

**University of Oxford Submission to the Independent Review by Sir Andrew Witty of
Universities in their Local Communities: Enabling Economic Growth**

TO: universitiesandgrowth@bis.gsi.gov.uk

FROM: The University of Oxford

Professor Ian A Walmsley, Hooke Professor of Experimental Physics and Pro-Vice-Chancellor
(Research, Academic Services and University Collections)

ian.walmsley@admin.ox.ac.uk

SUMMARY

1. We welcome the commissioning of the review, and believe that it is asking appropriate questions given the strength of our universities as national assets, and our national economic circumstances.
2. The UK's universities are, as Sir Tim Wilson observed, 'the anchors of the economy.'
3. The University of Oxford, as a global university, contributes significantly not only to the region as a focus for economic growth but also to growth through national R&D efforts and innovation, educating highly skilled, creative, enterprising people, attracting inward investment and taking part in international projects and networks.
4. Universities represent the Sovereign Knowledge Capability of the UK. We must continue to ensure that this is maintained at the current internationally leading level, including through very strong government support for curiosity-driven research so vital to creating new understanding, new technologies, improved policies and services, and new industries.
5. Especially in light of comparatively low Business Expenditure on R&D (BERD) in the UK, government must continue to encourage business investment in research and industry-university collaboration.
6. Finance for start-ups, spin-outs and scale-ups is vital; in particular, government should re-establish a funding channel to universities specifically for proof-of-concept/seed funds.
7. The Higher Education Innovation Fund (HEIF) is very important in helping universities translate research ideas, knowledge and technology strengths into economic, social, cultural and health impacts – HEIF must be maintained and targeted to support research-intensive universities where it can have most effect.
8. LEPs must work together and closely with universities to maximise the growth potential for their area and the UK as a whole. Universities must be represented on the boards of LEPs. Boards need funding and skilled advice (e.g. from UKTI) to help stimulate and support connectivity across sectors, establish or scale-up industry clusters, and attract new players. LEPs must be financed and expected to operate on a scale competitive with regional initiatives in, for example, Germany and Scandinavia.
9. The UK needs to use EU structural funding much more effectively and in particular to target sustainable growth in the knowledge economy through business-university collaboration.
10. Government must ensure that the UK's visa and immigration policies attract and retain talented people.

GENERAL OBSERVATIONS

We feel the two hypotheses outlined by Sir Andrew in his letter are critical;

“First, that the strongest basis for regional economic growth is activity based on a sound understanding of a locality’s comparative Economic Advantage.”

We agree that this is a strong hypothesis. As Sir Tim Wilson said, “universities are the anchors of the economy”. It is not the case that the immediate locality is the only focus for economic growth for a global University like Oxford, but we do agree that our regional efforts should be addressed to local strengths and clusters. In the case of Oxford, we are at the heart of clusters of high tech industries in several sectors, and part of a cluster of R&D strength including the facilities at Culham and the Science Campus at Harwell which are unrivalled in Europe. Because of this, we are working closely with the LEP, the City Council and the County and District Councils to articulate a coherent approach to economic growth in Oxfordshire. There is a great deal of convergence; “Innovation” is the headline for the Oxford City Economic Growth Strategy (which has been approved) and the City Deal Negotiation document (currently being written), and the University has jointly commissioned an independent study of the high tech economy in the region which we hope will underpin our strategy for contributing to economic growth over the next few years.

“Second, that much of the UK’s comparative economic advantage in the twenty first century could be derived from our universities, and in particular from world class research in fields relevant to the Industrial Strategy sectors and technologies.”

We agree that the strength of our universities is a powerful national asset that can be leveraged for economic advantage. We also agree that a focused strategy is valuable in the short term in allowing us to grasp those opportunities that we can see. In addition to this we would, however, continue to advocate funding excellent research across all disciplines, scientific and otherwise, to ensure we can take advantage of those opportunities to gain from disruptive knowledge and technologies that we cannot yet see. Universities represent the Sovereign Knowledge Capability of the UK. We must continue to ensure that this is maintained at the current internationally leading level, including in areas that are not currently fashionable; we are convinced that only this will create in the UK the seeds of industries that have not yet been born.

UK universities are very committed to enhancing the access which businesses, individuals and policy makers have to the research base. The Wilson Review commented that ‘Universities are an integral part of the skills and innovation supply chain to business.’¹ Recent findings from the Higher Education Business Community Interaction (HE-BCI) Survey show a continuing increase in the overall exchange of knowledge between UK HEIs and the public, private and third sectors. The growth rate in cash terms for the UK is around 7 per cent, from £3.1 billion in 2009-10 to £3.3 billion in 2010-11.² A report last year by the World Economic Forum ranked the UK among the best countries in the world for business-university collaboration and significantly ahead of other G8 nations.³

¹ See https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32383/12-610-wilson-review-business-university-collaboration.pdf

² <http://www.hefce.ac.uk/whatwedo/kes/measureke/hebci/>

³ http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2012-13.pdf

Specific Questions

In what ways are universities contributing to the sectors and technologies in the Government's Industrial Strategy?

We contribute to these areas in a number of ways.

- By developing strategic relationships with large companies so collaborative research efforts can inform their strategies and technology development, (e.g. Laing O'Rourke in Construction; BP in Oil and Gas; Merck, Novo Nordisk and UCB in medicine).
- By protecting IP and creating spin-out companies to develop disruptive technologies that will keep the UK at the leading edge in a sector (e.g. Yasa Motors in Automotive, Oxford Nanopore in Biotechnology).
- By exerting influence and authority ('diplomacy' through research/science). The UK needs to be clear about the position it wishes to occupy in future global economy. Excellence in research and the effective exploitation of research-generated ideas within emerging sectors will be necessary to guarantee the UK an authoritative position with other nations and to make the UK a strategic partner of choice for emerging nations and fast growing corporates from all corners of the world. Cooperation through the alignment of research capabilities, exchanging information and programme collaboration are a natural way for the UK to build trust and partnerships and to leverage the investments and efforts of other nations. Hence, in addition to the obvious benefits of knowledge generation, world class science/research can be used as a tool for influence and diplomacy. By contrast, to under invest in research and S&T is for the UK to be relegated to the role of an also-ran in research, and, by implication, in thought leadership.
- By creating institutes or units in partnership with individual companies which meet their needs and the needs of others in their supply chain (e.g. Oxford Man Institute for Quantitative Finance, Rolls Royce University Technology Centres).
- By working with companies in industrial Doctoral Training Centres to ensure tomorrow's best scientists are conducting research inspired by real industry challenges and developing the interdisciplinary skills that will be needed by tomorrow's businesses (eg DTC in Systems Approaches to Biomedical Science)
- By conducting research that addresses common industry problems, moving sector knowledge forward and establishing the UK as an attractor for industries (eg Structural Genomics Consortium, Oxford Martin School Programme in Nuclear Energy and Materials).
- By innovative research-led programmes tackling problems in the economy (eg the Stranded Assets Programme led by the Smith School of Enterprise and the Environment).⁴

⁴ Seven businesses and charities joined in the first six months to examine stranded assets, that is, where an investment's value drops and/or is not readily transferrable, compromising investment value.

- By establishing relationships between companies and research at the leading edge of technology (e.g. autonomous vehicles developed by the Mobile Robotics Group⁵). This ensures that technology remains embedded in the UK (by supporting and engaging with UK companies large (BAE Systems) and smaller (Guidance Ltd)), whilst drawing international companies closer to Oxford (Nissan), who fund research and can be drawn into the UK ecosystem through the University relationship.
- By working with regional partners to ensure that businesses that come to Oxford to connect to one part of the ecosystem have the opportunity to benefit from meeting other people who have something to bring (e.g. a recent industry event, organised by the University and “Invest in Oxfordshire”, in the field of earth observation, saw 25 company representatives and University researchers meet to discuss potential collaboration, with some companies moving or considering a move to the Oxford Harwell Innovation Centre)
- By using our Internship Office to provide a supply of talent to local companies. Interns work on short term projects, of course, but the programme also improves recruitment prospects. This provides a better route for our own graduates into the local economy. Universities outside the area are also beginning to use our service, we understand, channelling talent into our local clusters.
- By supporting entrepreneurs from the student body (e.g. Building a business course, SHED business support in the Careers Cervice⁶, social enterprise grants, software incubator, business plan competitions)
- By student research projects with industry (e.g. as part of the MSc in Mathematical Modelling and Scientific Computing⁷, the MSc in Statistics)
- By making facilities available to businesses, and investing in internal mechanisms to make consulting and services more accessible to those that need it (e.g. Oxford R&D work with Materials Characterisation Service, Clinical Biomanufacturing Facility, Oxford University Consulting Services, the Mathematics Industry Club⁸).
- Through supporting Open Innovation Networks. Increasingly medium to large scale companies are growing their open innovation networks: regionally and nationally and internationally. They seek networking and opportunities and collaborations that can provide them with real options. The R&D role of universities is to carry out activities that companies cannot easily justify to their own shareholders or staff-up because it is basic knowledge generation (and thus open ended), it is long term, it requires a range of expertise across different subject silos, and it requires access to equipment and research platforms. Universities are very well placed to carry out radical and multi-disciplinary research that many companies would find difficult to do. The Structural Genomics Consortium ⁹ based at Oxford is a shining example of an international open innovation

⁵ http://www.ox.ac.uk/research/research_impact/oxford_impacts/creating_cars.html

⁶ <http://www.careers.ox.ac.uk/work-experience-and-employability/employability-programmes/the-shed/>

⁷ E.g. projects with [Radius](#) on the design of flat-panel X-ray technology for use in remote areas and with [Arkex](#) on optimising aerial flight paths to save fuel and reduce CO2 emissions.

⁸ http://www.ox.ac.uk/research/research_impact/oxford_impacts/mathematical.html

⁹ <http://www.thesgc.org/scientists/groups/oxford>

programme. On a smaller scale, the Systems Approach to Biomedical Science Industrial Doctoral Training Centre¹⁰ offers another innovative model for open innovation collaboration between businesses, using a university as a nexus and host.

- By supplying innovative, trained researchers and scientists (undergraduate and post graduate). This is a bottle-neck for many industries: on the other hand availability of such people and any early career enabling (CPD courses and access to thought leadership and collaborative research) could be very attractive to companies. The current and future Centres for Doctoral Training are flagships but the true problems often go far beyond that scale. For example, the proper recognition of the urgent requirement for “data scientists”, beyond the standard business analytics (“dice and slice” and dashboards, BI and MRIs) is an imperative - with that term describing people who take a data-driven perspective in harnessing big data, creating new methods and algorithms, and producing actionable insights. There is a projected world shortfall of 190,000 data scientists by 2015.
- By Working with local companies to use academic knowledge to enhance their products (e.g. using climate models to enhance computer games¹¹
- By working with the national facilities in the region at Harwell to produce new products and materials (for example our new hydrogel to help cleft palates to heal¹², or work on turbine blades for Rolls Royce¹³).

Are there ways in which they could contribute more?

We believe there are several ways:

- Working with other regional bodies and networks to increase cross-referral of businesses and maximise access to people with relevant knowledge in different disciplines. This is a key plank of the Oxford City Deal programme.
- Improving the physical infrastructure for new and growing high tech businesses in Oxfordshire. The University, and Oxfordshire as a whole, need more capacity in the right place for start-ups and grow-ons. The University is seeking to build new incubator/escalator premises close to University departments on our Old Road Campus (the “BioEscalator”) and on Begbroke Science Park, adjacent to the academic departments there. The capital funding environment is, however, challenging. In March, 2011 the second CIF round of Capital funding was announced by HEFCE. Oxford saw a significant fall in capital funding, even though it received the highest allocation in the sector. Over the four years of the settlement, the loss of funding before inflation was 68%. This makes it very difficult to invest in such projects. The University has benefitted since 2011 from research capital funding rounds that have been awarded competitively: it was awarded £45m in Round 1 and £10m in Round 2.

¹⁰ <http://www.sabsidc.ox.ac.uk/>

¹¹ http://www.ox.ac.uk/research/research_impact/oxford_impacts/fateoftheworld.html

¹² http://www.ox.ac.uk/research/research_impact/oxford_impacts/hydrogel.html

¹³ http://www.ox.ac.uk/research/research_impact/oxford_impacts/pioneering_research.html

- LEPS should be aligned with the exploitation of the centres of expertise within Universities. These will be around big themes for growth such as the eight great technologies. For example, consider BIG DATA AND ANALYTICS. A £30 million¹⁴ “big data” health research centre at the University of Oxford has been announced (3 May 2013) benefiting from the government’s UK RPI Fund). The Big Data Institute at the Li Ka Shing Centre for Health Information and Discovery, launched by Prime Minister David Cameron on 3 May, will focus on the analysis of large anonymised medical data sets. The Institute will add to the already vibrant bio sciences cluster in Oxfordshire.
- LEPs could be able to channel funds to contribute to the costs of local companies having PhD collaborations within local CDTs (with a bias towards first time entrants). Summer internships are also an effective way to build relationships universities and to recruit graduates. We are already seeking to include links to the University Careers Service internship and student consultancy programmes within regional efforts, and would like to extend them directly to the catapult in the Region, the Satellite Applications Catapult.

What more could be done to maximise the associated benefits to local economies?

In addition to the comments in the previous paragraph, there is a particular issue locally around the transport infrastructure between the R&D foci in Oxfordshire. The development of an “Oxford Science Transit” is part of the City Deal proposal and will need to be addressed if the potential benefits of connecting universities and R&D facilities locally are to be realised.

Finance for start-ups, spinouts and scaleups is always required. Universities have proved to be very adept at investing in proof of concept activities deriving from the research, and a reboot of the University Challenge Seed Fund would be most timely. More detailed comments are included in the submission by Isis Innovation (the University’s technology transfer company).

How can we ensure that LEP strategic growth plans take account of the opportunity to derive global comparative advantage from world class research in some universities?

Importantly, both Oxford universities are on the LEP board, and Oxford University is taking the lead in Innovation. LEPs could be obliged to take account of universities in planning their investments where this is focused around innovation. Funding streams to LEPs for innovation, including ERDF funding, should be required to engage local universities in plans to spend that money. Innovation funding from Europe needs to be allocated according to opportunity, not just to need, thus avoiding the unfortunate situation in the past where the Oxfordshire had no funding through the RDA for innovation, despite having potentially one of the most fertile areas for investment.

What connections need to be in place between LEPs, industry and universities to ensure regions can exploit the opportunities offered by comparative global advantage?

Catapults and the TSB have a key role to play in this area, and should be built upon. Of course, catapults are based in one place, and so are not regional actors except in particular areas. Nevertheless, the idea of mechanisms to drive particular sectors in a local technical ecosystem could be rolled out in some fashion. Local industry clusters are already developing mechanisms to “connect the dots”, and perhaps this collaboration should be incentivised in some way, perhaps by supporting specific , local, cluster-based activities. In Oxford, this is the sort of thing that

¹⁴ <http://www.timeshighereducation.co.uk/news/oxford-big-data-centre-to-get-30-million/2003661.article>

Venturefest (to be held this year on June 18th and now in its 15th year)¹⁵ has been very successful at convening. Some expansion of the organisation to support industry clusters on a year round basis would meet this need.

How can universities best work with LEPs and other local actors to drive economic growth, based on their own strengths or the industrial or commercial strengths of the region?

Firstly, universities must be represented on the boards of LEPs. This is the case in Oxfordshire and has enabled an improvement of understanding of the role of local universities by the local business and government communities (and vice versa). Secondly, universities tend to have charitable objectives that focus on research and teaching. Despite the enormous efforts that have gone into the impact agenda within Universities, there is still a barrier to overcome when it comes to investing significant time and effort into the regional agenda. Funding to LEPs that specifically supports collaboration between the business community locally and universities and research institutions, or to build networks of businesses in a sector that include universities, would be a great help.

¹⁵ <http://www.venturefestoxford.com/>

What are the types of connections and collaborations that have most impact for regional economic growth?

Formal and informal networks that link firms and institutions together with providers of finance and professional advice are critical. The Isis Angels Network and the Oxford Innovation Society¹⁶ are concrete examples of the University actively supporting such groups, but we believe the many networks in the Oxford ecosystem must be better connected. This is being achieved by individuals within groups in the region committed to joining things together. Innovation is a contact sport and there is no substitute for investment in schemes that develop those contacts.

How can EU structural and investment funds spur the contribution to economic growth of universities working with businesses?

Innovation funding from Europe needs to be allocated according to opportunity, not just to need, thus avoiding the unfortunate situation in the past where Oxfordshire had no funding through the RDA for innovation, despite having potentially one of the most fertile areas for investment. This requires a redistribution of regional funding in a new way – not to ignore the needs of the poorer regions of the UK, but to acknowledge that hotspots of innovation drive growth that benefits all though increased government revenues. It should be for the government to redistribute the proceeds of economic growth to less developed regions, rather than seek to place innovation investments in areas that are less well equipped to make use of them. European Investment funds should be used to match funding specifically for the riskier areas of technology investing.

How can we ensure that there is collaboration and coordination in LEP strategic growth plans where that is mutually beneficial?

How can central Government best promote effective collaborations while building on local leadership of the local economic growth agenda? What incentives could be added to the current range of programmes?

There are many incentives to innovate and conduct R&D, all of which are good. What are needed are more incentives to collaborate. This is harder to provide, and requires a “something in it for everyone” approach. The City Deal process has been very effective at bringing together all the organisations required to support innovation, helping us recognise that the triggers include not just research and development, but housing, science parks and transport. For this to work long term, the government must recognise that part of the local give is a long term commitment to work together, and make sure that we are all (councils, universities, research facilities, businesses) incentivised to work together more closely until the behaviour becomes ingrained.

How far is it true that the commercial benefits derived from breakthroughs in UK universities often go outside the UK?

The markets for technology are global, and so any truly successful commercial breakthrough will develop a global supply chain and bring benefits beyond the UK. Universities that are surrounded by a strong innovation ecosystem can be ‘sticky’, incentivising companies to remain locally and

¹⁶ See <http://www.isis-innovation.com/about/ian.html> and <http://www.isis-innovation.com/about/ois.html> respectively

attracting mobile, innovative companies to come and join them. Examples include Stanford, MIT, Cambridge and Oxford.¹⁷ Investment in ecosystems around leading universities, and in the inward investment efforts within the regions and within UKTI, will develop an environment where more of the economic benefits accrue to the UK.

It is the case that UK universities are increasingly working with overseas companies, often because these companies have a greater appetite for working with UK universities than some UK companies do. Still, economic benefit accrues to the UK through this because such collaborations draw funding into the UK to strengthen our research base further. These collaborations are also a source of IP and ideas, with collaborating companies bringing additional expertise into the UK. Finally, commercial deals where IP is licensed bring direct benefits in royalties into the UK Higher Education system. Universities should be encouraged to ensure they achieve sensible commercial returns on licensing deals with companies. Globalised corporations are often a mechanism for distributing the benefits of commercialisation outside the UK.

If so, what measures, incentives or support systems would secure more of the commercial benefits for the UK?

See above.

¹⁷ See http://www.rhgraham.org/RHG/Recent_projects_files/Benchamrking%20study%20-%20Phase%201%20summary%20.pdf).