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Clerk of the Business, Innovation and Skills Committee  
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23 April, 2014

Dear Sir

### **House of Commons Business, Innovation and Skills Committee's inquiry into Business-University collaboration**

The Engineering Professors' Council (<http://epc.ac.uk>) is the representative body for academic engineers in the UK, with 79 university members comprising nearly 6,000 academic staff. Income\* from research grants and contracts (RGC) represents nearly one third of the total income generated by engineering departments in UK universities and 23% of this derives from industry (compared with just under 10% of RGC income on average for all other subjects). Indeed, 31% of all RGC income from industry, commerce and public corporations in UK universities is generated by engineering departments (and 56% of the increase over the 5 year period 2007-2012 can be attributed to engineering). There is an inextricable link between engineering education and industrial application. Engineering programmes in universities would operate in a vacuum without strong research/industrial relationships and act as a very effective link mechanism between universities and businesses. This is true for all types of university. It should also be noted that 27% of the RGC income from industry attracted by engineering departments is from non UK-based businesses and this proportion has been increasing over the last 5 years.

We therefore welcomed, and are supportive, of the development of an Industrial Strategy and are grateful for the opportunity to contribute to this important inquiry. We have consulted our membership in offering the following perspective.

In summary, we believe that there are many examples of good business-university collaboration in the UK but there is some way to go. Greater joined-up thinking between the Research Councils, Technology Strategy Board and regional initiatives such as LEPs, activities which promote and incentivise greater understanding between all types of university and business and a strategy for research and development (R&D) funding which incentivises collaboration and has cross-party support to allow longer term planning are required.

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

1.1 There is a significant amount of innovative business-university collaboration in the UK but this tends to be led and dominated by large businesses or small clusters of large businesses (for example, in the engineering sector, Boeing and Rolls-Royce, Jaguar Land Rover). At the other end of the scale, there are a number of spin-out companies which develop from within universities but this is highly dependent on the policies and capabilities of individual universities, and the different levels of investment needed to take these innovations to market, depending on their nature.

\*Source: Higher Education Database for Institutions: HESA Finance Record for 2011/12

- 1.2 UK universities find engaging with technology-led small and medium-sized enterprises (SMEs) particularly challenging and vice versa. It is recognised that this is in some way owed to their diversity and number and many different points of contact are needed. Equally, academic staff are under pressure within their institutions to deliver large grants and papers for the Research Excellence Framework (REF) and deliver demanding teaching loads above all else. These pressures tend to leave SMEs at a disadvantage when attempting to engage in innovative collaboration with UK universities which thus excludes a large proportion of UK Plc (and specifically the area from where growth tends to be driven). Further, mid-size companies tend to fall in the gap of being neither a major internationally known global brand with the resources to engage with universities and fund innovative programmes nor a start-up/small company (which tend to receive significant mention and support through funding schemes). Mid-size companies typically have huge potential: more resilience and experience than some SMEs and yet the flexibility to move at a pace of technology change. They are often cited as what makes Germany successful.
- 1.3 In addition, historically, Research Councils UK (RCUK) funding has tended to drive competitive behaviour amongst universities rather than encouraging collaboration and the establishment of regional centres of excellence. This is still true of some funding initiatives although we note more recent initiatives that may help, for example, the Catapults and innovation funding via the Technology Strategy Board (TSB) routes can work well for technologies already close to market development. However, we should not forget that underpinning fundamental research (traditionally funded by RCUK) is needed to prime the closer to market activities and while there is some “joined up thinking” between RCUK and TSB this could be further strengthened and improved. Business, when looking to invest in UK Plc, will usually seek sustainable (long term) regional availability of resources (people, skills and innovative research) and the funding system needs to evolve to support this.
- 1.4 A specific example of where current systems do not work is in CASE studentships where SMEs are sometimes forced to collaborate with universities that may neither be local to them nor necessarily the best in their field. Engineering Doctorate (EngD) schemes and Knowledge Transfer Partnerships work well but need to be more widely publicised in businesses, together with provision of advice on how businesses and universities can work together most effectively.
- 1.5 In summary, the UK has some relative strengths and the ultimate goals - that is, the health, strength and reputation of UK Plc of UK universities and business - are aligned. That said, the way in which success is measured for these two types of organisation and the fundamentally different cultural incentives and timescales to which they work (curiosity-driven, long term projects versus shorter term more immediately tangible deliverables) create tensions that make the ultimate goals challenging to achieve.

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

- 2.1 The developing economies in the east, such as Korea, are making academic input to “high tech” business development almost mandatory and the UK seems to be some way from its US counterparts, where, in many sectors, industrial research is competitive with university research, both in its level of innovation and in its culture (for example, US industry research engages with the academic culture of publishing and expecting staff to have PhDs: this does happen in some sectors but is not prevalent in the UK).
- 2.2 There are a number of European universities that have been willing to specialise in technology-led disciplines, in collaboration with industrial partners. This concentration on specific technological disciplines has led to some benefits and a perceived competitive advantage compared with UK universities. There are a few examples in the UK of technology-focussed models, but still within multi-disciplinary institutions. The University of Strathclyde is successfully pioneering the technology-led model

in the UK and the Fraunhofer CAP will build on this. Other universities are delivering other models, with research institutes at their centre, in strong collaboration with industry. Examples include the major investment by BP involving, in the UK, the Universities of Manchester, Cambridge and Imperial College, the National Graphene Centre and the multi-institutional Rolls Royce initiatives. These are operating largely without direct government intervention.

- 2.3 These are large long-established universities and global companies however. Smaller businesses and research teams with developing strength or potential seem to be at a disadvantage. While the multi-disciplinary nature of UK universities should (and has) enabled cross-cutting research programmes to develop (involving technology as well as social sciences, in recognition of the need to research the behavioural and other impacts of technological development), the increasing concentration of funding and the metrics of research assessment work against accommodating this type of programme.

**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?**

- 3.1 The Catapult Centre model has concentrated on a number of key areas for UK growth which are intended to focus the university and research community on innovating in a more collaborative manner. It has also secured short to medium term funding for a number of key projects and assets. There are however a number of issues with the model.
- 3.2 Some of the current Catapults have resulted in a ‘forced marriage’ of a number of different partners and the economic liability for assets that may otherwise not necessarily be fit for purpose. There is also an unrealistic time frame of expected success: other overseas institutions have evolved over a number of decades and grown within an existing or developing industrial cluster. They are also not expected to secure their own financial stability. By their own definition, the Catapult Centres are expected to deliver innovation within the technology readiness level range of 4 to 8 (pre-market readiness) - this should not be compromised, in the early stages of the work, by the diversion of time and energy needed to secure project funds in order to survive. If additional funding is achieved beyond the budget allocation, that can be used for the natural development of the centres. This model has been successfully implemented at IMEC in Belgium for example.
- 3.3 There has been some concern amongst businesses regarding Catapult Centres and their perceived initial focus on populating expensive buildings with many (100+) employees. Such infrastructure needs to evolve naturally over a number of years via industrial demand. It may be worth reflecting on, and learning the lessons of, the development and history of similar initiatives such as the Building Research Establishment and the Transport Research Laboratory.
- 3.4 There is still some confusion over accessibility and methods of engagement with Catapults, particularly amongst the SME community. This has been evident with the Offshore Renewable Energy (ORE) Catapult which was announced over two years ago but which has, as yet, shown very little SME engagement beyond its immediate geographic location. It is worth noting here that SMEs do not have large resources to engage with time-consuming and complex processes. It has to be clear what advantage the SME will gain by engagement with a Catapult, else the likelihood of successful engagement is greatly reduced.

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

- 4.1 KTPs can be, and in many cases are, a valuable and useful way of embedding knowledge within SMEs but there is significant effort needed by the SME to initiate a KTP. The application process is particularly

arduous and, if the recruitment process is included, it is not an exaggeration to expect the SME to commit itself to upwards of 10 meetings before the KTP Associate is employed. Even without the time taken to write both the expression of interest (EOI) and the full application, an SME could be expected to commit up to 50 hours to the process. Few SMEs can afford this time and improvements to the application process should be sought which reduce this burden without reducing the flexibility of the scheme or range of organisations that can engage. Further, there are some shortage skill areas where it is difficult to find a KTP Associate with the relevant skills, creating a rather circular challenge. Introducing flexibility to the scheme which tailors it to a particular need or industry and adding specialist training alongside the main project for the KTP Associate might help solve the problem. (For example, a version of KTP was developed about 10 years ago for venture capital firms which provided access to specialist training/mentorship for the Associate alongside the business project). Tax incentives for SMEs to engage in such schemes (as they are for apprenticeships) could also be considered.

**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?***

5.1 The systematic and long term under-investment in public and private research and development affects UK innovation as there are fewer opportunities to develop knowledge, skills and hence innovation-led competitive advantage over other economies. The lack of funding (or at the very least, certainty or high probability of future funding) leads to a fear of failure and pressure to deliver short term results. This is at the expense of long-term results and success. Some technologies and innovations need secure long term funding in order to make a significant break-through. For every long-term success there will undoubtedly be a number of projects that do not deliver what they had hoped but this should not be seen as a failure, rather, a learning process on the road to greater success.

5.2 The development of innovative technologies requires both an innovation-led culture and the fundamental research from which the technology can be developed and there is a huge breadth and depth of scientific expertise in UK research on which to build. This is counter-balanced, however, by the absence of a simple system for businesses to find out what is done and where and how to access it, compounded by a desire for all grants to be competed so that related activities often become scattered across the UK. These issues, and the fragmented and perpetually changing models and methods of funding that militate against long term planning and a collaborative approach between universities and business are all equally important issues to address in addition to the quantum of funding.

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

6.1 HEIF goes some way to aiding engagement with SMEs already. The proposals in the Review are not detailed enough to assess whether they would drive greater working with SMEs, however. HEIF has been a useful driver of collaboration between universities and businesses and allows flexibility for universities to deliver research and innovation in the manner required by companies. It also allows universities to respond rapidly to changes in demand for example, through growth in new sectors such as renewables.

6.2 Specific criteria within funding awards would encourage engagement. Even better would be specific funding calls aimed at innovation for the commercial and competitive success of SMEs. Research reputation and the ability to attract grant income are still the primary drivers of promotion and recruitment in universities and obtaining grant income trumps papers between Research Excellence Framework (REF) cycles so using this is the best way to encourage academics to work with SMEs in a more productive manner and would also provide resources to do so.

6.3 Providing support to universities to re-think the way they price industrial research projects would also be helpful. Currently many simply price in the same way they have been encouraged to cost Research Council grants (for example, including overheads). “Price” and “cost” are different and some universities are pricing themselves out of the working with business by being encouraged to think in this way. There are many benefits to universities and businesses that arise from these collaborations that have real, but difficult to quantify in financial terms, benefits, such as student employment opportunities, skills development, access to equipment, case studies for teaching etc.

**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?**

7.1 Universities need to ensure they are not operating in isolation and methods of measuring, rewarding and incentivising impact are therefore needed.

7.2 Including impact measures in the REF is one way to provide such an incentive but the narrow time boundaries of the census periods and the range of other needs that REF seeks to satisfy may mean that REF is perhaps not the most appropriate vehicle through which to drive these incentives.

7.3 Further, the constraints on what is eligible for inclusion in the REF as “impact” impede a more open and realistic approach to the exploitation of university research. In essence, the REF impact criteria (and the assumptions in the Witty Review) pre-suppose a simplistic linear model for research to development to production to sales. This rarely happens, particularly in complex and integrated engineering activities. To gain genuine impact, a wide range of technologies contribute, along with the market, societal, economic and other drivers extant at the time, and these do not come from one specific research project. An increase to 25% and a future long term commitment to developing appropriate and robust measures which both businesses and universities understand and support *may* help to instil this further but a thorough review of the measurement criteria and the appropriate-ness of REF as a vehicle through which to measure impact is recommended once the results of the REF2014 are known. In the meantime, greater use of the impact case studies and statements submitted could be made in order to increase the visibility of such work with businesses. This is being done by some universities, but it is by no means universal.

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

8.1 This is unlikely, as long term strategies need flexibility and concentrating on these technologies feels a little too rigid, seeming to devalue work and innovative activity in other areas. An industrial or market-led strategy with Government support and secure long term (20 years plus) funding is more likely to attract inward investment.

**9. To what extent is this focus compatible with and complementary to the European Strategy for Key Enabling Technologies?**

9.1 There seems to be good complementarity but the UK needs to take care that it is sufficiently flexible in its interpretation to maximise opportunity and ensure compatibility.

**10. Are Local Enterprise Partnerships (LEPs) (and their counterparts in the rest of the UK) investing as much as they could in innovation and R&D?**

10.1 LEPs do not have the financial resource or knowledge to deliver or support innovation and R&D. In order to genuinely succeed and deliver world class, cutting edge innovation, much greater flexibility to distribute resources to best effect nationally is required than is currently possible within the LEPs.

Furthermore, the geographical regional boundaries may be inappropriate for where businesses and universities are actually located and interacting, creating “forced marriages” which are neither sustainable in the long term, nor do they assist with dissemination, beyond regional boundaries, of best practice.

**11. How can LEPs, universities and Government encourage greater regional R&D investment?**

11.1 By pooling resource, both formally and informally through high quality networking events and initiatives, in order to dedicate enough to the identification and development of genuine areas of unique opportunity. 5 small UK LEPs all individually developing an R&D program in manufacturing is not only a waste of time, money and resource but makes the UK economy look disjointed.

**12. How should LEPs direct their allocation of European Structural and Investment Funds (ESF) in order to maximise increases in R&D output?**

12.1 By employing world-class professionals to identify genuine areas of potential specialism. If they do not have the potential to develop a unique, world class R&D programme, they should give their ESF allocation to a neighbouring LEP who do (and then reap the benefits from the third sector).

12.2 Essentially, visible and transparent joint planning between industry and education providers, facilitated by the LEPs, ensuring that lessons and case studies of other countries that have succeeded are taken on board, is required.

**13. To what extent will the new University Enterprise Zones encourage business university collaboration?**

13.1 They will surely help in the cities that have them but currently, only 8 city LEPs are allowed to bid for them. Further, care should be exercised to ensure that these become part of the long term regional and national infrastructure if the experiences of 1980s-style Regional Development Agencies are not to be repeated with jobs and businesses migrating every few years to where the (short term) incentives are available. Again, joint planning, long term reputation-building and minimising bureaucracy and administrative overhead will be essential for success.

Yours sincerely



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