Universities Scotland

Consultation Response

Response to Department of Business Innovation and Science *"A Consultation on Proposals for Long-Term Capital Investment in Science & Research"*

General Comments:

Universities Scotland is pleased to respond to the BIS consultation on capital investment in research. We represent all 19 Higher Education Institutions in Scotland, and our response has been developed through discussion with our members and with Universities UK.

Our member institutions have a rich diversity of scale and disciplinary focus. For each of them research is an essential element of their mission and capital funding to support that research is a key strategic issue. Many of our members will respond in their own right to this consultation, highlighting specific strategic needs.

The research base is a major source of economic, social and cultural value. The benefits it generates for our economy and society are wide-ranging and long-lasting. The work carried out by universities and research institutes, from producing groundbreaking research to training the next generation of researchers and high-skilled workers, produces substantial returns on public investment, which have been estimated to range between 20% and 50% but can be considerably higher[1].

Scientific research is one of a limited number of endeavours where the UK has long been and still remains a genuine world-leader. However, the UK invests less in research, expressed as Gross Expenditure on Research and Development as percentage of GDP (1.72 % in 2012) than the OECD average (2.4 %) and even the average for the 28-member EC (1.97 %). [2] In Scotland this gap is even more pronounced (GERD was 1.58 % of GDP in 2012)[3]. Research takes place on a competitive, global stage and therefore these differentials in investment are of strategic concern.

The Chancellor's announcements of increases in research capital funding in the last two years, reversing the cuts of four years ago, have been welcome. However, in global terms to stand still is to fall behind. Capital investment is a key element of competitiveness. It contributes to attracting the best staff from around the world, maintaining world-leading research and

[1] Department for Business, Innovation and Skills (2014) *Insights from international benchmarking of the UK science and innovation system* a report by Tera Allas
[2] OECD
[3] Scottish Government

securing significant efficiencies. It is also vital to recognise that capital investment must be married with appropriate revenue funding, to meet needs for technicians and maintenance and to ensure that equipment and facilities can be operated to full capacity. As digitisation becomes a key strategic call on capital funding it is important to factor in the cost of investment in research information systems and digital research repositories. The consultation sets out options for the balance between large-scale, national projects on the one hand and institutional level investment (through various routes) on the other. This balance is important. We set out below that national facilities are important but that over-concentration on these carries risks for our national capacity and the diversity of research and training. The reversal of funding cuts, or major one-off increase in funding, while welcome, increase this risk, because they mitigate towards larger scale projects.

The changing nature of disciplines, and the development of increasing volumes of inter-disciplinary work focussed on key societal challenges, brings new calls on capital funding. Capital investment is very important across the entire research spectrum including the arts, humanities and social sciences. For instance, we need to maintain the British Cohort studies and Understanding Society, the UK Household Longitudinal Study[4] Digitisation provides important opportunities for the arts and humanities, as shown by Glasgow School of Art's Digital Design Studio[5], which specialises in 3D digital visualisation and interaction technologies, and has attracted funding from public and private bodies, including the Ford Motor Company, Historic Scotland and NHS Scotland. For these disciplines, these are capital needs; where they are already supported by capital funding, this should be maintained and increased.

1. *What balance should we strike between meeting capital requirements at the individual research project and institution level, relative to the need for large-scale investments at national and international levels?*

Our members support a prioritisation of funding for projects at the level of individual institutions or small collaborations funded via the Research Councils, or formulaic institutional support, (options 1 or 2 in the consultation paper). It will be important, also, to consider the funding thresholds for projects to reflect the diversity of institutions and the varying scales of investment needed to achieve transformational outcomes.

We note, however, that for some disciplines, such as Physics and Astronomy, investment in national and international facilities is key to the continuing delivery of globally significant work. Such investments, (e.g. hadron collider, synchrotron, polar research, international telescopes, etc.) or the provision of a key shared resource (e.g. Mouse Genetics Project, Sanger Institute), must continue to be a key part of the funding 'eco-system'. There have been a number of one-off announcements of new centres and facilities that have already committed a significant fraction of the major project part of the funding before this consultation was launched.

The optimal balance between national facilities and a distributed network in the pursuit of excellent science depends on the nature of the activity, and serious peer examination is as important for major programmes as it is for traditional project proposals.

[4] https://www.understandingsociety.ac.uk/
[5] Digital Design Studio - Glasgow School of Art

Much outstanding science occurs at a local level and ensuring access for all institutions to funding for small and medium scale capital facilities is a key strategic issue. Alongside the specific outcomes from use of such facilities, they can also be used instead of, or as a precursor to, making use of expensive national facilities. Local investment is key for the replacement or upgrading of research equipment as a foundation to research excellence, critical mass and capturing the efficiencies available from the use of the very latest techniques.

Alongside formulaic funding, channelled through the UK funding councils, research councils, using robust peer-review, are well placed to fund innovative research and the equipment needed to support these activities, particularly at the small-science level.

Between the institutional and major national / international levels, there are important elements of the research eco-system that are supported at devolved or regional level that should be noted as conduits to shared facilities and equipment. Research pooling, pioneered in Scotland since 2004, is an example of this, and is explored further in response to question 2. Regional science parks drawing on a mix of funding sources could also fit under this category.

All of the presented options rightly include capital funding for significant national and international facilities. High priority international projects require national and international level investment, including the payment of international subscriptions where necessary, e.g. CERN, ESA, ESO. Similarly, E-Infrastructure plays an essential underpinning and enabling role and there is a role for national investment alongside that made locally. It encompasses sensors to gather data, computer hardware, system software and networking to generate and process data, and applications software to generate specific knowledge. In many areas of research and industry, the capabilities of our e-infrastructure are directly related to our international competitiveness. Thus, UK capital investment should ensure our e-infrastructure at least matches that of comparator nations. This is a fine example of a mixed model of local and national facilities; all HEIs are joined up and have local capabilities, but all also benefit from national facilities and UK capacity.

2. ***How can we maximise collaboration, equipment sharing, and access to industry to ensure we make the most of this investment?***

The UK must make a balanced capital investment across the entire ecosystem, from individual institutions through to collaborative, international facilities. Choice of solution will be guided by disciplinary competitiveness, cost-effectiveness and sustainability. In many cases this will lead to collaborative solutions, often in partnership with the public sector (eg. the NHS) and business.

Devolved or regional medium scale centres of excellence and research consortia (or pools) can reduce the need to replicate facilities at individual institutional level, thereby increasing the efficiency of funding, and encouraging collaboration and interdisciplinary research through bringing researchers together from different universities with access to world class equipment and facilities which might otherwise be unavailable. For instance, in 2012 one of the research pools, the Scottish Universities Life Sciences Alliance (SULSA), and Advanced

Procurement for Universities and Colleges set up the Equipment Database and Maintenance (EDAM)[6] to share facilities, equipment and a related database between its 6 university members.

As with any facilities, it is important to ensure that shared facilities have long-term financial stability, personnel support and facilities for hosting users in accommodation, office and lab space. Provision of an interface with industrial users including the provision of training is also important, ensuring that alongside research, there are strong knowledge exchange impacts from the capital investment. There are also areas where refinement or simplification of regulations could assist collaboration, for instance in further easing the VAT regulations for sharing equipment and services between institutions.

Scottish institutions have been successful in this use of facilities to develop relationships with the business community. They have enjoyed a mutually beneficial relationship with the Technology Strategy Board, with the development of Catapult Centres offering a new opportunity for business engagement, for example the High Value Manufacturing Catapult Centre Catapult at the University of Strathclyde. Similarly, investment through RPIF has also been an important route to investments, alongside those from industry, to create routes to knowledge exchange. The Dundee Centre for Translational and Interdisciplinary Research[7] and the investment in clinical research facilities for stratified medicine at the University of Glasgow are two such examples. Care is needed here, however, to ensure that thresholds of funding through this route do not exclude smaller initiatives which may be more suited to particular institutions and industries.

It is important that such investments continue to be made and are co-ordinated with other funded initiatives such as the eight new Innovation Centres in Scotland. SFC has to date provided core funding for eight Innovation Centres in Stratified Medicine, Sensors, Digital Health, Construction, Big Data, Aquaculture, Industrial Biotechnology, and Oil & Gas.[8]

Similarly, Scottish institutions are hosting the first Fraunhofer Institute[9] to be based in the UK, and the world's first international Max Planck Institute partnership.[10] Evaluation of the model of focusing interactions with industry through centres should guide future investments.

Regional science parks associated with co-located industrial R&D activities and university departments, are also excellent for both academic and industrial performance and collaborations, as long as they have a close connection to universities and a pool of students. Science parks can be particularly effective for those institutions with specialist national research centres. Edinburgh Bioquarter[11], for instance, offers a world renowned medical school, a state of the art teaching hospital and bespoke biomedical research and development facilities; it was established in 2011 through funding and support from the University of Edinburgh, Scottish Enterprise, the NHS and a private equity company, and has now attracted

[6] http://www.sulsa.ac.uk/research-facilities/scot-uni-equipment-database-live
[7] http://www.lifesci.dundee.ac.uk/other/ctir/
[8] http://www.sfc.ac.uk/funding/FundingOutcomes/KnowledgeExchange/InnovationCentres/FundedInnovationCentres.aspx
[9] **Fraunhofer** Centre for Applied Photonics - **Fraunhofer** UK
[10] http://www.hw.ac.uk/news-events/news/impp-website.htm
[11] **Edinburgh Bioquarter**

11 commercial companies to its site. This in turn is part of the Edinburgh Science Triangle[12], a collaboration of seven science parks, four universities and two agritech institutes which forms one of the top ten research and development locations in Europe – and is home to more than 3,000 researchers and 120 market-leading companies. Ensuring a distribution of centres around the UK also enhances the diffusion of talent, rather than increasing further existing concentration.

3. *What factors should we consider when determining the research capital requirement of the higher education estate?*

Requirements will vary by discipline, both in terms of equipment and the role of collaboration in delivering outcomes. For most subjects it is important to ensure that there is a basic infrastructure available in departments across the country (e.g. for chemistry and biology, medium-range NMR, mass spec., X-ray diffraction and microscopy techniques, clean rooms). A regular programme of refreshing laboratories and building infrastructure is also key. This can result in significant efficiencies; for instance the latest genome sequencing equipment is far quicker and less expensive than equipment that is 5 or 7 years old. This can apply even to equipment at the lower end of the cost scale, i.e. £0.5 to £2m. This should be arranged to be broadly applicable to all research areas. Possible mechanisms could be the enhancement of formulaic BIS funding through the UK funding councils or through an annual bidding round for smaller capital projects arranged by different research councils. The current RPIF programme is very welcome, but is rather too targeted at specific areas and institutions, and requires a minimum of £20m of matching funds for each project, so it is not really the right mechanism to fulfil this role. As noted above, such thresholds risk excluding institutions from accessing funding, especially in Scotland where HEIs have, on average, smaller cohorts of research-active staff than the rest of the UK; respectively 692 FTE per institution, against 1028 per institution[13].

4. *Should - subject to state aids and other considerations - science and research capital be extended to Research and Technology Organisations and Independent Research Organisations when there are wider benefits for doing so?*

Only in very limited circumstances. Extending funding to other research organisations would spread the available budget too thinly and would exacerbate not remedy underfinancing of HEI research in international terms with a consequent loss of reputation and competitiveness. Further, extending science and research capital investment to RTO and IRO organisations will likely duplicate existing facilities and equipment rather than building on the UK's research strengths within our centres of globally-recognised excellence in universities.

HEIs are best placed to provide basic infrastructure in terms of buildings and personnel to provide the expertise to develop and/or run and maintain expensive, specialised equipment and to host regional centres, which are needed to complement the University-based resources. Investment via HEIs is better for growth and generating start-ups, and they offer better prospects for long-term sustainability; universities are much less likely to close down or relocate.

[12] **Edinburgh Science Triangle**

[13] HESA average 2010-13

However, in the context of research campuses with mixed funding sources, where universities, other public sector and industrial entities share a location, and especially where boundaries are minimised and colleagues from all disciplines work collaboratively, there should be consideration of how capital investments from the varying partners can be co-ordinated to mutual benefit.

5. ***What should be the UK's priorities for large scale capital investments in the national interest, including where appropriate collaborating in international projects?***

As mentioned in the introduction, the large scale capital investment priorities for our members are highly specific to the discipline mix of their research. Our members have indicated that, of the options presented in the consultation document, options 1 and 2 best reflect their strategic needs. This includes a recognition that both of these include significant investments in large scale, national and international projects. As noted, these are of particular importance for some disciplines.

6. ***What should the criteria for prioritising projects look like?***

Paramount importance should be given to scientific excellence, as judged by a peer review process according to the Haldane principle.

The criteria of Appendix B2 are sensible, but could be extended by some additional criteria, including:

- Is this research area mature enough to merit the scale of investment proposed, particularly where there are many basic research questions open?
- Is the programme sustainable and will it continue to produce ground-breaking science beyond the next 5-10 years?
- The extent of the genuine added-value compared to accessing similar infrastructure elsewhere in the world.
- Is this a programme where industry could make a significant contribution, e.g. 'UK Spaceport', 'Innovative Production Processes', and 'Industrial Biotechnology Innovation'?
- The contribution to society and to the economy, including the training of highly qualified staff.
- Does the UK have a critical mass in the area already that can exploit the additional resources?
- Is there duplication of infrastructure with other projects?
- Does the academic community feel that this the most appropriate scale, network structure and national distribution to achieve the desired research goal?

7. ***Are there new potential high priority projects which are not identified in this document?***

As mentioned above, our members will have varied views on the priorities for large scale capital investment reflecting the diversity of the scale and discipline mix of their research.

8. ***Should we maintain a proportion of unallocated capital funding to respond to emerging priorities in the second half of this decade?***

A balance of funding through formulaic and RCUK competitive routes would allow for some re-prioritisation in light of strategic shifts. In the event of any new individual strategic priority emerging we believe that this would have to be dealt with by UK government as a strategic issue.

9. ***Are the major international projects identified in the consultation the right priorities for this scale of investment at the international level? Are there other opportunities for UK involvement in major global collaborations?***

Because of the unique research opportunity to pursue fundamental new science, and because of the exposure it gives to UK science, both inside the scientific community and the wider public, it is important to continue to participate in some big international projects such as the LHC and the International Space Station.

Beyond that, as above, the large scale capital investment priorities for our members are highly specific to the scale and discipline mix of their research. They will respond setting out their strategic needs in that context.

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