



# **THE INNOVATION EDGE BUSINESS INNOVATION AND UNIVERSITY COLLABORATION IN SCOTLAND**

Growing Value Scotland Task Force

**Second Report**  
by David Docherty  
**March 2016**





Editorial input was provided by the Task Force Co-Chairs and Executive Group, Martin Ince, Elspeth Elliott and Sarah Walker.

# Introduction to the National Centre for Universities and Business

The National Centre for Universities and Business develops, supports and promotes world-class collaboration between universities and business across the UK.

## **We are:**

- ★ **Led by leaders** and guided by our networks of universities and business;
- 🔍 **Informed by research**, providing independent myth-busting analysis;
- 📱 **Digital innovators** and curators of opportunities for universities, business and government;
- 👤 **Change managers**, through our Task Forces which tackle talent and innovation challenges.

A National Centre Task Force brings together leaders from universities, government and business to focus on a particular economic sector or issue. We work together to identify problems, and we examine issues in depth.

In 2012, the Enhancing Value Task Force report 'Growing Value' put UK research in an EU and global context, and explored the synergies between public and private research.

The Growing Value Scotland Task Force, chaired by Rob Woodward (STV Group plc) and Sir Ian Diamond (University of Aberdeen), builds on the success of this UK-wide report. It explores the R&D capabilities of the Scottish economy, the innovation culture of firms and their relationships with universities, and the potential for change and change management.



A handwritten signature in black ink, appearing to read 'David Docherty'.

Dr David Docherty  
Chief Executive



# Foreword on the Growing Value Scotland Task Force

This report is the second in a linked series from The Growing Value Scotland Task Force. It builds on our First Report, published in October 2015, which highlighted Scotland's strong university sector and the need for universities and businesses to work closely together to exploit the research base and translate this inventiveness into business innovation in Scotland. Our Second Report is underpinned by qualitative evidence gathered through thorough consultation with leading figures from across Scotland.

We began by convening a series of four sector-based round table workshops which brought together business leaders and organisations from across Scotland's Creative and Digital; Energy; Financial Services; and Life Sciences sectors. Here the aim was to tease out their varying innovation requirements and challenges in greater detail. We then commissioned a programme of "deep-dive" interviews with eighty-four senior leaders from businesses, universities and policy organisations, to gather first-hand their views on the current status and future potential of university-business collaboration and innovation in Scotland. The interview programme had a particular focus on priority sectors of the Scottish economy (Creative, and Digital; Energy; Financial Services; Food and Drink; Life Sciences; and Tourism).

The findings have provided tremendous additional insight into Scotland's innovation requirements, challenges and opportunities, and provide valuable context for our First Report. This Second Report sets out the breadth and complexity of Scotland's unique innovation culture and practices, and sends a powerful message about the crucial role for universities in driving business innovation and long-term prosperity in Scotland. It highlights the overarching innovation challenges, the need for Scotland's universities and businesses to interact in a more integrated way, and the value of personal connections. And it stresses the often very different needs of each sector in absorbing knowledge from the university research base.

As we move towards the Task Force's Final Report in May 2016, we will be working closely with partner organisations and initiatives to consolidate the findings from our First and Second reports, and we will focus on building a short, coherent set of recommendations for the future shape of our innovation landscape in Scotland.

We would like to thank David Docherty, BiGGAR Economics and our Task Force Steering Group colleagues for their time, support and insight.



A handwritten signature in black ink, appearing to read 'Ian Diamond'.

**Professor Sir Ian Diamond**  
*Co-Chair, Growing Value Scotland*



A handwritten signature in black ink, appearing to read 'Rob Woodward'.

**Mr Rob Woodward**  
*Co-Chair, Growing Value Scotland*

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“ We know that the nation that goes all-in on innovation today will own the global economy tomorrow.”

President Barack Obama,  
2014 State of the Union speech

In his 2014 State of the Union speech, President Barack Obama said: 'We know that the nation that goes all-in on innovation today will own the global economy tomorrow'.

This innovative edge is even more vital for smaller countries, such as Scotland, which rely on new thinking and fresh ideas to gain competitive advantage for their businesses.

High-quality university research and graduates are vital in sharpening a nation's innovation edge, and the Growing Value Scotland Task Force was created to explore the ways in which inventiveness in universities can be translated into jobs and growth in the Scottish economy. Led by senior business executives, University Principals and policy makers, and coordinated by the National Centre for Universities and Business, it will make clear recommendations on how to bring this about. The Steering Board commissioned original research to guide its deliberations. It sought to:

- Place Scotland's public and private sector research and innovation in a UK, EU and global context through a research programme that analyses expenditure on R&D, and broader indicators of innovation spend, both by geographical region and by industrial sector.

- Promote an understanding of the challenge to deeper synergies between public and private sector research and innovation in Scotland, in part through deep dives into six sectors.
- Identify ways of connecting the university and public innovation system to the supply and value chains of major employers in Scotland, and to small and growing companies.

In this Second Report from the Task Force, we summarise the three phases of research which led to our final conclusions and recommendations. In the first phase the researchers reviewed the state of research and development in Scotland. The second part of our work encompassed four business sector workshops: oil and gas in Aberdeen, biopharma in Dundee, financial services in Edinburgh, and creative and digital in Glasgow. Finally, we commissioned deep dive interviews with eighty-four senior executives in companies, universities and policy organisations.

## Capability, Culture and Change – Growing the Value of R&D in Scotland

The first submission to the Task Force was an extensive in-depth investigation of R&D in Scotland, setting it in a UK and global context. This formed the basis for the Task Force's first report, *Capability, Culture and Change – Growing the Value of R&D in Scotland*. It concluded that:

- The proportion of total R&D spending undertaken by Scottish universities is significantly above the UK average, and much of it is linked to Science, Technology, Engineering and Maths (STEM).
- At 1.6% of GDP, Scotland spends significantly less on R&D than leading EU countries, which are mainly in Northern Europe. Its R&D spend is above those seen in Eastern Europe, although some of these nations are increasing their R&D spend rapidly.
- Scotland's R&D to GDP ratio is declining, whereas it is increasing in some English regions.
- Businesses in Scotland contributed only 3.1% of the £24.1bn invested in business R&D in the UK in 2012, compared to over 9% of GVA and population, making Scotland the third worst-performing area of the UK on this measure. A significant reason for this appears to be the type of R&D undertaken within Scottish industry. However, here are significant variations within Scotland and between sectors, and these may point to ways of increasing R&D.
- The level of innovation cooperation between businesses and universities in Scotland is much lower than for the rest of the UK, as is the absorptive capacity of business for research knowledge. This is a major challenge, but also a significant opportunity, for the Scottish economy.

These findings raised some hard questions about how to build a culture of innovation and how to increase the capacity of firms to absorb university inventiveness.

For example, is the only path to growth via attracting the research arms of large companies into Scotland, or is there another route through growing small and mid-size businesses in innovation-rich industries?

The success of Scottish universities in attracting funding from UK and EU sources is a necessary component of success, but are there simpler ways to increase the pull-through into product and service innovation?

In policy terms, the findings make it clear that a higher level of capital intensity in service industries, such as database management, data processing and hardware consultancy, leads to greater innovation. What are the levers to increase this type of innovation and how does the STEM research taking place in Scottish universities become more effectively leveraged? And how can the Scottish higher education system help attract more US firms, which are more likely than their European counterparts to locate their R&D in Scotland?

Finally, graduates are at the heart of any knowledge exchange between universities and business. How do we increase the number staying in Scotland after their degrees, either as entrepreneurs or as enterprising members of staff?

# 3.1%

Scotland's contribution to UK business R&D



## Securing Success and Building Capacity

To answer some of these questions, we convened four business sector workshops with a total of sixty-nine business and sector leaders to guide us on sector themes, issues, solutions and good practice. A number of cross-sector commonalities emerged from these discussions:

- Scotland's business sectors should clarify their R&D needs and communicate them more effectively to universities.
- Graduate talent is vital to innovation. Businesses and universities should work together on curriculum development. Student placements are key to producing industry-ready graduates.
- There are significant information gaps between higher education and business. These can be filled by publicising successes and developing robust sector-based forums.
- Academic researchers should be encouraged to work with their colleagues in business schools to package up industry-ready projects.
- There is an obvious and well-documented pressing need for economic levers to attract inward investment into Scotland's business sectors. Higher education plays a crucial role here.

***The sector communities also cited a number of specific themes facing their industry. The following four pages provide a summary of their views.***

# Creative and Digital Sector - Glasgow

## Where do the emerging R&D opportunities lie for the creative and digital (C&D) sector in Scotland?

- Low carbon technologies, artificial intelligence, gaming, health and wearable technologies
- Adapting traditional technologies to become future businesses: building tech product rather than software

Themes/Issues/Challenges	Suggested Actions/Points for Further Investigation
<b>Innovation and Competition</b>	
Adapting to rapidly changing technologies – industry invests quickly in new products and services.	Encourage two-way relationships. Clarify R&D needs for academia.
<b>Inconsistent Timescales</b>	
Timescales of universities and C&D industry are inconsistent: university model can be slow; focus for industry is on being first to market and gearing to scale.	Co-location may enhance alignment of timescales e.g. build satellite businesses inside universities.
Maximising growth and impact of the C&D community.	Encourage foreign investment: create a uniquely Scottish offering of creative talent, e.g. by taking artificial intelligence R&D to Silicon Valley. Be commercially driven: create spin offs and develop ideas into manufacturing capability.
<b>Talent, Recruitment and Retention</b>	
Demand from the sector is mismatched to the graduates being produced.	Involve industry in course development to produce problem-solving individuals, who understand media. Provide bi-directional placements for students and professionals in industry and academia.
<b>Finance and Risk</b>	
Untested ideas are risky: lack of access to capital for start-ups when scale is too small.	De-risk collaboration: more commercial willingness from universities; industry could set challenges for innovation funding. Need venture capital and private funds in order to attract foreign investment. Improve start-up funding and tax incentives.
<b>R&amp;D Collaboration</b>	
Taking responsibility for driving direction: innovation often internal; collaborations can fade.	Improve NGOs' ability to foster Scottish university and C&D partnerships; improve collaboration between central belt universities.
<b>Culture and Best Practice</b>	
Too little sharing of best practice; examples of successful collaboration are isolated.	Set up a Scottish Digital Network. Medium-term, encourage clustering with professional services (legal, financial etc.) allowing focus on spin-out.
Building a labour force equipped to engage in innovation.	Promote behaviours to build capability and encourage risk-taking.

# Oil and Gas Sector - Aberdeen

## Where do the emerging R&D opportunities lie for the oil and gas sector in Aberdeen?

- Defining Aberdeen as a centre of excellence in subsea production, mature basin asset management; ensuring decommissioning excellence and maximising economic recovery
- Efficient management of mature assets, cost-effective well construction, small-pool development
- Cross-industry expertise in renewables within its highly skilled professional base

Themes/Issues/Challenges	Suggested Actions/Points for Further Investigation
<b>Innovation and Competition</b>	
Enhance levels of R&D in the oil and gas sector in Scotland.	<p>Consider government implementation of a mandatory R&amp;D requirement for oil and gas sector, as in Norway and Brazil.</p> <hr/> <p>Identify factors associated with highly successful regions (e.g. Trondheim, Houston, Qatar).</p>
<b>R&amp;D Collaboration and Technology</b>	
The oil and gas sector needs clarity on new, emerging opportunities that university R&D can offer.	<p>Define and collate Scotland's full range of university research capabilities relevant to the oil and gas sector into central repository.</p> <hr/> <p>Development of an online brokerage platform, learning from other sectors such as aerospace.</p>
Transparency and clarity on the R&D issues facing the oil and gas sector specifically in Scotland.	<p>Requirement for an oil and gas sector forum with a single advisory board to define needs across the whole sector.</p> <hr/> <p>Explore the use of technologies from other industries (e.g. high performance computing, sensors etc.).</p>
Defining new ways of encouraging collaboration limiting duplication and avoiding unnecessary competition.	<p>Develop a well-defined communication channel to define non-competitive need.</p> <hr/> <p>Pooling of equipment between universities and businesses to forge collaboration and avoid duplication of effort.</p>
<b>Finance and Risk</b>	
Funding to address R&D needs in Scotland's oil and gas sector.	<p>Ensure funding levels are on par with other leading sectors. Partner with the Oil &amp; Gas Innovation Centre to leverage Innovate UK and Horizon 2020 funds, and channel into Scottish opportunities.</p>
Risk that key players in the sector will leave the North Sea area, resulting in a loss of focus for R&D spend in Scotland.	<p>Focus R&amp;D through a central body such as Oil and Gas UK or the Oil and Gas Authority.</p> <hr/> <p>Government to incentivise companies to stay in Scotland (tax breaks to release capital for R&amp;D, attractive infrastructure, transport capability).</p>
<b>Talent, Recruitment and Retention</b>	
Attracting the right people to undertake R&D in Scotland. Location of Aberdeen, graduate perceptions and current UK Government's policy on immigration are all recognised barriers.	<p>Encourage student mobility into industry during studies to develop industry readiness.</p> <hr/> <p>Companies need to incentivise graduates to relocate to Aberdeen and North East Scotland.</p> <hr/> <p>Government to convey a strong message that there is a credible future in the North Sea.</p>

# Life Sciences Sector - Dundee

## Where do the emerging R&D opportunities lie for the life sciences sector in Scotland?

- Consolidate Scotland's life sciences communities to compete realistically within the UK (e.g. with South East England), and internationally (e.g. with Boston region)
- Smart health/digital health
- Pharma-services
- Nutraceuticals
- Relationship between universities and the public sector, including the NHS in Scotland

Themes/Issues/Challenges	Suggested Actions/Points for Further Investigation
<b>Innovation and Competition</b>	
Define Scotland's unique selling points in the life sciences sector, and market them nationally and internationally.	Focus the sector and market as a united life sciences brand, Scottish Government could co-ordinate and market this.
Scottish universities with life sciences divisions risk disadvantaging themselves through their highly competitive attitudes towards each other.	Major universities with strengths in life sciences could develop a mutually beneficial culture of diverting and sharing business with the relevant university centre of excellence to create synergistic value for the sector.
Lack of a multinational life sciences industry based in Scotland and undertaking collaborative research with Scottish universities.	The Scottish Government needs to work hard to attract multinationals to invest in Scotland, using economic levers to assist with this. The key to attracting inward investment is to involve senior politicians, as shown with GSK.
Scotland offers substantial support to nurture life sciences SMEs; is this sending the wrong message to multinationals as to what Scotland is looking for?	Need to join up SMEs with larger companies to encourage the latter into Scotland. SMEs can provide Scotland's business face.
<b>R&amp;D Collaboration</b>	
Defining the key attributes for success in generating a productive university-business collaboration in the sector.	Scotland's universities need to create dynamic translational engines in their life sciences divisions, where they can shift rapidly between commercial and fundamental research. Speed, expert recruitment and funding sources are key to supporting translational activity.
	Scottish Government to assist in tackling the complex VAT algorithm on buildings used to co-locate universities and business.
	Input from senior university and business leaders who are prepared to make concessions and take swift action.
<b>Talent, Recruitment and Retention</b>	
Creating and nurturing the best talent for the sector.	Enhance volume of life sciences placements in Scottish industry to support student demand. Develop models to encourage mobility at senior level to recruit commercial experience into universities (e.g. GSK 5-year professorial fellowships in industry).
Encourage entrepreneurship in the sector.	Provision of dedicated mentoring support for life sciences entrepreneurship.

# Financial Services Sector - Edinburgh

## Where do the emerging R&D opportunities lie for the financial services sector in Scotland?

- 'FinTech,' involving software and solution providers; in-house tech operation services; and smart start-ups with disruptive technologies
- Modelling risk and uncertainty
- Understanding the impact of regulation
- Social and customer analytics

Themes/Issues/Challenges	Suggested Actions/Points for Further Investigation
<b>Sustainability</b>	
Long-term sustainability (being viable tomorrow or in 5 years).	Research is needed on software, digitisation and programming to meet long-term trends in processes and technology.
Gaining a competitive advantage.	Consolidate and cluster with defined leadership and drive. Compile an evidence base to establish whether Scotland is a feasible place for FinTech.
<b>Communication and Collaboration</b>	
Enhance communication of the sector's needs in R&D, design, software, research and skills.	Clarify sector's R&D needs to academia e.g. Big Data, software, analytics, FinTech, social and psychological research.
Collaboration landscape is disaggregated.	Promote engagement with business schools to provide coordination and leadership.
<b>Timescale Mismatch</b>	
Timescales of universities and financial sector are inconsistent: businesses prefer short-term research projects due to rapid changes in technology, policy and use.	Sector professional bodies should create structures and mechanisms to enable universities to adapt more quickly.
Universities need significant funding over a long time to conduct usable, high-quality research.	Create an industry research fund to incentivise universities. Businesses and universities to work with government to identify funding.
<b>Regulation</b>	
Speed and quantity of change in regulation.	Encourage universities to conduct research into the impact of regulation on the financial services sector and model the future landscape.
<b>Talent, Recruitment and Retention</b>	
Lack of suitable graduates.	Balance need for hard skills i.e. STEM, coding and higher maths with broader awareness (e.g. role and use of technology, customer relations and practical skills). Student placements are key.
Universities can be reluctant to employ industry professionals or to involve them in teaching.	Cross-fertilise by employing industry professionals in universities to ensure graduates are business-ready.
Perception as an 'unethical' industry: some graduates are not attracted to the sector.	Improve image of the financial services sector with graduates and demonstrate the positive contribution it makes to society.
<b>Culture and Best Practice</b>	
There is a culture of short-term focus in the financial services sector.	Learn from digital tech companies with ability to invest as well as see benefits of long-term viability.

# Leading the Innovation Edge

For the final part of our investigation, we commissioned an independent research team to conduct interviews with business, academic and policy leaders in Scotland's key industrial sectors. Despite obvious sector differences, there was a widespread view that Scotland needs a step-change in innovation to increase productivity, and that this should be a top priority for the Scottish and UK governments. However, this study also rounded out our views on innovation. In particular, they pointed to the slow accretion of new ideas and continuous improvement that is day-to-day innovation rather than fundamental R&D. Scottish businesses felt that they were more innovative by this definition than the quantitative data suggested.

Similarly, the businesses felt that they had the capacity to absorb and use new knowledge, and agreed that more could be done to bring in ideas from outside the firm. This is encouraging for a programme of renewed focus on the brokerage mechanisms by which universities and businesses work together. The consultants concluded that:

- Engagement with universities was strongly welcomed and traditional issues, such as negotiation around intellectual property, were seen as an inconvenience rather than a fundamental challenge.
- Universities could play a more important role in delivering step-change improvement in innovation support. Most of those consulted as part of this exercise believed that universities could do far more to support innovation in Scottish business.

- Personal relationships are at the heart of all successful interactions between businesses and universities. Many consultees believed that the key to enhancing university-business interaction lies in empowering those tasked with delivery. Many consultees also believed that there is a need to achieve greater alignment between the incentives for university staff and those facing business.
- There was a consensus amongst consultees that university knowledge exchange offices should be better resourced, with stronger capacity to engage at a senior level. Many believed that there is a need for knowledge exchange functions within universities to be more focused on economic development rather than on sales and income generation.
- A more holistic approach is required. Those we consulted believe that to achieve a significant increase in the volume of university-business engagement, universities, and policy makers within government and its agencies, will need to take a more holistic approach to innovation support that recognises the full spectrum of university-business interaction. While collaborative R&D is and will remain an important component of this mix, it can only be part of the solution.





## Conclusion

**It is clear from the research programme that Scotland has significant structural challenges to overcome if it is to take on the Obama challenge.**

The innovation edge must be sharpened by policy makers, while businesses are calling for simplicity, focus and clarity. The data in our first report and the interviews from our second show the value of universities, but also their untapped potential. In its final report, the Task Force will hone its recommendations to meet this challenge.

**The NCUB gratefully acknowledges the continued support of our public funders and all members of the NCUB network of leaders (below), who provide direction and resources to fulfil our mission.**

Public Funders		
DELNI	HEFCW	Research Councils UK
HEFCE	Innovate UK	Scottish Funding Council
Businesses		
Accenture, UK & Ireland	Cisco UK & Ireland	Nesta
Airbus Group	Compass Group UK and Ireland	Pearson Plc
Anglo American plc	Deloitte LLP	PepsiCo
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Universities		
Aberystwyth University	Nottingham Trent University	University of Glasgow
Anglia Ruskin University	Open University	University of Greenwich
Aston University	Oxford Brookes University	University of Hertfordshire
Bangor University	QAA	University of Hull
Birmingham City University	Queen Mary University London	University of Leeds
Brunel University London	Queen's University Belfast	University of Leicester
Canterbury Christ Church University	Sheffield Hallam University	University of Lincoln
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Imperial College London	Universities UK	University of Salford
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