniority and influence. Thus, attendees at small scale roundtable discussions and seminars addressed by UK~IRC researchers included the Minister for Universities and Science and the Secretary of State for Business, Innovation and Skills, Secretary of State for Culture, Media and Sport, Mayor of London office and London Assembly members, Group Head of Technology at BP, the Director of Academic Liaison at GlaxoSmithKline, the Managing Director of the Advanced Technology Centre of BAE Systems plc, the President of Boeing UK, the Chief Executive of Finmeccanica UK, the Chairman of Legal and General, the Chairman and Chief Executive of QAA, the Managing Director of Spencer Stuart, senior partners of Amadeus Capital Partners, the Executive Vice President of Innovative Medicines at AstraZeneca, the Director of Research and Technology at Rolls Royce, the President of Pharmaceuticals R&D at GlaxoSmithKline, the Chairman of Ford of Britain, the Chairman of BAE Systems, the Chairman of Anglo-American, the Executive Director Head of UK Banking Santander, a Non-executive Director of Invensys, Aegis Group and Lloyd's of London, the President and Senior Vice President of the Royal Academy of Engineering, the Managing Director for UK and Ireland of Accenture, the Vice President of Global Education Cisco International Ltd, the Vice President of EADS Innovation Works, the Head of the Centre of Technology of the BBC Academy, UK Sales Director of Twitter, Chief Statistician at the Bureau of Economic Analysis in the USA, EC Directorate-General for Research & Innovation, Head of Partnership Development at the BBC Archive, Chairman, Innovation Leadership Team at Balfour Beatty plc, President Elect of the Royal Institute of British Architects, as well as the RCUK CEO Champion for Impact, the Director of Research, Innovation and Skills at HEFCE, the Director of Research Programmes at the Medical Research Council, the Director of Enterprise and Communications at the Technology Strategy Board, Director of Research at the Arts and Humanities Research Council, Director of Strategy at Arts Council England, the Director of Research and Enterprise Services at Newcastle University and Chair of PraxisUnico, and the Associate Director of Impact at EPSRC, Chi Onwurah MP, the Chairman of the Higher Education Funding Council for England, the Permanent Secretary to the Department for Business, Innovation and Skills (BIS), the Director General of BIS, the Director for Further Education and Skills Investment at BIS, the Chief Executive of Universities UK, the Chief Executive of the Technology Strategy Board, the Chief Executive of the EPSRC, the Vice Chancellors of the Universities of Loughborough, Cambridge, Manchester, Oxford, Aston and Dundee, University College London, Warwick, Teesside, Southampton, Sheffield, Brighton and Coventry

Members of the UK~IRC Governance Group were also invited to 9 UK~IRC related different events during the year.

The Hub also continues to maintain contact with its target audiences through regular communication of its emailed newsletter, Twitter feeds and updates to the centre's website.

2. Research - Progress against Objectives

Project 1: New Modes of Innovation: Managerial and strategic Business Practices and Open Innovation

Project Leaders: Andy Cosh, Joanne Jin Zhang (Research Fellow)

Other Investigators: Alan Hughes, Michael Kitson, Tim Minshall, Ammon Salter, Oliver Alexy, Gerald Avison (TTP), Chas Sims (TTP)

Period: Oct 2009-Oct 2012

Progress to date

The project period ran from April 2012-until October 2012, the team continued to make significant progress during this time, and continues its work after this period too.

The growing interest in open innovation has been driven by the phenomenon where organisations are increasingly moving toward network-based forms of innovation, sourcing ideas through licensing agreements, formal alliances and mergers and acquisitions and the use of a wide variety of sources of knowledge for innovation. Although attempts to examine open innovation using the UK innovation survey have made some progress, we still lack in-depth data at the sectoral level and a clear theoretical understanding of how firms build capabilities to be open and how they can successfully integrate external actors into their innovation processes.

In order to deepen and extend our existing knowledge on the nature and extent of open innovation among UK firms, this project was designed to shed light on the organizational mechanisms and capabilities as well as institutional arrangements that are required to foster effective open innovation. In particular, it addressed three questions:

- How do patterns of usage of OI practices vary across firms, sectors and sizes?
- What are the factors driving the firms' usage of OI practices?
- How does the firms' usage of OI practices affect their innovativeness and performance?

Our "open innovation" survey among UK firms with up to 999 employees, covering both manufacturing and business services sectors in 2010 resulted in 1202 completed interviews. The full report 'Open innovation choices: what is British enterprise doing?' was published in June 2011 and a launch event was held at NESTA. Subsequently, the report was presented to an OECD NESTI meeting and this may result in collaboration over the creation of an open innovation module that could be bolted on to existing innovation surveys (particularly CIS).

We have also actively engaged in academic, policymaker and practitioner community to discuss and disseminate our research. Several papers are being prepared by members of the team and a number have been published or accepted in Research Policy, Journal of Economic Geography, California Management Review, Academy of Management Review and MIT Sloan Management Review.

A key conference was held in June to celebrate a decade since Chesbrough coined the term open innovation and a special issue of Research Policy on "Open Innovation" is likely to be published towards the end of 2013. The Special Issue is being co-edited by Ammon Salter; the conference received 78 submissions, with around 40 in the first round for the issue. Several members of the team had papers accepted for the conference and it is likely that up to 3 UK~IRC papers could be included in the Special Issue.

UK~IRC research student Nelli Theyel had a paper accepted for the Best Paper Proceedings of the Academy of Management conference last summer and has had another paper in the special issue of the International Small Business Journal on "Open Innovation in SMEs: An International Perspective on a Dynamic Approach to Contemporary Entrepreneurship". Oliver Alexy and Ammon Salter's paper with Paola Criscuolo 'Managing unsolicited ideas for R&D' was runner-up in The Best-Paper-Award in Innovation Management (sponsored by the European Business School (EBS) and MikroFORUM. It was subsequently published in California Management Review (54 (3): 116-139.). Additionally Oliver Alexy's co-authored paper 'Citius, Altius, Fortius? The Two Sides of Community-enabled Bricolage and Their Effect on Entrepreneurial Ventures was nominated for best paper at the Strategic Management Society Conference (nominated as best conference paper) in Prague in October 2012.

In addition to this exploitation of the results of our survey, other case study work has been initiated that will provide rich insights into how open innovation does, and does not, work.

- Nelli Theyel is presently in California and has carried out a series of interviews with clean energy companies about their open innovation practices following interviews with their British equivalents.
- Joanne Zhang and Andy Cosh are examining the engagement and IP practices of a technology consultancy company.
- Tim Minshall is working on several related case studies. One project focuses on location and small firm innovativeness in East England. Another focuses on how firms change their location to benefit their innovation. Another examines how two public organisations and two private firms help start-ups from product development to commercialisation.
- Alan Hughes, Andrea Mina and Jocelyn Probert are working on case studies aimed at exploring how the UK can maximise the return to R&D at the sectoral level (Pharma, Construction, Digital IT and Energy).
- The team actively disseminated our research findings at leading international conferences including multiple papers at the annual Academy of Management conference in Boston, the DRUID conference in Copenhagen, Centre for Innovation Research 2012 Conference at the University of Tilberg, Euram conference in Rotterdam, VHB Tagung in Hamburg and the Strategic Management Society conference in Prague.

Project 2: Knowledge Intensive Business Services (KIBS) and Innovative Performance

Project leader: Bruce Tether

Other Investigators: Alan Hughes, Jonathan Haskel, Ken Coutts, Bob Rowthorn, Cher Li (Research Fellow), Stan Metcalfe, Andrea Mina (Senior Research Fellow), Bill Martin, Karl Wennberg, Elif Bascavusoglu-Moreau (Research Fellow)

Period: Oct 2009-Oct2012 (extended to April 2013)

Progress to-date

The funded research phase of this project has now concluded, and we are engaged in the process of developing outputs from the project, especially writing academic articles and book chapters. We have also presented work at various conferences and engaged in other engagement and dissemination activities.

The team has had work accepted for publication and published in academic journals, including:

- Harris, R., Li, Q.C.(2012) 'Export-Market Dynamics and Firm-Level Productivity: Evidence for UK Tradable Sectors', Industrial and Corporate Change, Volume 21, No 3, pp. 649-670

- Harris, R., Li, Q.C., Moffat, J. (2013) 'The Impact of Higher Education Institution-Firm Knowledge Links on Establishment-level Productivity in British Regions', *The Manchester School*. Volume 81, No. 2, pp.143-162.
- Haskel, J and Wallis, G, (2013), 'Public Support for Innovation, Intangible Investment and Productivity Growth in the UK Market Sector', forthcoming *Economics Letters*.
- Probert, J., Connell, D. and Mina, A. (accepted and forthcoming) 'R&D Service Firms: The Hidden Engine of the High-Tech Economy?', *Research Policy*.
- Tether, B.S., Li, Q.C., Mina, A. (2012) 'Knowledge-Bases, Places, Spatial Configurations and the Performance of Knowledge-Intensive Professional Service Firms', *Journal of Economic Geography*, Volume 12, No.5, pp. 969-1001.

Two book chapters are also forthcoming:

- Salter, A. and Tether, B.S. (forthcoming), 'Innovation in Services: An Overview', in Haynes K. and Grugulis I. (eds), 'Managing Services: Challenges and Innovations', Oxford University Press.
- Tether, B.S. (forthcoming) 'Services, Innovation and the Management of Service Innovation', in Dodgson, M., Gann, D. and Phillips, N. (eds.) *Oxford Handbook of Innovation Management*, Oxford University Press.

Other papers have been submitted to journals which have asked us to revise and resubmit. These include:

- Goodridge P, Haskel J, and Wallis G, (2013), 'Spillovers from R&D and other intangible investment: evidence from UK industries'
- Haskel, J, and Pesole, A., (2013), 'Productivity Growth in UK Financial Services: An Intangible Assets Approach'
- Li, Q.C., Tether, B.S., Mina, A. and Wennberg, K. (2012) *Diversification and Human Capital as Antecedents of Internationalization amongst Professional Service Firms: A Study of UK Based Engineering Consultants*.
- Tether, B.S. and Stigliani, I. (2012) *No Fools, No Rushing: Entrepreneurial Actions to Imagine, Create, Nurture and Legitimate a New Industry (The Case of Service Design Consulting in the UK)*.
- Wennberg, K., Tether, B.S., Li, Q.C. and Mina, A.(2012) *Taking or Eschewing Opportunities? Diversification in Professional Service Firms*.
- Mina, A., Bascavusoglu-Moreau, E. and Hughes, A. (2012) 'Open Service Innovation and Firm's Search for External Knowledge'

UK~IRC Published Reports and Officially Commissioned Reports

Coutts and Rowthorn worked on the evolution of services and manufacturing and were commissioned by the Foresight Programme on the Future of UK Manufacturing to write 2 reports *De-Industrialisation and the balance of Payments* and *Scenario Models of the Future of UK Trade in Manufacturing and Services*. The reports will be published with the main Foresight report in October 2013. Bill Martin and Robert Rowthorn also continued work on macro-modelling and published a report *Is the British economy supply constrained II? A renewed critique of productivity pessimism*. The report developed the analysis by Bill Martin in his previous UK~IRC's report *Is the British Economy constrained?* published in July 2011. The report received wide coverage in national and trade press including FT and BBC online news pages.

- Coutts, K. and Rowthorn, R. (Forthcoming 2013) "De-Industrialisation and the balance of Payments" to be published with the *Foresight Future of Manufacturing Report* in 2013.
- Coutts, K. and Rowthorn, R. (Forthcoming 2013) "Scenario Models of the Future of UK Trade in Manufacturing and Services", to be published with the *Foresight Future of Manufacturing Report* in 2013.
- Martin, W. and Rowthorn, R. (Forthcoming 2013) "Is the business Economy Supply Constraints?", to be published with the *Foresight Future of Manufacturing Report* in 2013.

Meanwhile, Jonathan Haskel has continued his pioneering work (partially in association with NESTA and the Intellectual Property Office) on the significance of investments in knowledge (or 'intangibles') in the UK economy. This has found, amongst many other things, that investment in knowledge is now greater than investment in tangible assets at around £124bn and £93bn respectively in 2009, or around 12% and 9% of gross value added. Interestingly, the most knowledge (or intangible) intensive industry is manufacturing, where intangible investment as a proportion of value added is 17%, but in each of manufacturing, financial services and business services, investments in intangibles are around three times higher than investments in tangibles. These findings highlight the significance of investments in knowledge, not only in knowledge intensive business services, but also in manufacturing, and hint at the strong significance of linkages between knowledge producing services and manufacturing businesses – further research will examine these links directly.

The team also presented papers at various international conferences, including the Academy of Management Annual Meeting, Boston; the 14th International Schumpeter Society Conference, Brisbane; the 9th Annual International Industrial Organization Conference, Boston and the DRUID Society Conference, Copenhagen, June. Papers were also presented at seminars, including at Manchester Business School, University of Rome La Sapienza and the School of Management at the University of Southampton.

Jonathan Haskel has been appointed as a member of "Economic High Level Group Innovation for Growth Group –i4g" advising the EU Research and Innovation Commissioner (since November 2012). He is also an elected member, Council of the Royal Economic Society. Project Leader Bruce Tether was one of the main organisers of the UK~IRC Innovation Summit held in Manchester in November 2012 on the theme "Creative Industries and Vibrant Places".

Bruce Tether and Cher Li also organised the UK~IRC and AIM international symposium on Innovation and Practices in Professional Services (Imperial College Business School, March 2011), bringing together scholars from Boston College, Imperial College, Universities of Harvard, Oxford, Cambridge, Bath etc.

Meanwhile, Dr Elif Bascavusoglu-Moreau was one of the principal organizers of the UK~IRC Early Career Researcher Workshop, held at Jesus College, Cambridge in September.

In December 2012 Bruce Tether acted as an invited discussant at the OECD for their final conference of the INNOSERV project. This examined innovation in services, and shows that this topic remains one of considerable interests amongst policymakers around the world.

Bruce Tether also continued his collaboration with the Architects Journal and New Civil Engineer, leading professional magazines for architects and civil engineers respectively. He analyses the firm level data

gathered by both of these journals to form the basis of the annual AJ100 list of architecture practices and NCE's 'Consultants File' respectively. These analyses are both published in the journals annually. He also sits on the associated judging panels which determine various prizes for 'architectural practices of the year' and 'engineering consultancies of the year'. These activities have led to a further collaboration with the Association for Consultancy and Engineering, which celebrates its 100th anniversary in 2013. Bruce Tether will provide an commentary on how the sector has developed and grown over time.

Finally, we are very pleased to report that two of the researchers heavily involved with this project have been appointed to faculty positions at leading universities. Dr Andrea Mina has been appointed University Lecturer in the Economics of Innovation at the Judge Business School, University of Cambridge, whilst Dr Cher Li has been appointed Associate Professor in Industrial Economics at Nottingham University Business School. Many congratulations to both; both are committed to contributing further to the research articles and other outputs that this project will produce in due course.

Project 3: Network Evolution in Open Innovation Communities

Project Leaders: Ammon Salter, Martin Kilduff

Other investigators: Antoine Vernet

Period: Oct 2010-November 2013

Progress to-date

This project focuses on studying open source software communities and has made good progress over the past year in developing greater insights in how networks evolve in open innovation communities. The research seeks to generate new understand about how innovation emerges in these communities and how networks shape the development of different forms of innovation. Empirically, the project focuses on SourceForge - the large on-line repository of open source software projects. In the SourceForge dataset, there are over 250,000 unique individuals and 200,000 open source projects. The files include records for all projects from 2006 onwards, allowing us to create time-stamped information on the network affiliations of open source programmers to project teams. This is complemented in the dataset by records of the activity of individuals on projects they participate in. Moreover, the dataset contains detailed information on projects (description, newsfeed, forums) and on individuals over time. Using this database, the research has focused on three topics:

- the impact of social capital on the emergence of new, successful projects;
- the influence of networks on the patterns of movement within the community; and
- the social capital of project founders and how this shape project outcomes.

In the first sub-project, we have investigated how an individual's brokerage and closure social capital influences their ability to choose future successful projects. Most open source projects end in failure – the inability to create a functional piece of software. This means that open source developers need to be careful in allocating their time and effort only to projects that have a high potential for success or else their efforts will be lost or unnoticed in the wider community. The factors that enable individuals to anticipate the future direction of the community is an open research question. To explore this question, the analysis captures information on individual's network positions prior to their joining a project and then following the subsequent development of the project. The initial results show that individuals with high levels of brokerage or closure are able to anticipate projects that will later become successful. We further expand that result by investigating whether the global state of the field influences the benefits that individual can reap from their social capital, focusing dynamism and small-worlds. A working paper summarizing the results of that sub-projects has been presented in seminars at the University of Bologna in Italy, Grenoble Graduate School of Business in France, VU Amsterdam in the Netherlands, Greenwich Business School and Cass Business School in the UK.

In the second sub-project, we have studied the creation and decay of collaborative ties. Distributed innovation communities are associated with fluid movement between projects and it is not clear what drives such movements and how these movements may be shaped by network resources. Using innovative techniques to build a comparative control group, we are able to assess the dynamic of creation and severing of ties within the community. This research is being expanded into a working paper investigating how past project affiliations influence new ones. In this paper, we investigate how patterns of past affiliation help predict how developers will engage with new projects they get involved with. More precisely, depending on the type of past affiliation, we will see an individual take on different roles in a new project; an individual previously linked by a strong tie to a member of the project will have a tendency to engage in more political activity (participation on the forums and in the discussions to set the direction for the project). An individual who has weaker links to the project is more likely to take on more technical roles (activity in solving bugs).

The third sub-project investigates the social capital of project founders, exploring how network positions may shape the success of new projects. Building on the literature on entrepreneurial teams, we study how their experience and network position influences the success of their ventures and, additionally, how that position helps them to build a team around their project. Ultimately, we hope to assess the effect of different team building strategies (i.e. reaching for an individual close by or far away in the network) on the outcome of the project.

The project also led to the development of a book chapter on the use of data from 2-mode networks in innovation studies for a volume of Research in the Sociology of Organization featuring prominent management scholars specialist of network analysis. As the piece was invited, it is a sign of visibility of our work in the management community.

The outreach part of the project was very active in 2012 with the organization of several events. We participated in the organization of the second Early Career Researcher Workshop of the UK~IRC at Cambridge University in September, we also gave feedback on papers during this workshop. For this workshop, we selected 20 contributions from around the world (out of about 40 applications) from PhD students, post-docs and assistant professors to be discussed by prominent management scholars from around Europe. We organized the Network and Innovation Training Programme at Imperial College in November. This workshop was a theoretical and practical course on using network analysis for innovation research. We selected 22 participants out of about 40 applications at the PhD, post doc or assistant professor level. For both of those events, we got very positive feedback from participants (both academic and from NESTA).

Project 4: Evidence Base for Innovation Policy

Project Leaders and Associates: Keith Smith, Alan Hughes, Michael Kitson, Ammon Salter, David Connell, Andrea Mina, Jocelyn Probert, Elif Bascavusoglu-Moreau and Henry Lahr

Period: January 2009 – December 2013

Progress to date

UK~IRC/CIHE Enhancing Value Task Force (Hughes, Mina, Probert)

The Enhancing Value Task Force was set up in 2012 to address four principle tasks:

1. To place UK public and private sector research in an EU and global context.
2. To explore the similarities and synergies between public and private sector research.
3. To isolate the characteristic of different business sectors and explore appropriate sectoral systems of innovation.

4. To identify and prioritise a small set of key actions for change that will enhance the value of publicly funded research and collaboration with business.

Substantial progress was made during the year and the project was completed in December 2012. The work of the Task Force produced 10 core conclusions and four key recommendations.

Conclusions

1. There is a global trend towards greater openness in research and collaboration between companies and research institutions. These dynamics are present in the UK, with some institutions being leading practitioners.
2. The openness and excellence of the UK research base is reflected in its attractiveness to overseas firms. The UK has the world's highest percentage of R&D coming from foreign subsidiaries. But this extreme position carries risks. This investment could go elsewhere as developing countries incentivise inward investment, or the UK could increasingly be viewed as providing a higher education and research service 'at cost' to the world. This would profit other countries' innovation systems with little or no follow-on benefit to the UK.
3. Research is a competitive, global activity and developing countries are capturing market share. The UK needs to compete for a greater share of supply chains, from research through to wide-scale deployment of new concepts and products, in order to support the UK's economic prosperity and sustained investment in the higher education and research base.
4. Enhancing the impact of the UK's higher education and research base requires a joined up or systems-based approach, which recognises the linkages from research through to deployment, and from start-up companies through to major multi-nationals, as well as the importance of infrastructure and finance in achieving growth.
5. Large international companies account for the majority of the UK's business research and have the capacity to interface effectively with UK universities and funding organisations. These same companies choose to invest where they can find the best people, leveraging national research expenditures and infrastructure. Smaller companies account for a small fraction of R&D, and those seeking to innovate often struggle to leverage the university and funding systems, due to a lack of resources and relevant 'bridging' skills, both in the companies and in universities.
6. The commercialisation of research is one of many ways in which value is created and it is inherently risky. Large companies are practised at this and have the ability to manage the whole innovation pipeline and portfolio. Failures occur regularly and are to be expected. Smaller companies have fewer resources and a narrower portfolio, making failure terminal, but success also more dramatic.
7. The impact of publicly-funded research is difficult to quantify, but is consistently assessed as strongly positive where capacity exists to absorb the research into business and community activities.
8. Innovation pathways vary by sector, depending for example on the 'clock-speed' of specific industries, industry structure, maturity, and the significance of IP. There is no single 'silver bullet' solution to enhancing the value and impact of university inventiveness that would work across all sectors. Equally, many technologies have multiple applications across many sectors.
9. The absence of an industrial strategy has arguably resulted in offshoring of manufacturing, fewer opportunities for local leverage of the research base and a lack of strategic prioritisation of public research funding. Each sector has a particular set of strategic requirements and particular growth trajectories, and requires specific policy support.
10. Despite having a vibrant financial services industry in the UK, UK inventions often end up being funded by overseas businesses, and their value is not captured in the UK.

Recommendations

1. Maintain the excellence of the UK Research Base through long-term strategic commitments from government.
2. Prioritise and finance collaboration, and the sharing of best practice in innovation, between UK universities and businesses, local and global.
3. Promote entrepreneurship and entrepreneurial corporate management in universities in order to enhance risk-taking and innovation in business.
4. Develop consistent differentiated sector strategies to incentivise university-business interactions designed to match specific sectoral systems of innovation.

The Enhancing Value Task Force was carried out with funding and support from the BBC, BP, Cisco, the Technology Strategy Board, HEFCE, the EPSRC and one of the UK~IRC's strategic partners, the Council for Industry and Higher Education (CIHE). The first report based on the work of this project was published as *The UK R&D Landscape* written by Alan Hughes and Andrea Mina was reported in the UK~IRC Annual Review for 2011. This year's work focused on the development of methodologies to value public sector funded research expenditures. This produced a major new review published as *Enhancing Impact - The Value of Public Sector R&D* co-authored by Alan Hughes and Ben Martin of the University of Sussex. In parallel with this research a series of in-depth case studies was undertaken in bio-pharmaceuticals, energy, construction and the creative digital and information technology industries. This was published as *Enhancing Collaboration Creating Value* by Andrea Mina and Jocelyn Probert. The work was conducted in close collaboration with industry and supported by the Technology Strategy Board's membership of the Task Force Steering Group. The research included 50 interviews with the UK's most important companies and leading SMEs as well as key agencies including the Technology Strategy Board, Research Councils and Universities in the chosen sectors. Findings were presented at a series of high-level workshops and breakfast briefing meetings at which the results were presented and discussed with the Rt Hon David Willetts MP, the Minister for Universities and Sciences, and Lord Sainsbury, the former Minister for Science. In addition to the three substantive research based reports, the production strategy included the dissemination of short specially written briefing documents co-authored with David Docherty and a final Enhancing Value Task Force report entitled *Growing Value: Business-University Collaboration for the 21st Century* written by David Docherty of CIHE, David Eyton of BP, Alan Hughes of UK~IRC and Shirley Pearce, former Vice-Chancellor of the University of Loughborough. The *Growing Value* final report was presented at BIS on the 19 December 2012 at a meeting chaired by Martin Donnelly, the Permanent Secretary of BIS. The findings and insights deriving from this work have attracted very positive feedback from BIS and HEFCE and have been included in numerous internal BIS briefing documents.

Evidence Based Policy Analysis

In addition to the work of the Task Force, further work continued on the input of advice into policy formation at UK, EU and broader international domains.

Connell prepared presentations on EU/US style public procurement SBIR programme at a workshop organised by the European Parliament in Brussels in April 2012 and on the role of lead customers at a Euroscience Open Forum in Dublin in 2012 as well as giving the presentations at the University of Vilnius in Finland and took part in a series of meetings which led to the launch of public procurement linked policy initiatives in the EU.

Hughes worked on the evidential and conceptual basis for industrial policy. He wrote an invited paper for an ESRC & CEPR BIS conference hosted by the Rt Hon Vince Cable MP on *National Innovation Policy and Global Innovation Systems: Key Challenges and Opportunities for the UK*, 14th June, which was published in the resulting edited book. He made presentations at numerous OECD and EU policy

meetings. He was invited to speak by the Foundation for Science and Technology at the Royal Society alongside the Rt Hon David Willetts MP, the Minister for Universities and Science, and Sir John Parker, the President of the Royal Academy of Engineering, where the topic for debate was “Intervene or stand back – what should be the industrial strategy for the UK?”. He was appointed as one of eight lead experts advising the UK Government’s Foresight Programme on the Future of UK Manufacturing. As a member of the Council for Science and Technology, he attended meetings with the Rt Hon Vince Cable MP, the Rt Hon David Willetts MP, and produced policy advice and presentations to senior officials at BIS and at HEFCE as well as at seminar and conference presentations on the theory and practice of innovation policy in the UK and Australia. He was also appointed as Innovator in Residence to the Queensland’s State Government in Australia in July 2013.

Elif Bascavusoglu-Moreau and Cher Li were commissioned by the Government’s Foresight Programme on the Future of UK Manufacturing activity to analyse the evidence on the nature and extent of knowledge spillovers from R&D and innovation in manufacturing and their impacts on regional development. Their report will be published in the supporting evidence to the main report which is due to be published in October 2013.

The project continued its development of policy networks through collaboration with CSaP and received visitors and provided informal advice to senior officials from the EC Directorate-General for Research and Innovation, the N8 Industry Innovation Forum, the Emerging Technologies and Industries Programme of the Technology Strategy Board, the ESRC, the Office of the Shadow Business Secretary and the Office of the Shadow Cabinet Office Minister as well as hosting ministerial visits by the Rt Hon Vince Cable MP and Secretary of State for Culture, Media and Sport, the Rt Hon Jeremy Hunt MP.

The Governance Group agreed that for the year Jan 2012-Dec 2013 a new sub-project would be directly funded on the analysis of international comparative inputs into the formation of selected policy domains. This will allow a focus on the types and forms of evidence used in the development of innovation policy. This research will produce both academic research output and, more specifically, a series of high-level policy briefing papers for three Chatham House Rule events to be held in the second half of the calendar year 2013-14.

3. Knowledge Hub - Progress against Objectives

The Hub has continued its ongoing dialogue with key stakeholders and has forged a range of new alliances and partnerships, with partners in the UK and abroad.

The Hub has also continued its knowledge exchange activities including a wide range of research on innovation (including collaborating with other projects commissioned as part of the initiative) and has developed links and relationships with other national and international institutions concerned with innovation policy and practice, including BIS, NESTA, the Technology Strategy Board, the Council for Science and Technology, the OECD, the EU, CIHE (Council for Industry and Higher Education), DRUID, and Centre for Science and policy (CSaP).

In 2012/13 the Hub continued to regularly update the content of its website, including disseminating more information around the events that we run, with newsfeeds being uploaded to the website as the events are happening and post event podcast interviews and videos being uploaded to the Centre’s website. There are regular mailings to the centre’s contacts database including newsletters and events news, as well as steady news flow through our Twitter feed. There are also Working Papers on the UK~IRC’s website, which are available to download.

The Hub launched and promoted 5 major reports in the year, “Growing Value: Business-University Collaboration for the 21st Century”, “Enhancing Collaboration Creating Value: Business interaction with the UK Research base in four sectors”, “Enhancing Impact: The value of Public Sector R&D”, “Is the

British economy supply constrained II?A renewed critique of productivity pessimism” and “The Dual Funding Structure for Research in the UK: Research Council and Funding Council Allocation methods and the Pathways to Impact of UK Academics”

- The centre has held 9 dissemination and research development events over the year, which were attended by over 308 delegates.

The Centre has once again conducted an online questionnaire seeking feedback on all of its activities. The questionnaire was sent to the whole of the contacts database, which has nearly doubled since last year. The survey received a 22% response rate. A summary of the responses can be found on the UK~IRC website at: <http://ukirc.ac.uk/newsandevents/news/article/?objid=8270>.

Some of the results from the survey include:

- 70% of respondents strongly agreed or agreed that they had increased personal and professional development as a result of participating in UK~IRC activities, this increased from 68% in 2012
- 71 % of respondents strongly agreed or agreed that they had experienced new research that can be used in their working environment as a result of participating in UK~IRC activities, this increased from 63% in 2012
- 80% of respondents strongly agreed or agreed that they had experienced a new network of contacts as a result of participating in UK~IRC activities this was quite a significant increase from 65% in 2012
- 80% of respondents strongly agreed or agreed that as a result of their contact with the UK~IRC they always read new information about the UK~IRC when it is presented to them, this increased from 78% in 2012
- 73% of respondents are still in contact with people that they first met as a result of an UK~IRC activity or event, this builds on the response of 63% in 2012
- 81% of respondents are sometimes or frequently involved with exchanging information activities with contacts made as a result of a UK~IRC activity, which is consistent with the response of 81% in 2012
- 99% of respondents found the website easy to navigate, an increase on the 95% in 2012

The Centre has continued to increase its geographical and audience scope throughout the year. This has been done by the team travelling and by international visitors coming to UK~IRC events, which has included United States of America, Canada, South America, Korea, Taiwan, Australia, Japan, India as well as many European countries. We have also looked to ensure a good reach within the UK by collaborating and co-producing events which has included locations such as Manchester and Sussex.

The UK~IRC team have been involved in many policy and practice briefings and submitted written evidence to the House of Commons, Science and Technology Committee report ‘Bridging the valley of death: improving the commercialisation of research’, in addition to this the centre sponsored the launch or publication of 5 major policy reports. The website has been used to highlight key events, report publications, news and insights from the centre and its partners. The centre also has an active Twitter page with 350 registered followers. The UK~IRC also held its fourth Innovation Summit in November 2012. For fuller details see Section 4b.

4. Investment Specific Indicators (In Progress – to be completed by 31st March 2012)

***α.* Investment Specific Indicators**

In the year 2012-2013, UK~IRC associated researchers had 16 journal articles published or accepted for publication. We also published 9 books and official research reports and policy submissions, 5 chapters in a books, produced 15 working papers or other publications and gave 38 presentations at universities and policy and practitioner forums and in addition to this the team gave 8 keynote addresses at events throughout the year. UK~IRC associated researchers published in a broad range of leading journals, such as Research Policy, Research Technology Management, Strategic Management Journal, Strategic Entrepreneurship Journal, Journal of Business, California Management Review and Journal of Management Studies. In addition, the Centre continued to play an important role in building research capacity and supporting dialogue and exchange among early stage scholars of innovation through its second Early career researchers event and Networks and Innovation Training 3 day training programme.

Our research has commanded attention in the popular press. In total, 19 newspaper articles and media features have showcased research from the wider programme.

Finally, our work has been influential in shaping policy through our engagement in leading policy communities and committees, such as The Foundation for Science and Technology, Royal Society, BIS, ESRC, N8 Industry Innovation Forum, Council of the Royal Economic Society, Association of Consultants and Engineering, Royal Academy of Engineering, Engineering and Physical Sciences Research Council, Patent Office Research Advisory Group, Labour Party Small Business Task Force on Small Businesses, NHS SBRI Task and Finish Group, NHS East and Midlands SBRI Management Board, Arts Council England, Arts and Humanities Research Council, Council for Science and Technology, Council for Industry and Higher Education (CIHE) and HEFCE. As well as on an international basis, including in Europe the OECD, French Foreign Trade Advisors and Associate and EU Research and Innovation Commission along with our work influencing further afield including the Bureau of Economic Analysis in the USA and the Chilean and Australian Governments

b. ESRC General Indicators for Reporting to Government

<i>UK Innovation Research Centre</i>	
<i>Indicator</i>	<i>Number</i>
A. Number of activities and events involving the general public	2
B. Number of grants attracted by the investment (involving leveraged funding and/or in-kind contributions)	
C. Number of public policy/business/civil society orientated seminars and workshops	9
<p>D:</p> <p style="text-align: center;">How many non-academic users have worked within the investment on a formal basis to complete a specific programme of work?</p> <p style="text-align: center;">How many researchers have the investment placed in user organisations on a formal basis to complete a specific programme of work?</p> <p><i>NB – placements funded through ESRC placement schemes should not be included.</i></p>	<p>Number of non-academic users hosted:</p> <p style="text-align: center;">0</p> <hr/> <p>(ii) Number of researchers placed in user organisations:</p> <p style="text-align: center;">0</p>
E: Number of non-academic users on the investment’s Advisory Committee	(i) Total number of Advisory Committee members: 17
	<p>(ii) Total number of non-academic user members: 9</p> <p><i>Including:</i></p> <p>Number of private sector members: 7</p> <p>Number of public sector members: 2</p> <p>Number of third sector members:</p>

Indicator A: Activities and events involving the general public

Title:	Date:	Format: [<i>type of event (e.g. lecture/broadcast ...)</i>]	Total number of participants:	Number of general public participants
UK~IRC Innovation Summit 2012 - Creative Industries & Vibrant Places	30 November 2012	One day conference	61	7
Innovate UK	11-13 March 2013	3 day conference and exhibition (4,000 visitors)	30	20

Indicator B: Grants attracted by the investment (involving leveraged funding and/or in-kind contributions)

Name of Grant	Amount of organisation providing funding	Start and end date of co-funding:	Total value of grant (if in-kind contributions please report this and state their nature)	Amount of funding in 2012/2013 (estimated by allocating funding by financial year)	Specify whether private, public or civil society funding/in-kind contribution

Indicator C: Public policy/business/civil society orientated seminars and workshops

Title:	Date:	Target audience: [<i>private sector/public sector/practitioners/civil sector</i>]	Number of participants:
Open Innovation: New Insights and Evidence	25-26 June 2012	Selective audience for an academic workshop in conjunction with a Special Issue of Research Policy	65
Early Career Researcher Workshop 2012	24-25 September 2012	Academic audience	31

Science, Technology & Multilateral Collaboration	30 October 2012	Policy makers workshop	16
'Innovative Places: Lessons from the Cambridge Phenomenon'	14 November 2012	EU Policy makers workshop	14
Regional Innovation and Competitiveness Policy Workshop	15 November 2012	Academic and policy workshop	31
Networks & Innovation Training Programme	21-23 November 2012	Academic audience	25
UK~IRC Innovation Summit 2012 - Creative Industries & Vibrant Places	30 November 2012	Private sector/public sector/practitioners/policy/	61
European Knowledge Sharing Event on R&D Capitalisation	17-18 December	Academic audience	35
Innovate UK	11-13 March 2013	Private sector/public sector/practitioners/policy/	30

Indicator D: Number of (i) non-academic users hosted and (ii) number of researchers placed in user organisations *NB – Placements funded through ESRC placement schemes should not be included.*

Name:	Hosted: [Where from?]	Placed: [Where to?]	Dates:	Placement days or hours:	Purpose:
	None	None	None	None	None