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Russell George AM  
Chair  
Economy, Infrastructure and Skills Committee

4 January 2019

Dear Russell,

Thank you for the invitation to attend Committee as part of its inquiry into Research and Innovation in Wales. This letter is in response to your request for information in advance of the 9 January session. Enclosed is an overview of Welsh Government policy in relation to Research and Innovation Wales.

I look forward to discussing this topic in more detail with the Committee on 9 January.

Yours sincerely

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Rydym yn croesawu derbyn gohebiaeth yn Gymraeg. Byddwn yn ateb gohebiaeth a dderbynnir yn Gymraeg yn Gymraeg ac ni fydd gohebu yn Gymraeg yn arwain at oedi.

We welcome receiving correspondence in Welsh. Any correspondence received in Welsh will be answered in Welsh and corresponding in Welsh will not lead to a delay in responding.

## **Economy, Infrastructure and Skills Committee Evidence Paper**

The purpose of this paper is to provide written evidence to the Economy Infrastructure and Skills Committee's inquiry into research and innovation in Wales, in advance of a proposed Post-Compulsory Education and Training (PCET) Bill. The evidence below addresses the Committee's agenda.

### **Evidence**

#### **1. Funding for research and innovation activity, with an interest in:**

##### **i. The balance between funding for basic research (which will have no immediate commercial value) and funding for applied research that has more immediate innovation potential.**

Research and development (R&D) is defined by the Organisation for Economic Cooperation and Development (OECD) as "creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge"<sup>1</sup>. R&D can generate new knowledge through discovery, invention, experimentation and innovation, as well as the meta-analysis and synthesis of accumulated previous studies. Innovation can take the form of product, process or business model innovation and may be incremental or more radical.

Conventional analysis of R&D activity tends to differentiate between pure and applied research often in a university laboratory and company-based innovation and commercialisation. One way of differentiating between these activities is to consider developments in terms of levels or stages of development. In engineering, software development, medical research and the commercialisation of new products and services this approach is often used to benchmark development, review progress and consider funding decisions (see Figure 1).

Recent commentary on the R&D process in a range of industries based on an examination of past projects has called into question the appropriateness of the linear process implied by level and stage models of development. In the "real world" it has been suggested that development is messier than these models imply and often works in an iterative manner with frequent stops and starts, returns to earlier stages and jumps in the process. Indeed, in some instances it may even work in reverse from application back to idea generation<sup>2</sup>.

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<sup>1</sup> <http://oe.cd/frascati>

<sup>2</sup> Gibbons, M. Limoges, C. Nowotny, H. Schwartzman, S. Scott, P. and Trow, M. (1994). *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. London, Sage.

**Figure 1: Technology Readiness Levels, Clinical Stages and Product Service Development**

Technology Readiness Level (TRL)	TRL Description Engineering and Physical Sciences Research Council (EPSRC)	Clinical drug and appliance testing stages (Medical Research Council)	Product and service development (Marketing Insider)
1	Basic principles observed	Basic and Applied Research	Idea generation
2	Technology concept formulated		Idea screening
3	Experimental proof of concept		Development
4	Technology validated in the Laboratory	Marketing strategy development	
5	Technology validated in relevant environment	Business analysis	
6	Technology demonstrated in relevant environment	Clinical Evaluation and Regulatory Approval	Product development
7	System prototype in operational environment		Test Marketing
8	System complete and qualified		Local commercialisation
9	Actual system proven in operational environment		International commercialisation
10.		Post-launch evaluation	Post launch evaluation

UK Government research funding has tended in the past to avoid funding late stage development and commercialisation of innovations because of concerns about breaching European Union rules governing State Aid, as well as concerns about private organisations benefiting directly from public subsidies where the risks for commercial investors are lower. A related concern is the so-called “valley of death” which it is suggested often stands between initial research and commercialisation<sup>3</sup>.

The establishment of Innovate UK and the development of streams of dedicated

<sup>3</sup> <https://publications.parliament.uk/pa/cm201213/cmselect/cmsctech/348/348.pdf>

funds from UK research councils to promote the commercialisation of research have sought to bridge the “valley of death”. Other initiatives from the formation of the Welsh Development Bank to the Be the Spark Initiative have sought to promote Government backed investment, private equity, venture capital and angel investor involvement in early and mid-stage commercialisation of research and innovation. Meanwhile a range of new procedures have been introduced by UK research councils and funding bodies to improve the impact of Government funded research. These new procedures include a requirement for research council funding applications to specify the intended pathways to academic, economic and social impact and an increased proportion of Research Excellence Framework (REF) assessment focused on the impact of university based-research. As part of the REF process researchers are now required to produce case studies for independent review detailing how their research has had an effect on, or benefited, culture, the economy, the environment, health, public policy, quality of life or society more generally. More recently there has also been an expectation that applications for R&D funding programmes will be supported by representatives from business bodies and/or sponsoring Government departments.

Statistics are not available detailing the balance between funding for basic and applied research. The funding of research in the UK draws on finance from a variety of sources including business, higher education, government and not-for profit organisations (charities).

Those statistics on research expenditure which are available differentiate between.

- GERD = Gross Domestic Expenditure on Research and Development
- BERD = Business Expenditure on Research and Development
- HERD = Higher Education Expenditure on Research and Development
- GovERD = Government Expenditure on Research and Development
- PNP = Private Non-Profit Expenditure on Research and Development.

**Figure 2: Expenditure on Research and Development by Type and by Nation and Region of the UK, 2016.**

	Source of Funding <sup>1</sup> (£ millions) <sup>45</sup>					GERD per capita
	GERD	BERD	HERD	GovERD	PNP	
South East	6,665	4,693	1,269	606	97	738
East of England	5,662	4,393	758	223	288	924
London	4,899	2,296	1,943	451	209	559
North West	3,165	2,346	654	164	1	438
East and West Midlands	4,856	3,958	751	144	3	459 <sup>1</sup>
Scotland	2,331	1,072	1,061	163	35	431
South West	2,159	1,500	409	229	21	391
Yorkshire and Humberside	1,401	750	531	116	4	258
Wales	716	435	266	15	0	230
Northern Ireland	647	481	152	14	0	347
North East	629	302	241	47	39	239
UK	33,130	22,226	8,035	2,172	697	505

Notes: 1. Estimate based on ONS and House of Commons Library data.

<sup>4</sup><https://www.ons.gov.uk/economy/governmentpublicsectorandtaxes/researchanddevelopmentexpenditure/bulletins/ukgrossdomesticexpenditureonresearchanddevelopment/2016>.

<sup>5</sup> <https://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN04223#fullreport>

Analysis of the level of per capita GERD funding by nation and region in the UK indicates that the recorded level of expenditure in Wales is approximately half the UK average at £230 per person rather than £505 per person. Assessment of the levels of the different sources of funding as a proportion of the UK totals by funding type reveals that business expenditure on research and development in Wales (BERD) is 1.96% of the UK total, meanwhile higher education and government expenditure (HERD and GovERD) is 2.75% of the UK total.

Across the UK the bulk of R&D funding comes from business sources and the ratio between this source of finance and other forms of funding (i.e. HERD, GovERD and PNP) is approximately 2 to 1. In Wales the corresponding figure is 1.5 to 1. This indicates that for the overall level of GERD to increase in Wales from its current level to the current UK average would require BERD to increase by £676m from £435m to £1.1bn.

The relatively low level of business expenditure on R&D in Wales has encouraged some to call for Welsh Government funding of research to be channelled from pure and applied research in higher education to innovation and commercialisation in companies and other organisations. This proposal misreads the current weaknesses of R&D arrangements in Wales and recommends a solution which is unlikely to address these problems.

The recent Reid Review of Government funded research and innovation in Wales identified challenges to the existing level of higher education and government expenditure on R&D in Wales as a consequence of BREXIT (estimated at approximately £65m per annum) and recommended that the Welsh Government should use its available funds to encourage university researchers and business representatives to bid for the £6bn of R&D funding available from the newly formed United Kingdom Research and Innovation (UKRI) and its nine constituent research councils.

- Arts and Humanities Research Council (AHRC)
- Biotechnology and Biological Sciences Research Council (BSRC)
- Engineering and Physical Sciences Research Council (EPSRC)
- Economic and Social Research Council (ESRC)
- Innovate UK
- Medical Research Council (MRC)
- Natural Environment Research Council (NERC)
- Research England (RE) (administers the Strength in Places fund to develop local research capabilities across the UK)
- Science and Technology Facilities Council (STFC)

The Welsh Government's White Paper "Securing Wales' Future: Transition from the European Union to a New Relationship with Europe" makes the case for the replacement of European Union Structural Funds for R&D and other activities with an increase in the Block Grant to ensure that there is no overall reduction in funding coming to Wales<sup>6</sup>.

The remit of the UK Research Councils is to promote and fund research and innovation with a balance between directed programme-based funding examining specific issues and response mode research investigating topics generated and defined by the researchers making the application.

Funding from the research councils is complemented by QR funding which is used to

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<sup>6</sup> [https://beta.gov.wales/sites/default/files/2017-01/30683%20Securing%20Wales%20Future\\_ENGLISH\\_WEB.pdf](https://beta.gov.wales/sites/default/files/2017-01/30683%20Securing%20Wales%20Future_ENGLISH_WEB.pdf)

allocate money to fund research staffing and infrastructure in higher education institutions to enable them to bid for funds from competitive sources. This money is allocated by four funding bodies: the Higher Education Funding Council for Wales (Hefcw), Scottish Funding Council (SFC), the Department for the Economy in Northern Ireland and Research England. The sums of money allocated through the QR process are determined by reference to the results of the Research Excellence Framework (REF) assessment process which examines the quality of research in all academic subject areas every five to seven years. The last REF exercise took place in 2014 and the next one is scheduled for 2021. Money allocated through the QR process is un-hypothecated and is therefore available to the university leaders to allocate as they deem appropriate within their own institutions. This money may be used for any purpose including support for basic or applied research, innovation and commercialisation or for staff development and improving the impact and communication of research results.

Over recent years the balance at a UK level between research council funding for programme funded activity directed at specific economic, cultural and environmental objectives, responsive mode allocations and QR funds has shifted in favour of the former. This change has accompanied the growth in funds from the HM Treasury's National Productivity Investment Fund and the associated Industrial Strategy Challenge Fund (ISCF) and Global Challenges Research Fund (GCRF). The current ratio between competitively sourced funding (i.e. research council, corporate and charitable funds) and QR funding in England is 1 to 0.68, but is subject to review by Research England and seems likely to move closer towards a ratio of 1 to 1 in the near future.

The Reid Review recommended that the Welsh Government should also seek to achieve a 1 to 1 ratio between competitively sourced funding and QR funding in order to support increased high quality bids for funding from the research councils, charities and corporate sponsors.

The Reid Review made the following three main recommendations to achieve these objectives.

1. The Welsh Government should increase the visibility and influence of Welsh research by creating a new Welsh Research and Innovation London Office (WRILO) (to enable improved engagement with research funders and policy makers based in London).
2. The Welsh Government should strengthen the Welsh research base to enable Welsh researchers to attract a greater share of UK-wide funding by implementing Diamond's recommendation for QR funding and creating an additional Future of Wales Fund specifically to incentivise Welsh researchers to win funding from outside Wales.
3. The Welsh Government should increase the visibility, coherence and impact of research and innovation in Wales by creating a single overarching brand for its innovation activities: the St David's Investment Fund. This should be worth some £35m yearly in the first instance, but with the potential to grow to £100m yearly or more, post-BREXIT.

Responsibility for the delivery of the Reid Review (and the associated policy areas) has only just been moved into my portfolio. One of my first tasks will be to assess progress that has been made in responding to the report and our preparedness to implement the recommendations.

## ii. The differences between research and innovation funding for universities and funding for businesses

UK Government research and innovation strategy, funding and means of oversight has developed over the last eight years through a series of initiatives which have been directed towards the business and economic objectives of improving productivity and Gross Value Added (GVA) as recorded at a national and regional level. Over the same period research focused on cultural goods and activities has been less emphasised.

Evidence to support a mix of investment by Government through universities and business is provided by economists from a variety of different theoretical and political traditions<sup>789</sup>. However, the strength of this support varies according to the type of research proposed, the ends to which it is addressed, and the suggested source and form of funding.

Not all research and development is equally good at improving economic and social outcomes. There are sectors of the economy in which the UK and Wales have maintained an international competitive business advantage and which enjoy high rates of economic growth and good employment prospects, but where spending on R&D is low by comparison with other sectors, or where it is not always recorded, e.g. creative industries and financial services. These sectors have historically relied on employing large numbers of graduates who have completed their education in universities where the staff engage in research. Whether these sectors will continue to have relatively low levels of R&D expenditure in the future is open to question with the expected future growth in the use of artificial intelligence and digital technologies.

There are sectors of the Welsh economy in particular where there has been growth, but the quality of employment and levels of productivity are low and where there has historically been little research informing how companies and other organisations can improve this performance. This is particularly the case in the foundation sectors of care, food, retail and tourism identified in the Welsh Government's economic action plan. Finally, there are areas of the Welsh economy where there has been growth, employment prospects are good, but where the volume and impact of R&D activity is not always at internationally competitive levels, e.g. advanced manufacturing (aerospace, automotive and rail), enabling technologies (construction and energy) or tradeable services (creative and digital).

For those advocating changes in the tax regime for companies investing in R&D it is important to note that this can have significant consequences for where R&D expenditure is recorded by businesses rather than increasing the overall level or quality of research<sup>1011</sup>. Similarly, the provision of publicly funded research grants and favourable loans to commercial companies may crowd out private investment effectively moving the cost and risk of this activity from the private to the public sector, while the returns and benefits may be gained by the private sector rather than

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<sup>7</sup> <https://onlinelibrary.wiley.com/doi/pdf/10.1111/1475-5890.12174>

<sup>8</sup> [http://www.demos.co.uk/files/Entrepreneurial\\_State\\_-\\_web.pdf](http://www.demos.co.uk/files/Entrepreneurial_State_-_web.pdf)

<sup>9</sup> [http://www.whatworksgrowth.org/public/files/Policy\\_Reviews/15-10-20-Innovation-Summary.pdf](http://www.whatworksgrowth.org/public/files/Policy_Reviews/15-10-20-Innovation-Summary.pdf)

<sup>10</sup> Brooks, R. (2014) *The Great Tax Robbery*, One World Publications, London.

<sup>11</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/752144/RandD\\_web.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/752144/RandD_web.pdf)



the general public<sup>12</sup>.

Variations in the level of business expenditure on R&D between the nations of the UK and the regions of England reflect the pattern of industry in these different areas and the long history of investment in university and research and technology organisations (RTO) in these different geographical areas. Here it would appear that success generates further success as companies, particularly knowledge intensive foreign direct investors, are disproportionately attracted to areas of high R&D intensity<sup>13</sup>.

In the UK health and pharmaceuticals have consistently accounted for the lion's share of investment in research and development and this has tended to be located in and around the M25 corridor and in Cambridge. Similarly, the automotive and parts industry which is the second largest investor in research and development has tended to be based in the West Midlands while the fourth on the list, aerospace, has had a strong geographical presence in the North West and South West of England as well as North Wales, although the research capability is largely confined to the first two of these locations.

**Figure 3: Expenditure by UK businesses on performing research and development in current prices, by largest product group 2010 to 2017**

Industry sector	Value (£ million)	% of UK total	Rank 2010	Rank 2017
Pharmaceuticals	4,337	18	1	1
Motor vehicles and parts	3,601	15	4	2
Computer programming and information services	1,919	15	2	3
Aerospace	1,521	8	3	4
Miscellaneous business activities, incl. testing and analysis	1,513	6	9	5
Software development	1,389	6	7	6
Research and development services	1,138	6	8	7
Machinery and equipment	1,037	5	6	8
Chemicals and chemical products	870	4	7	9
Consumer electronics and communication equipment	821	4	12	10
Telecommunications	753	3	5	11

## **2. How to prevent the research and innovation interests of universities and colleges over-shadowing the research and innovation interests of industry**

The Reid Review draws attention to the shift in the balance of opportunities for

<sup>12</sup> Marino, M. Huillery, S., Parrotta, P. and Sala, D. (2016) "Additionality or crowding-out? An overall evaluation of public R&D subsidy on private R&D expenditure," *Research Policy* November 2016, Vol. 45, No. 9, pp1715-1730.

<sup>13</sup> <https://www.gov.uk/government/statistics/research-and-development-by-foreign-and-domestic-ownership-2016>



research and innovation funding moving from the European Commission in Brussels and the Wales European Funding Office (WEFO) to be increasingly focused on the UKRI and the research councils, companies and charities with headquarters in London. The report also notes the lower levels of success in bidding for competitively allocated research funds from the UK research councils and Horizon 2020 scheme overseen by the European Union. While noting that researchers and businesses in Wales have benefitted from approximately £65m per annum of European Union Structural Funds to support research and development activity in Wales, the report strikes a note of caution about the effects caused by the removal of this funding when the UK leaves the European Union.

The Reid Review analysis notes that R&D funding decisions will increasingly be made in London by bodies on which researchers based at Welsh universities and business representatives from Wales are poorly represented, or not represented at all.

Under the terms of The Wales Act (2017) the legal regulation of the operation of the UK Research Councils is a reserved matter and not devolved. The allocation of research funding by Welsh Ministers is provided for in this Act and in practice QR funding is allocated in Wales by HEFCW and a limited amount of direct Government research expenditure is allocated by Welsh Ministers, however, the position of R&D funding and the precise nature of the balance of the oversight of research and innovation policy in Wales by the UK and Welsh Governments is not currently totally clear.

The Reid Review implies that the primary question facing the Welsh Government and National Assembly is not how to prevent the research and innovation interests of universities and colleges overshadowing the interests of industry (in Wales). The question is instead how to ensure representation of the research and innovation interests of universities and businesses in Wales on the bodies making research funding and policy decisions in London. This is a matter Welsh Ministers have sought to draw attention through opinion pieces and in their meetings with UK Government ministers and representatives from UKRI.<sup>14</sup>

The UK Government budget in 2018 made a commitment to increasing the level of GERD within the UK to 2.4% of GDP by 2027. Recent actual and future forecasted increases in UK R&D expenditure are detailed below along with an indication of what a population-based share of this expenditure based on 5% of the overall UK figure might constitute.

**Figure 4: Actual and Forecast Research and Development Expenditure within the National Productivity Investment Fund 2017-2022 (£ million)<sup>15</sup>**

	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Research and Development Funding	425	820	1,520	2,000	2,325	-	-
Notional 5% target for R&D funding	21.25	41.0	76.0	100.0	116.25	-	-

<sup>14</sup> <https://www.timeshighereducation.com/blog/he-and-research-bill-changes-must-respect-national-differences>

<sup>15</sup> [https://assets.publishing-service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/752201/Budget\\_2018\\_print.pdf](https://assets.publishing-service.gov.uk/government/uploads/system/uploads/attachment_data/file/752201/Budget_2018_print.pdf).

The proposals outlined in the consultation document “Public Good and a Prosperous Wales” were intended to provide a framework for the future oversight and coordination of R&D activity in Wales to enable the achievement of a greater share of the competitively allocated funds provided by UKRI, research councils, companies and charities<sup>16</sup>.

While Welsh Government ministers have sought to increase the influence of businesses and researchers in Wales over UK R&D policy and funding, the UK Government has sought to increase the influence of business over R&D funding through the five interlinked activities detailed below. Here there is considerable synergy with the approach mapped out in the Welsh Government’s Economic Action Plan.

**Science and Innovation Audits (SIAs):** have been conducted in 21 regional areas across the UK to examine current business and research strengths and the scope for future development. Three of the SIAs conducted to date have involved university researchers and business people from Wales:

- a. South West England and South East Wales (2016)<sup>17</sup>
- b. North West Nuclear Arc (2018)
- c. South Wales Crucible (Swansea, Aberystwyth, Bangor and Cardiff universities).

There is some alignment between the information and activities associated with these SIAs and the economic regions identified in the Welsh Government’s Economic Action Plan, but there is also scope for greater alignment and closer joint working.

**i. Industrial Strategy Challenge Fund:** providing grants in eighteen areas linked to the industrial strategy’s four grand challenges<sup>18</sup>. The economic contracts described in the Welsh Government’s action plan have been taken forward with selected companies and provide for loans and grants to be offered in exchange for a range of commitments including where relevant the location of corporate R&D activity in Wales.

**ii. UKRI and Research England:** The UKRI and Research England provide a mechanism across the UK and in England for aligning R&D spending with the four grand challenges in the UK Industrial Strategy and the funding streams organised by the research councils. The Research and Innovation Wales (RIW) component of the Commission for Tertiary Education and Research (CTER) is intended to undertake similar functions to both UKRI and Research England through its role in overseeing hypothecated and un-hypothecated research and innovation funding in a manner which connects and is coordinated with UKRI.

**iii. Sector deals:** designed to link R&D and other government led investment to the needs of business in eight sectors. As noted at recent joint lecture involving the Welsh Government’s Minister for Economy and Transport, Ken Skates, the UK Government’s Business Secretary, Greg Clark, and the CEO of UKRI, Mark Walport, there are significant complementarities and synergies between the sectors identified in the UK Government’s Industrial Strategy and associated sector deals and those identified in the Welsh Government’s Economic Action Plan.

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<sup>16</sup> [https://beta.gov.wales/sites/default/files/consultations/2018-02/170620\\_consultation-en.pdf](https://beta.gov.wales/sites/default/files/consultations/2018-02/170620_consultation-en.pdf)

<sup>17</sup> <http://gw4.ac.uk/sww-sia/>

<sup>18</sup> <https://www.ukri.org/innovation/industrial-strategy-challenge-fund/>

**Figure 5: Sector Deals and R&D Facilities**

UK Industrial Strategy Sector Deal	R&D in Wales mentioned in the sector deal	R&D activity linked to the Welsh Government's Economic Action Plan	Welsh Government Economic Action Plan Sectors
Life Sciences	Life Sciences Hub <sup>19</sup> and UK Dementia Research Institute <sup>20</sup>		
Aerospace		Advanced Manufacturing Research Institute	High Value Manufacturing
Automotive		Automotive Technology Park (Ebbw Vale) <sup>21</sup>	
Rail			
Creative Industries		Creative Wales <sup>22</sup>	Tradeable Services
Artificial Intelligence		Compound Semi-Conductors Applications Catapult <sup>23</sup>	
Construction		SPECIFIC <sup>24</sup>	Enablers
Nuclear		North West Nuclear Arc and National Thermal Hydraulic Facility <sup>25</sup>	
Rail			
			Care
		IBERS	Food
			Retail
			Tourism

<sup>19</sup> <https://lshubwales.com/>

<sup>20</sup> <https://ukdri.ac.uk/>

<sup>21</sup> <https://gov.wales/docs/det/publications/tech-valleys-strategic-plan.pdf>

<sup>22</sup> <https://gov.wales/newsroom/culture-tourism-sport/2018/180712-creative-wales-to-build-on-successes-of-cadw-and-visit-wales/?lang=en>

<sup>23</sup> <https://csa.catapult.org.uk/>

<sup>24</sup> <http://specific.eu.com/>

<sup>25</sup> <https://www.gov.uk/government/news/national-thermal-hydraulic-facility-consultation>

The Economic Action Plan outlines the Welsh Government's commitment to maintaining and investing in a small number of specialist research and innovation hubs in-keeping with the recommendations of the Diamond and Reid Reviews.

“Beginning with the Compound Semi-Conductor Cluster in Newport and the Advanced Manufacturing Research Institute in Broughton and building on established strengths like the Institute of Biological, Environmental and Rural Science (IBERS) in Aberystwyth and SPECIFIC at Swansea University, we will make selective investments in key research and innovation facilities to support new technologies and business development in all parts of Wales. Planned research investments for the future include an Automotive Technology Park in the South Wales Valleys and a Steel Research Centre in Port Talbot<sup>26</sup>.

**iv. An Industrial Strategy Council:** consists of independent business and academic representatives appointed to advise ministers on the effectiveness of the Industrial Strategy and associated investment in transport, skills and innovation<sup>27</sup>. An equivalent function is performed in Wales by the long-established Council for Economic Development which provides a forum for the First Minister, Minister for the Economy and other members of the government to consult with national business and trade union representatives.

The proposals to establish a Commission for Tertiary Education and Research (CTER) are aligned with the economic strategy outlined above. These proposals were the subject of a technical consultation between June and August 2018. A summary of responses was published on 12 October. In the proposals, research and innovation are a key part of the remit of the new Commission and it is proposed that a new body Research and Innovation Wales (RIW) is created as a statutory committee of the Commission.

Being a statutory committee of the Commission would give a strong identity and presence for research and innovation. Similarly, so does the proposal that the chair of RIW would be appointed by Welsh Ministers and simultaneously be vice-chair of the Commission. This will ensure an alignment between the Commission and RIW. The Welsh Government's relationship with the Commission will be that of an arms-length body and it is proposed that Welsh Government will issue a statement of priorities to the Commission which is highly likely to include research. The Commission will then respond with a strategic plan to be agreed with Welsh Ministers. RIW will advise the Commission on aspects relating to research and innovation.

Broadening the remit of the Commission beyond that of the Higher Education Funding Council for Wales (HEFCW) to cover the whole post-compulsory sector also means that RIW will be able to operate strategically and fund research and innovation to all organisations within the sector and indeed beyond to industry, private sector and the public sector such as the NHS.

The technical consultation envisaged three main funding streams that will be administered by RIW on behalf of the Commission:

- a. **Un-hypothecated:** funding where there is no specification about the nature of the research and innovation to be funded. This is envisaged to be akin to the QR funding currently administered by

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<sup>26</sup> <https://gov.wales/docs/det/publications/171213-economic-action-plan-en.pdf>

<sup>27</sup> <https://www.gov.uk/government/news/new-industrial-strategy-council-meets-as-membership-announced>

HEFCW.

b. **High-level hypothecation:** funding targeted at strategic priorities of Welsh Ministers so that the nature of the research and innovation to be funded will be specified at a high level.

c. **Hypothecated:** funding for specific, ad hoc and significant projects.

RIW will monitor the effectiveness of this funding to ensure maximum success, effectiveness of delivery and value for money and administer them in line with the principle of academic freedom and the Haldane principle – meaning decisions on research funding will be made by appropriate experts. RIW will contribute to the Commission's annual report detailing the effectiveness and impact of its funding activities.

As well as administering funding, it is proposed RIW will:

- actively promote the exploitation of research and innovation in Wales;
- collect data and evidence of Wales' R&I delivery and performance; and
- engage where appropriate with similar, common UK activities and bodies.

The aim is that RIW will operate strategically as part of the Commission, offering a strengthened identity and voice for research and innovation in Wales.

Responses to the consultation were supportive regarding the establishment of RIW as a statutory committee of the Commission and for it to take forward the recommendations of the Reid Review. The wider funding scope was also welcomed.

The main criticisms were about the overly detailed nature of the proposals containing much that was not regarded as appropriate for primary legislation. The funding modes was one such issue and respondents felt that the proposals were too focused on what is currently taking place rather than providing key principles for the future. There was also a desire that members of RIW are appointed by the Commission rather than the Welsh Ministers. The responses to the consultation will now be taken into account as the legislation is developed.

### **3. Student and graduate entrepreneurs and the support available to them**

The Welsh Government's Economic Action Plan makes a commitment to building an entrepreneurial culture and to establish targets for the numbers of school, college and university leaver's start-ups.

In the academic year 2016/17, there were 241 graduate start-ups reported by Welsh universities with an estimated turnover of £56 million.

In October 2018, the Welsh Government announced a total boost of £2.5m over 3 years for universities and colleges to accelerate student entrepreneurship in Wales. Applicant bodies are required to set institutional targets for the number of students starting a business.

Our youth entrepreneurship and graduate start up focuses on 5 priorities:

- raise aspirations and understanding of entrepreneurship;
- develop entrepreneurial skills and attitudes through practical experiences;
- identify and nurture future entrepreneurs via young people's networks;

- engage business, particularly entrepreneurs to share expertise;
- empower the FE/HE in Wales to drive student enterprise;

Business Wales providers offer start up loans up to £25K, with an average investment of £8,589. 13% of loans are allocated to individuals aged 18-24.

Graduate start-ups can also progress to the Accelerated Growth Programme which has supported 820 businesses to overcome strategic constraints. In November 2018, the Welsh Government announced over £4m for new enterprise hubs, which will provide individuals start-ups and companies with the space to network, innovate and access a range of support services. The hubs will establish strong connections to our colleges, universities, local authorities and the Development Bank of Wales, providing a well-connected, simple and visible support system for entrepreneurs.

The five hubs have aggregate targets of creating at least 700 new enterprises and 1160 new quality jobs.

The Be The Spark initiative is an independent Community Interest Company (CIC) which supports an entrepreneurial culture by engaging with stakeholders (academia, corporate business, entrepreneurs, government and risk capital) to promote innovation-driven entrepreneurship.

#### **4. How universities and business (particularly SMEs) interact with each other with a particular interest in:**

##### ***i. How they transfer or absorb the knowledge gained from research.***

There are various ways in which this happens: through collaborative R&D projects; through knowledge transfer e.g. seminars, courses, training, each-way secondments; contract research and consultancy; academic publications and conferences; and licensing of intellectual property.

Based on historical evidence the most successful of these is generally collaborative projects and secondments.

Companies, particularly SMEs often claim to have difficulties dealing with universities. Some of the most often quoted reasons include:

- universities tend not to work to industry timescales;
- their costs are excessive (although they should charge a premium, as their knowledge should be cutting edge);
- they tend to require sole ownership of intellectual property and/or overvalue it;
- not delivering what companies actually expected.

Companies also find difficulty in interacting with universities as they each have their own specific terms and conditions that leads to inconsistency and uncertainty on the company's part.

The conditions of SMART R&D funding ensure that the IP benefits are shared between the industry and academic partner and that the risks inherent in the R&D activity are shared also, thus reflecting more closely a true partnership in which there is mutuality of benefits, costs and risks between partners. Consideration of support for a comprehensive suite of SMART-like programmes should be a priority, post-BREXIT.

## ***ii. The incentives and rewards for interacting***

Our current SMART operations provide financial support, via Calls to Action and the Economic Futures Fund, for businesses to interact with universities.

SMART Expertise provides support for innovative collaboration projects between industry and Welsh research organisations, which address strategic industrial technical challenges. Projects need a clear focus on commercialisation of new products, processes or services. The research organisation's costs are fully covered and the industry partners provide in-kind contributions via parallel complimentary R&D activity.

The university's knowledge (intellectual property) is commercialised by the industry partners rather than the university itself. The university retains rights to continue research in the area but it does not have the financial burden to maintain patents etc. These costs are carried by the industry partners.

Support is also provided via Knowledge Transfer Partnerships and SMART Partnerships which award funding to cover the costs of an associate, typically a graduate, to work in a business with supervision from a university academic, embedding new knowledge in the business.

## ***iii. How interaction can be improved***

The Reid Review makes the recommendation that all Welsh Government research and innovation is brought together under one overarching brand to effect coherence, transparency and simplicity of access. A major implication of this is that the Welsh Government should develop a priorities framework to achieve greater coherence and coordination. Such a priorities framework could be based on elements of the Economic Action Plan. As stated above, I am looking at the progress that has been made as one of my first tasks.

Many OECD countries have made strategic investments in Research Technology Organisations (RTOs) e.g. Finland, Germany, Netherlands, Singapore and the USA as described in the Reid Review. Wales does not have a strong history in this area, but recent developments are very encouraging with the following centres established in the last few years:

### **SPECIFIC**

SPECIFIC is one of six national innovation and knowledge centres. It is in its second round of funding from Innovate UK and EPSRC c.£5million over 5 years. They have championed the concept of Active Buildings – buildings that generate, store and release their own energy and energy positive. In addition, they have been supported with £15Million of WEFO funding to increase their impact in Wales, working with Welsh SMEs.

This centre collaborates with many large companies including Tata and Akzo Nobel taking ideas from concept to commercialisation.

It has built several demonstrators in recent years including the Active Classroom and Active Office.



## **The Active Building Centre**

In September, the UK Government announced that Swansea University had won £36M from UKRI to establish an Active Building Centre (ABC). This followed a consultation with industry on the need for such a centre.

To facilitate this Welsh Government aligned £7.4M funding to helping the Centre support projects.

The ABC is tasked with accelerating the adoption of active building and helping to create a new industry. The focus will be on housing and public sector buildings.

## **Compound Semiconductor Applications Catapult**

Electronics and Compound Semiconductors were identified as Welsh strengths in the recent Science and Innovation Audit of SE and SW England carried out by BEIS. Over £50M will be invested via Innovate UK to create a national semiconductor R&D facility in South Wales. This is the first Catapult to be headquartered in Wales. Alongside partner match funding, including Welsh Government. It will result in a total £150 million investment. The Catapult will focus on helping businesses turn the new materials developed at the Institute into applications for new products.

The Reid Review recommends the creation of three industry-led innovation hubs with funding provided by the St David's Investment Fund, which is to focus on innovation within business. These centres could be created with a target to achieve the third funding model, to ensure long-term sustainability.

Wales needs to maintain its own distinctive approach based on particular areas of strength and priority but cannot operate completely in isolation. We should note the extensive research conducted to shape the priorities of the funding from UKRI and Innovate UK. Policy and practice must also take account of UK and International initiatives as we prepare for BREXIT.

In terms of future opportunities to improve business/academic collaboration - if new funding channels were to become available – there are possibilities around the following areas:

- Incentivise our universities and businesses to attract Industrial Strategy Challenge Fund and Sector Deal investment in to Wales such as through the proposed Future of Wales Fund. This could use Wales' ability to coordinate internally and act quickly to attract major RD&I investments and allowing us to compete more effectively for more of the £4.7bn Industrial Strategy Challenge Fund.
- The Reid Review also recommended the creation of the St David Day Research and Innovation fund.