UK COMPUTING RESEARCH COMMITTEE

UKCRC/2014/4

Business, Innovation and Skills inquiry into business-university collaboration

UKCRC Response

The UK Computing Research Committee (UKCRC), an Expert Panel of the British Computer Society, the Institution of Engineering and Technology and the Council of Professors and Heads of Computing, was formed in November 2000 as a policy committee for computing research in the UK. Its members are leading computing researchers who each have an established international reputation in computing. Our response thus covers UK research in computing, which is internationally strong and vigorous, and a major national asset. This response has been prepared after a widespread consultation amongst the membership of UKCRC.

The UKCRC view presented in this response relates to computing research, and to a lesser extent to electrical and electronics engineering and telecommunications. Since most of computing in the UK is embedded in other industries, the UK has much more of a *push model of new computing ideas from academia* that enable and stimulate *new methods and applications in a wide variety of industries*.

1. What are the key strengths and weaknesses of the UK's innovation system in relation to business-university collaboration?

The UK's innovation system in relation to business-industry collaboration benefits from a healthy variety and multiplicity of modes of collaboration, ranging from university-based consultancies, industry funding of individual PhD studentships, joint EPSRC and other council grants, RAE and RS Fellowships and chairs and direct industry funding of University research, to Catapult Centres and Technology Strategy Board projects. In the recent past, the UK model also benefited from joint industry and MoD funded Technology Centres which have brought more UK universities to appreciate the needs and opportunities offered by the Defence sector. The current creation of several University Cybersecurity Centres is leading to more collaboration (and hopefully innovation) amongst government, academia and business/industry.

The key role of research in academic institutions, especially in computing due to the "push" model mentioned earlier, is on the one hand to train and educate PhD students who will then spearhead innovation in business and industry, and on the other to use the normal international academic network and peer review system to develop and acquire the understanding of the most advanced science and technology that will sustain further generations of PhD students and of technology transfer.

Thus we have doubts about the wisdom of not providing funding for PhD students through standard research grants from the Councils, and concentrating PhD support through a relatively small number of Doctoral Training Centres. We also note that business and Council co-funding should be available to support PhDs.

In computing and related areas, major innovations have often been initiated in universities and advanced research laboratories worldwide. Such innovations are first adopted by UK universities through the usual process of national and international academic contacts and dissemination, critical debate and adoption of best practices, and then "pushed" towards UK business and industry.

These specific characteristics of the field of computing may call for new models of tripartite partnerships between research intensive universities, together with institutions that specialise in training and technology transfer, business and industry. Thus we believe that the landscape in computing is different to some other sectors, so that there may be a benefit to develop new models of collaboration that respond directly to the needs and nature of this sector.

Compared to universities in the United States and some countries in Continental Europe, business-university collaboration in the UK appears to suffer some handicaps and weaknesses.

For instance, protracted legal negotiations regarding intellectual property (IP) prior to the launch of a project can inhibit and even dissuade both the academics and the business partners from engaging with each other. Such discussions are particularly damaging to smaller seed projects, of which there should be a large number, since smaller projects are a way to test ideas and allow partners to know each other and learn to collaborate. Furthermore high overhead rates practiced by some universities for industry funded projects, that sometimes reach 100% or more, can also be dissuasive.

Also, academics themselves should be encouraged (rather than inhibited) to create spin-outs that can share in the IP that the same academics generate as part of their academic work, and spin-outs need not be partially owned by the university where the academic works for most of her/his time.

Industry internships for PhD students are difficult to put in place, due both to IP issues, and because of the excessively strict limitations on the duration of a PhD. A 4 or 5-year PhD including one to two years spent in industry (plus a half-year writing stage) rather than the current 3.5 years, would be a welcome addition to doctoral training programmes that enhance university-business collaboration.

2. How competitive is business-university collaboration in the UK against relevant international comparators?

The density and volume of business-industry collaboration at a "top-100" American university, or at many German universities, is hard to equal in the UK and in most parts of Europe.

In the USA, a publically funded state university is a pivotal component of the state's business development programmes. Many American state universities receive additional direct funding from the State (i.e. regional) Authorities in order to match (often one-on-one) each industry contract for a specific research to be accomplished. Once the university team and the business partner has reached an agreement on the project among themselves with a given level of funding, in effect 50% of the funding is directly provided by the so-called "matching fund", while IP agreements typically follow a standard template based on "first right of refusal" so that patents are jointly filed and the university is free to pursue other partners with the outcome of the research, should the funding business partner not be willing to pursue licensing rights.

Another very great strength of the American system is the wide use of the SBIR model for federally funded research in small businesses, which in effect encourages academics to start spin-outs which in turn again can collaborate with the university in mutually beneficial way via joint government research funding schemes, and also offer jobs and internships to doctoral graduates and academics. The TSB SBRI competitions and the Centre for Defence Enterprise provide some support of this sort, but the scale is small in comparison.

3. What are the strengths and weaknesses of the Catapult Centre model of business-university collaboration? What areas of research should future Catapult Centres focus on?

It is perhaps too early to evaluate the effectiveness of the Catapult Centre Model. However one important issue that needs to be addressed via some common guidelines for such centres relates to intellectual property.

A successful model, similar to the Catapult Centres, that could be considered for the UK could be the NSF (National Science Foundation) industry-university research centres which are in effect self-governing multi-company and multi-university technical consortia centred around a specific (e.g. electronics manufacturing, telecommunications, the automotive industry, robotics, etc.) where NSF provides anywhere from 20 to 30% of the cost, the universities offer premises and their staff and PhD programmes, and industry provides the balance of the financial support through open "core" projects involving several partners, and more focused one-on-one projects between a given academic and an industry partner. Projects are proposed annually and also reviewed and possibly renewed on an annual basis, while the centre itself is typically runs for five or more years. Many

of these centres have been running for decades, and their success and long-term effect has benefited from a "bottom-up" rather than "top-down" approach: the ongoing dialogue between groups of academics and industry partners first leads to the proposal for the creation of such a centre, and the collaboration and dialogue allows it to adjust and change its focus over time.

Industry-University research centres are also funded by some States, rather than by the NSF, such as the long-running and very successful Brooklyn Poly-NYU Telecommunications (CATT) and Wireless Centres in New York City.

Another issue is that of centralisation of Catapult Centres; at least in computing and communications disciplines, it would make more sense to distribute the present and any future 'Centres', given the existence and importance of expertise across the UK (not just in London), even if this means adopting a hub and spokes model.

4. What steps can be taken to improve the uptake of Knowledge Transfer Partnerships (KTPs), particularly among SMEs?

Business and industry appear often to lack adequate staffing to contribute the time and effort needed for technology transfer in a KTP. While the funding model of KTPs allows staff from the academic partner to engage in the KTP, business (and in particular SMEs) can only assign staff to projects that have a short term commercial outcome. Furthermore KTPs are not overly attractive for academic staff who must fit the visit to the partner within their existing duties without significant funding beyond their own time and expenses and no clear benefit with regard to an academic career. Thus some form of funding, similar perhaps to the SBIR (small business research) activities and funding scheme used in the USA may be a better model than KTPs for stimulating the uptake of academic research by SMEs.

5. Recent BIS analysis found that the UK exhibits "a sustained, long-term pattern of under-investment in public and private research and development and publicly funded innovation". How does this affect business-university collaboration in the UK?

In the UK, similarly to the USA and more than in Continental Europe generally, research oriented academic staff are evaluated on their ability to attract funded research. Such funding emanates primarily from the research councils and from the European Union, and very seldom from UK industry. Universities typically do not have the resources to sustain a research enterprise without external sources of funding and do not benefit from mechanisms such as CNRS and INRIA in France, or the Max Planck Institute or Fraunhofer in Germany, to sustain their research. As a result, academic staff have few incentives to pursue business-industry-academic collaborations and the best academics

pursue the type of research that can attract EU or Council grants. This obviously does not help business-university collaboration.

Outright industry grants to launch and support an area of research, or gifts of equipment from business and industry to universities in the UK, are also unfortunately rare. A fiscal environment that encourages business to make gifts to universities would, in the long run benefit, all parties concerned: universities would become more prone to devoting part of their staff's time to addressing the needs of industry, students would become more aware of the business or industry partner's needs and about the quality of their products, industry would remain more engaged and better informed about advances that they can take advantage of in various universities, and gain direct access to potential employees without having to rely on expensive recruitment schemes.

6. Will the changes to Higher Education Innovation Funding (HEIF), proposed in the Witty Review, be successful in increasing university engagement with innovative SMEs?

Government funding for collaboration with business and industry does not handle applied research particularly well, since on the one hand there is no guarantee that a team or institution that receives funding for applied research technology transfer will also receive some funding for basic research. Furthermore, the current funding for applied work does not allow the academics to feed some of the resources back into basic research to enable the next round of innovation in basic concepts. Thus any changes in funding schemes must ensure that technology transfer by higher education institutions is also accompanied by resources that will allow that institution to develop basic research and also attract staff that can bring further advanced concepts and methods to the academic institution.

7. What has been the effect of including commercial 'impact' criteria in REF assessments, and should the weighting increase to 25% as suggested in the Witty Review?

It is too early to say anything definitive at this stage. However we note that REF in general does not address long term transformative research very well, and it is not clear that expanding REF's shorter term outlook can be viewed as an overall improvement.

8. Will the Government's focus on the 'eight great technologies', as described in the industrial strategy, help to attract inward investment?

Inward investors are attracted by skills, capabilities and resources that they cannot find elsewhere or that are more convenient to access in the UK. Inward investors also need assurance that they are investing in something that has a future. The Government's focus on eight technologies will help to increase and sustain the scale of research in these areas so long as there is a commitment to maintain the focus for several years. In the past, it has too often happened that a new Minister or a new administration has decided that a field has had its day in the limelight and that investment should be switched to some newly fashionable area. Reallocation of resources needs to be strategic and based on clearly stated criteria.