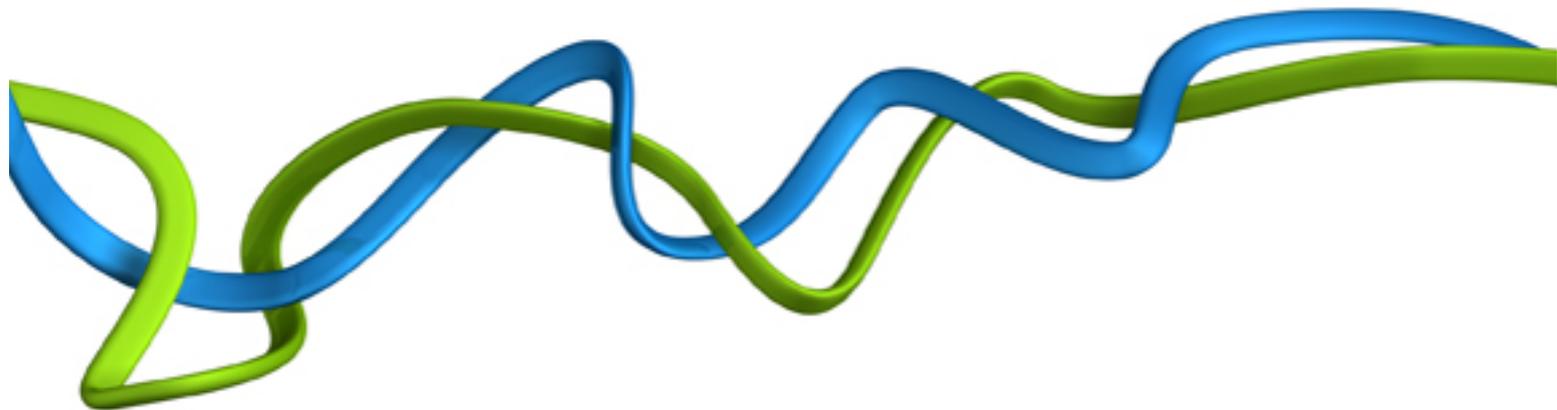


Royal Academy of Engineering Response to the Department for Business, Innovation and Skills Consultation on Higher Education: teaching excellence, social mobility and student choice

Department for Business, Innovation and Skills

Submission from the Royal Academy of Engineering

15 January 2016



About the Royal Academy of Engineering

As the UK's national academy for engineering, we bring together the most successful and talented engineers for a shared purpose: to advance and promote excellence in engineering.

Royal Academy of Engineering Response to the Department for Business, Innovation and Skills Consultation on Higher Education: teaching excellence, social mobility and student choice

1. The Royal Academy of Engineering welcomes the opportunity to contribute to the Department for Business, Innovation and Skills' consultation on Higher Education, *Fulfilling Our Potential: teaching excellence, social mobility and student choice*. The Academy's submission comments on the proposed next steps for higher education reform as detailed in the green paper. However, with regard to Part D of the consultation: *reducing complexity and bureaucracy in research funding*, the Academy has also taken into account the recommendations made by Sir Paul Nurse HonFREng FRS FMedSci in his Review of the UK Research Councils, which, according to the Chancellor's Autumn Statement 2015 speech, are to be implemented. Furthermore the Academy has taken the opportunity to consider in its response to the higher education consultation, the implications of other announcements as detailed in the Autumn Statement 2015 that will impact on the UK's research and innovation landscape.
2. The Academy's response has been informed by the expertise of its Fellowship, which represents the nation's best practising engineers, including leading researchers, innovators and entrepreneurs.

Part A: Teaching excellence, quality and social mobility

3. The Academy welcomes the government's recognition of the need to rebalance the weight given to teaching in higher education (HE). The Academy has long pressed for improvements in the quality of teaching in engineering education in HE and has written various reports on ensuring that engineering graduates are equipped with the right skills needed for employment in the 21st industry.^{1,2}
4. Most recently, in 2015 the Academy published a report examining the perspectives of lecturers and senior HE managers on the importance of teaching in terms of career progression.³ The study clearly showed that most academic staff (up to Reader) perceived that the quality of teaching beyond a 'minimum threshold level' had no bearing on career progression. In the survey of academic staff 97% of respondents reported research to be a 'very important' promotion criterion in their department, compared to 12% for teaching/education. As this suggests, dedicating time to improving the curriculum, teaching delivery or the quality of the students' experience are not seen to be career-advancing activities. Indeed, when asked, "*thinking about your own career progression, how much incentive is there from your department to devote time to developing your teaching practice?*" two thirds (67%) of academic staff reported there to be 'none' or 'very little'. The implication of this is that many lecturers perceive a lack of reward for teaching excellence in the promotion criteria. This may be at odds with the efforts that many institutions have been putting into more firmly

¹ Educating Engineers for the 21st Century, Royal Academy of Engineering, 2007, <http://www.raeng.org.uk/publications/reports/educating-engineers-21st-century>

² Engineering graduates for industry, Royal Academy of Engineering, 2012, <http://www.raeng.org.uk/publications/reports/engineering-graduates-for-industry-report>

³ Does teaching advance your academic career? Royal Academy of Engineering, 2015, <http://www.raeng.org.uk/publications/reports/does-teaching-advance-your-academic-career>

embedding teaching excellence into their promotion criteria in recent years, but the perception still exists at the more junior levels.

5. The Academy therefore welcomes the principle of a teaching excellence framework (TEF) with the right incentives on universities to stimulate the improvement in the balance of teaching and research and improve the quality of teaching and learning for students. If developed and executed with proper thought and care, it will be a powerful tool in improving the quality of teaching in HE and will have a positive impact on student learning for many generations to come.
6. It is also important to explore what is meant by teaching excellence. It is not the same as student satisfaction. At its best, education in universities is mind expanding and horizon stretching. It is often not comfortable and many of the activities which are most profoundly educational are also deeply uncomfortable for students. For example many students find working in teams hard because they have been brought up in a very individual-focussed education system (either in the UK or internationally). However such activities are deeply formative because it is through such experiences that students develop judgement; a quality of huge value in the workplace but also to society more widely. Teaching excellence is about more than teaching delivery, it includes; curriculum design and development, learning resources (both within department and at university level), student support (pastoral and welfare support both within the department and at university level), learning experience, quality assurance and student achievement. In engineering it also includes achieving professional accreditation standards which are internationally recognised. For example, for learning experience, an academic can deliver a lecture brilliantly, and students may report high levels of satisfaction but if the content is wrong then we are not serving the students well.
7. The Academy welcomes the proposal that the TEF be introduced to all forms of HE provision and that government is exploring the use of the TEF with the devolved administrations. However, care needs to be taken to distinguish different forms of provision in the TEF. The Academy also welcomes that postgraduate study will be included in the TEF at a later date. Thought should also be given to the education and employability of those students undertaking postgraduate research. In the interim, the TEF should clearly indicate that the measure is for first degree study only.

TEF years one and two

8. The Academy recognises that government is keen to get the new TEF underway and sees the use of current QAA reviews as a useful starting place. The proposals for a successful QAA appear sensible. It is necessary however to ensure that incentives are open to alternative HE providers which do not undertake QAA reviews to ensure fairness across the sector. The Academy also welcomes the proposed technical consultation in 2016 to cover operational detail of metrics and assessment criteria etc. for the higher levels of the TEF to be awarded from year 2 onwards.
9. To minimise the burden and bureaucracy on institutions, the Academy would like to see the TEF use the same metrics and indicators as the QAA process to provide comparable data between institutions.

10. However, a fundamental issue with the TEF in year one is that it will be a single measure for a whole educational institution, rather than by discipline. This is unlike the Research Excellence Framework which measures subject areas individually across institutions. A TEF score for an entire university will not provide any meaningful data to students applying for specific degree programmes. The Academy questions any value of the institution-based measurement and suggests moving directly to a discipline level TEF assessment.

Aspects of teaching excellence

11. The Academy agrees with the government's recognition that there is a complexity to measuring teaching quality and excellence. However, we are uncertain whether the three criteria proposed (teaching quality, learning environment, student outcomes and learning gain) will achieve the necessary outcomes. It is essential also to ensure that the TEF does not create unintended consequences of behaviour and that metrics are applied with the necessary contextual understanding.
12. For example, under 'teaching quality' the green paper suggests that courses, curriculum design, teaching and assessment are effective in developing all students' knowledge and skills. While at first sight this appears sensible, in practice it is likely to be very difficult to measure whether this has been achieved without individuals having years of employment experience to reflect on their knowledge and skills acquired. Universities have to specify course outcomes and measure teaching delivery against these outcomes. These course outcomes need to be designed with a degree of sophistication to ensure the stretch and challenge of which should be at the centre of university education.
13. The 'student outcomes and learning gain' criterion also has potential serious flaws. The metrics proposed such as Destinations of Leavers of Higher Education (DLHE) data will need to be treated with particular care. For example, the location of particular universities is likely to impact on graduate earnings and employment prospects – particularly for those institutions which attract local students who cannot afford to leave home while studying.
14. DLHE data needs to be treated with a degree of caution. There are variations across subject areas, there is some evidence that because of the high contact time in engineering that some students delay looking for a graduate level job until after graduation. This then affects the 6 month DLHE data. The Academy's recent but as yet unpublished analysis of DLHE after 3 years shows very good employment outcomes of engineering graduates.
15. The use of National Student Survey (NSS) also raises some concerns. There have been suggestions from members of the engineering HE community that students tend to provide lower scores for subjects they perceive as difficult in the NSS. Analysis of the 2013 NSS data shows that engineering as a subject, in general, has an overall lower satisfaction rating than a range of subjects including history and philosophical studies, combined honours, languages and law.⁴ Yet the employment, salary and productivity outcomes for engineering graduates are substantially higher than those from other subjects.

⁴ National Student Survey data, HEFCE, 2013, <http://www.hefce.ac.uk/analysis/nsstrend/differencecore/>

16. Many of the issues focussed on by students in the NSS can be rather short-term and can also at times be about making life 'easy', but universities must focus on truly excellent education. This should require stretch and challenge, and indeed the capacity to 'take pains' and to strive when faced with setbacks. There is significant value in the NSS but it must be interpreted for what it is – an indicator of satisfaction and not fundamentally of the quality of the education.
17. In addition, the very nature of the NSS raises some questions. Students only undertake their studies at a single institution and as there is no standard against which to measure the student satisfaction for different institutions, it is questionable whether the NSS can properly compare performance of Higher Education Institutions (HEIs).
18. Taking the above into account, the Academy strongly favours the proposal in the green paper that the TEF will consider institutional evidence of excellent teaching.
19. The engineering profession already has a measure of teaching, curriculum and expected student outcomes through its well-formed accreditation process. HEIs apply to Professional Engineering Institutions to have degree programmes accredited to a standard set out by the Engineering Council. The accreditation process provides a structure against which engineering departments assess, evaluate and improve the quality of their degree programmes. Accreditation is undertaken by a panel of Professional Engineering Institution members including academics and employers. Degree accreditation acts as a useful signal both to prospective students and employers about the quality of the course. It is also outcome-driven rather than input-based; universities that have accredited engineering degree courses all meet a required output standard for the engineering profession and this provides good social mobility for students across all institutions with accredited programmes. A detailed mapping of the Engineering Council's standard for HE undergraduate accreditation against the TEF proposals can be found in the submission to the consultation from *Engineering the Future* the alliance of the professional engineering institutions.⁵ This is also benchmarked internationally via the Washington Accord.⁶
20. Where mechanisms such as professional accreditation of degree programmes exist, for engineering and other subjects (such as architecture), HEIs should be able to use accreditation status as evidence to support their submission, rather than undertaking unnecessary and burdensome duplication of effort. For example, those HEIs which have Engineering Council accreditation will have already demonstrated employer engagement in curriculum design through Industrial Advisory Boards and other mechanisms. Laboratories and other learning environments are also inspected as part of the accreditation process. However, the accreditation does not take into account other aspects of teaching quality such as pedagogical innovation, contact hours etc.
21. As part of the TEF measures, the Academy would like to see institutional evidence of progression of academic staff who demonstrate commitment to improving teaching and learning. As highlighted above, many institutions have been working to more formally embed teaching excellence in academic promotion procedures. Teaching excellence

⁵ Engineering the Future submission to the HE green paper

<http://www.engineeringthefuture.co.uk/government/default.aspx>

⁶ For further information on the Washington Accord, see <http://www.ieagreements.org/Washington-Accord/Accredited.cfm>

must be seen in all its aspects as academics have a variety of strengths; some having great capacity to deliver brilliant lectures, some are strong on curriculum development and others good at pastoral support and small group teaching. Others bring great strength as academic and programme leaders. The TEF needs to recognise this variety of strengths.

22. Academic staff, both those undertaking teaching and research and those employed on a teaching only basis would need to demonstrate their contribution, quality and impact in teaching and learning through some agreed mechanism. This could be achieved through the Higher Education Academy (HEA) professional standards framework.
23. In addition, for the past six months the Academy has been developing a tool that enables academic staff to demonstrate their contribution to teaching. In the Academy's new report *Does teaching advance your academic career? the teaching evaluation template*⁷ due to be published in late January 2016, the template defines four progressive levels of teaching achievement expected by Academics. The template also provides the criteria underpinning the progression to each successive level of teaching achievement. The template itself has not created new tools for measuring teaching quality, but rather brings together a range of measures based on best practice *across the world* under a single template. It can be used by universities and staff to define and evaluate teaching achievement at various stages of academic progression. The template draws on feedback from the international academic community, education research and good practice globally. Importantly, it has been designed for application across all disciplinary, institutional and geographic contexts. The template is now being evaluated and piloted by an international consortium of universities. The Academy will submit the template to BIS in late January for consideration as part of its ongoing work with the TEF.

Social mobility and widening participation

24. The Academy welcomes the government's emphasis on social mobility and widening participation. We are committed to improving diversity, equality and inclusion in the engineering profession. The engineering profession suffers from poor diversity, particularly among women, black and minority ethnic (BME) groups and those from socially disadvantaged backgrounds. Yet engineering offers good employment prospects and social mobility - this is reflected in the professional standards beginning at level 3, with the EngTech professional qualification.
25. The Academy therefore welcomes new and additional routes that open up access to higher education to groups which are currently under-represented both in engineering and in HE more generally. Degree apprenticeships may offer an alternative mode of provision for individuals wishing to pursue higher qualifications while in work. The best technical apprentices have the potential to make excellent professional engineers - money spent on Degree Apprenticeships would be money well spent and the Apprenticeship levy may indeed increase interest with employers through this route. However, the scale of the challenge of increasing student numbers should not be

⁷ Does teaching advance your academic career? A template for measuring teaching excellence. Royal Academy of Engineering. To be published in January 2016. www.raeng.org.uk/evaluatingteaching

underestimated. Currently there are very few engineering apprenticeships above level 3 in England. Current numbers for engineering/manufacturing higher apprenticeships at level 4 and above are less than 500, so the success of this approach in addressing social mobility and widening participation will depend on the demand both from employers and individuals.

Part B: The higher education sector

26. The Academy is content with the government's aspiration to open up the HE sector to new providers, provided that the principles of maintaining quality and protecting students remain. The high cost of provision of laboratory based subjects such as engineering will likely be a barrier to significant new entrants to engineering higher education, however new institutions developing innovative new forms of teaching such as the proposed NMITE⁸ (University of Hereford) should find it easier to establish provision with the single route into higher education as laid out in the green paper. In addition, the removal of barriers for new entrants may result in an increase in industry led provision.

Part C: Simplifying the higher education architecture

27. The ambition to simplify the higher education architecture is sensible. However, the Academy does have concerns that the disbanding of the Higher Education Funding Council for England (HEFCE) will lead to a serious gap in the connection between teaching and research resulting in a negative impact for both aspects of HE activity. It is essential to recognise that the two aspects of academic activity are delivered by the staff in the same university departments; and having two different sets of bodies providing oversight is a real concern.

28. The need to keep teaching at the cutting edge of disciplinary knowledge is paramount and therefore research-led teaching is essential. The green paper recognises this and clearly sets out an intention to stimulate greater linkages between teaching and research as government recognises the mutual benefits between teaching, scholarship and research. However, having a single body overseeing both these elements of HE activity provides greater connectivity between the two. Further detail on the importance of HEFCE's continuing role in maintaining links between teaching and research is presented in part D.

29. Some subjects are strategically important for the nation and HEFCE has had a role in ensuring these subjects are sustainable – in particular the use of a premium for high cost subjects. The Academy would strongly emphasise the importance of this funding for engineering.

30. The Strategically Important and Vulnerable Subjects (SIVS) advisory group of HE and industry representatives plays an important role in ensuring that subjects of strategic importance maintain an adequate supply of graduates to the economy and society.

⁸ New Model in Engineering and Technology <http://nmite.org.uk/>

Part D: Reducing complexity and bureaucracy in research funding

Funding

31. The Academy strongly welcomes the Chancellor's commitment to protect the UK science budget in real terms and is also pleased that Innovate UK's budget will be maintained in cash terms. We comment further on the settlement for Innovate UK below.

Global Challenges Fund

32. The Academy welcomes the establishment of the Global Challenges Fund and, more generally, the increased proportion of Official Development Assistance (ODA) that is now being deployed by the UK in support of research, engineering and innovation. Engineering research and innovation has a pivotal contribution to make towards tackling the problems faced by developing countries, from rapid urbanisation to food insecurity to inadequate access to safe drinking water and sanitation. The Academy, along with the other National Academies, has already offered to support BIS in developing the governance and guidance for the Global Challenges Fund and looks forward to doing so.

Research

Research UK

33. The overarching recommendation from the Nurse Review of the Research Councils is the creation of Research UK (RUK), an evolution of Research Councils UK (RCUK) into a strengthened body, which will work across the seven Research Councils. It is intended that RUK will take responsibility for cross-Council strategy, provide a stronger and more coherent voice in communications with government and simplify transactional operations, reducing the administrative burden on the Councils. While these are all desirable aims further clarification is required about many aspects of the proposed role, structure and modus operandi of RUK.

34. The Academy agrees with Nurse's intention that the individual Research Councils should continue to hold their own budgets and provide leadership for their own disciplines with significant autonomy. This should also include the means to effectively manage their institutes and other major components of their infrastructure.

35. Although the intention is for RUK to be the umbrella body for the majority of publicly funded research in the UK, it will be important to remember that a significant proportion of UK research will not be administered through RUK. For example funding from government departments, charities, European and international sources, National Academies and the private sector, will be administered through other routes. Thus government must not be misled into thinking all strategy in relation to research needs to be operated through RUK; other major funders clearly have a role to play and mechanisms must be in place to allow them to engage in relevant strategic decisions. It is possible that this could be achieved in part through representation on the Ministerial Committee.

Reallocation of Research Councils budgets

36. The Nurse Review of Research Councils recommends reallocation of budgets between Research Councils when necessary, to promote agility in response to new developments in science. Although it is important to be able to review the budget allocations to individual Research Councils, the Academy strongly believes that transparent principles should be drawn up to determine the circumstances under which redistribution would be warranted and the mechanism by which this would be implemented. It will also be crucial that the wider research community has visibility of the process and principles to be used so confidence in the system is maintained and uncertainty is minimised.
37. Careful consideration should be given to the importance of long-term stable funding, which allows the Research Councils to develop long-term strategies and fund a diverse portfolio of research and innovation with confidence.

Bureaucracy and administrative burden

38. The Academy recognises that the creation of RUK offers the opportunity to reduce the administrative burden of the Research Councils, in part through simplification; however it cannot be assumed that a reduction in burden will automatically arise as a result of the new arrangements. Considerable efforts will be required to ensure that the creation of RUK does not increase bureaucracy by adding an extra layer in the management chain. In addition, it will be important to ensure that in transferring administrative functions to RUK, the capability and capacity of the individual Councils to effectively lead their disciplines is not undermined. Changes to the administrative burden of Research Councils should be framed as a means to improve the administration of research rather than as an exercise in reducing administrative burden.
39. Simplification, as acknowledged in the Nurse Review, was the overarching recommendation in the Dowling Review of Business-University Research Collaborations, and the Academy believes that Nurse's approach of implementing 'schemes which are simpler, clearer, and where appropriate, consistent and common across Research Councils and Innovate UK' will yield substantial returns.⁹ It will of course be essential for any simplification or consolidation to be undertaken in a way that is sensitive to any genuine differential needs between the Research Councils: in some instances different approaches will be required. It will also be important to ensure that administrative and governance changes don't stifle the opportunity for innovation within the Research Councils.

Interdisciplinary and Multidisciplinary Research

40. The Academy welcomes the recognition in the Nurse Review of the importance of establishing mechanisms to deal with cross-cutting issues such as support for multidisciplinary and interdisciplinary research. The world is facing ever more complex challenges, and often the research and innovation that is required to solve these problems occurs at the interface of disciplines, therefore multidisciplinary and interdisciplinary research are growing in significance. In the experience of the engineering community there is still significant room for improvement in the facilitation and support available for interdisciplinary and multidisciplinary research and

⁹ Dowling Review of Business-University Research Collaborations, 2015, <http://www.raeng.org.uk/policy/dowling-review/the-dowling-review-of-business-university-research>

researchers, so the creation of RUK provides a valuable opportunity for progress to be made.¹⁰

41. Indeed RUK has the potential to substantially improve the facilitation and support of interdisciplinary and multidisciplinary research. Greater oversight of the Research Councils should result in better sharing of good practice and ultimately inform a more strategic approach to cross-Council working. RUK will also be well placed to look for opportunities for collaboration and proactively encourage their formation, as well as ensuring that any gaps between Councils are identified as early as possible. However, it is important to consider that excellent interdisciplinary and multidisciplinary research is built upon a foundation of excellence based in single disciplines.
42. The creation of a 'common research fund' held at the level of RUK to cover interdisciplinary and cross-cutting work is welcome, though care should be exercised to ensure that the existence of the fund does not result in individual Research Councils decreasing their support for interdisciplinary and multidisciplinary researchers, both within the confines of a single Research Council and between Councils.

Governance

43. To appropriately support the restructured research and innovation landscape, a new set of governance structures will be required. In parallel with establishing new governance structures the Academy would encourage government to give greater clarity regarding how the UK's research and innovation agenda will be defined and set under the new arrangements.
44. Nurse suggests that the Chief Executive of RUK 'should be a highly distinguished scientist, capable of delivering a managerially efficient organisation and of interacting effectively with Government'. The Academy believes the criteria should focus less on scientific distinction and more on breadth and relevance of knowledge and understanding across the spectrum of research, innovation and business, especially if HEFCE research functions and Innovate UK are integrated into RUK. This focus on breadth and relevance of knowledge and understanding should also extend to the representatives on the RUK Board.
45. The Academy strongly supports the creation of a Ministerial Committee to facilitate a sound dialogue between the Research Councils and senior ministers beyond BIS, including in HM Treasury. It also offers the potential for research and innovation to be embedded more effectively throughout government. Understandably, the wider research and innovation community is seeking reassurance that the creation of the committee will not result in the creeping erosion of the Haldane principles over time or inappropriate control of RUK.

Innovation

46. Innovation is diverse and stretches far beyond the traditional view of commercialisation of a discovery resulting in a marketable product; innovation can also derive from developments in design, business models and mechanisms of service delivery. Innovation is instrumental in delivering the economic and productivity gains associated

¹⁰ Royal Academy of Engineering's Response to the British Academy's consultation on Interdisciplinarity, 2015, <http://www.raeng.org.uk/publications/responses/interdisciplinarity-response>

with investment in research, and offers a key route to developing new tools and approaches for tackling major societal challenges and improving quality of life. Consequently it is essential that investment in innovation and associated innovation support mechanisms are considered in tandem with investment in research, even though much innovation investment is outside of the 'science ring-fence'.

47. As the Academy outlined in its recent report *Investing in Innovation*, the UK has many innovation assets; the challenge for government is to ensure that there is an overarching vision and a coherent, stable and strategic policy framework that enables these to act effectively in concert over the long term.¹¹

Innovate UK

48. According to the Autumn Statement 2015 the government will 'look to integrate Innovate UK into Research UK', which goes further than Nurse's recommendation that this option should be explored. This announcement came as a surprise and has generated significant disquiet among the engineering community, exacerbated by the lack of both prior consultation and detail accompanying the announcement. Consequently the community is keen to understand the rationale for this proposal and seeks reassurance that the following questions have been, or will be, addressed, with engagement of relevant stakeholders prior to any final decision:

- What is the case for Innovate UK moving into RUK?
- What benefits are anticipated?
- How will the risks and disadvantages be mitigated or managed?

49. Closer communication and collaboration between the Research Councils and Innovate UK will undoubtedly be beneficial, as has been acknowledged in the Dowling Review, the Nurse Review and by the government. Closer interactions between the two organisations could further strengthen the offering for collaborative R&D and innovation support and help to bridge the valley of death by enabling a more seamless transition between the funding agencies for high-quality research with strong commercial potential.¹² The Catalyst and Collaborative R&D schemes already demonstrate the type of success that can be achieved when Innovate UK and the Research Councils work together effectively. However the role of Innovate UK is far broader than research commercialisation.

50. The primary focus of Innovate UK is to incentivise business-led technology innovation, through funding, supporting and connecting innovative businesses via a mix of expertise, facilities, networks and programmes to accelerate sustainable economic growth.¹³ To achieve its aims Innovate UK requires a close connectivity to its primary customer base of businesses and entrepreneurs, and an understanding of markets, supply chains and mechanisms of business growth. Proximity to research is also important, but an effective innovation agency which is business-facing should not solely

¹¹ Investing in Innovation, Royal Academy of Engineering, 2015, <http://www.raeng.org.uk/publications/reports/investing-in-innovation>

¹² Dowling Review of Business-University Research Collaborations, 2015, <http://www.raeng.org.uk/policy/dowling-review/the-dowling-review-of-business-university-research> and Royal Academy of Engineering's submission to the Nurse Review of Research Councils, 2015, <http://www.raeng.org.uk/publications/responses/nurse-review-of-research-councils>

¹³ Innovate UK's strategy Concept to commercialisation, 2011-2015, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/360620/Concept_to_Commercialisation_-_A_Strategy_for_Business_Innovation_2011-2015.pdf

depend on the push from research and technology: the pull from businesses, customers and markets is also critical.

51. Furthermore, the Academy is concerned that there is a risk that Innovate UK will struggle to be an effective voice for innovation if it is integrated into RUK. It is reasonable to expect greater commonality of interests and concerns between the seven Research Councils than with Innovate UK, thus the voice of innovation could become comparatively weak during discussions at the strategic level. This calls into question how feasible it is for Innovate UK to retain its business focus if it is integrated into RUK, despite the government's assurances.
52. If the government intends for Innovate UK to remain as the UK's innovation agency, integrating it into RUK would be both confusing and misleading, particularly to the business community. Inclusion within a body called 'Research UK' where all the other component entities focus on research will inevitably give the impression that the primary objective is to enhance the commercialisation of Research Council funded research. If it is indeed government's intention that Innovate UK should adopt this focus, clarification is urgently needed regarding how the other elements of Innovate UK's role will be fulfilled. It should also be noted that the inclusion of Innovate UK within RUK would add considerable complexity to an already complex organisation, which may pose substantial governance and operational challenges.

New Finance Products

53. Innovation is a risky process, often with uncertain outcomes and with benefits that may only materialise over very long timescales. There is currently little detail about the nature of the new financial products proposed but it is assumed that they may include loans of some kind. Loans tend to be used when there is a reasonable degree of certainty of financial return and are thus likely to be most suitable for supporting innovations that are relatively advanced. Serious concerns exist about whether loans will be effective in stimulating and supporting the type of high-risk and disruptive innovation that has previously been part of Innovate UK's portfolio.
54. While there is an established evidence base regarding the effectiveness of grants for encouraging applicants to engage in various stages of innovation, we are not aware that comparable evidence exists to support the effectiveness of loans in stimulating business investment in high-risk innovation.¹⁴ Even if new financial products are well designed and targeted to the most appropriate types and stages of innovation, the findings of the Dowling Review suggest that businesses, especially SMEs, could be deterred by the perception that the funding landscape is now even more complex, in addition to holding concerns that accepting a loan rather than a grant may make the company less attractive to downstream investors.¹⁵
55. Careful thought and extensive stakeholder engagement will therefore be required when designing and implementing the new finance products to ensure that in practice they deliver the intended impacts for the UK. It is also not clear that Innovate UK is the

¹⁴ Estimating the effect of UK direct public support for innovation, BIS, 2014, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/369650/bis-14-1168-estimating-the-effect-of-uk-direct-public-support-for-innovation-bis-analysis-paper-number-04.pdf

¹⁵ The Dowling Review of Business-University Research Collaborations, 2015, <http://www.raeng.org.uk/policy/dowling-review/the-dowling-review-of-business-university-research>

appropriate body to engage in loan-making which would require different skills sets, structures and governance to an organisation that primarily engages in grant-making.

56. The Academy further notes that an additional challenge posed by the diversion of grant funding into new financial products is the lack of 'headroom' in Innovate UK's budget that may prevent it from being able to issue new commitments in the ensuing few years, depending on the rate at which the move to new financial products is expected to occur. Innovate UK now has a broad base of support amongst the engineering and business communities and reassurance is needed from government that the important progress made over the previous parliament is not going to be eroded by these new developments.

Industrial Strategy

57. As outlined in the Academy's response to the Science Budget, the Academy has been strongly supportive of the development of the modern industrial strategy in the UK since it provides a welcome signal to business (both domestic and overseas) that government is committed to providing a stable policy framework for key sectors and technologies.¹⁶ Consequently the Academy was pleased to note the reaffirmation and announcement of continued support for the industrial strategy in the Chancellor's Autumn Statement 2015 speech. It is understood that the government will be providing over £1 billion additional funding for innovation in the aerospace and automotive sectors over the next 10 years. Further clarity regarding support for the other strategy sectors would be welcomed, as would confirmation that the industrial strategy is supported across government. In the absence of clear messaging from government there is considerable risk of momentum being dissipated.

58. Similarly the Academy has also welcomed the focus brought by the identification of the Eight Great technologies, and would like to see how the momentum they established will be continued.

HEFCE

Research and Teaching

59. The HE green paper sets out proposals to restructure the HE landscape with the intended aim of putting students at the heart of the HE system. Central to these proposals is the relocation of the teaching functions from HEFCE into the new Office for Students (OfS). Consequently, HEFCE as an organisation will be disbanded, although it is envisioned that many of its functions, both teaching and research, will transfer to other bodies. The proposals will see teaching and research housed and administered by two separate bodies, the OfS and RUK. The Academy is concerned that the separation of research and teaching could potentially have a negative effect on research, innovation and skills (the impact of teaching is discussed in part C).

60. HEIs have institutional strategies that include both research and teaching, buildings are designed to house both teaching and research functions, and staff and students engage in both teaching and research activities. The interactions between teaching and research are frequent, often inseparable and complementary. Although the green paper

¹⁶ Royal Academy of Engineering's submission House of Commons Science and Technology Science Budget Inquiry, 2015, <http://www.raeng.org.uk/publications/responses/science-budget-inquiry>

acknowledges that 'research and teaching should be recognised as mutually reinforcing activities', it is unclear how this will be facilitated in England if there is no single organisation taking an overview of both teaching and research, a role HEFCE used to fulfil.

61. A seamless link between teaching and research is also critical to ensure the UK's skills pipeline is viewed in its entirety; an adequate supply of skilled people is vital for innovation.¹⁷ A joined up approach spanning both teaching and research will be necessary to address the UK's engineering skills crisis. To ensure the UK has a sufficient number of appropriately skilled people who can help make the UK an innovation leader, monitoring and strategic planning across the spectrum of teaching and research through institutional, regional and national approaches will be required and the Academy encourages government to ensure an appropriate mechanism is in place to enable this.

Dual support

62. The UK's world-class research base has been funded for many years by the dual support system that combines a mix of competitive project funding (through Research Councils) and long-term support through formula based quality-related research (QR) funding. The Academy, in agreement with both Nurse and Jo Johnson MP, Minister for Universities and Science, believes that this dual support funding mechanism has contributed to the UK's research success and should be continued. As HE is a devolved matter, the allocation of QR funding is carried out separately by each of the four Funding Councils of the UK. Consequently the disbanding of HEFCE means a decision will have to be taken as to where the administration of QR funding for England should now be housed. As acknowledged in the HE green paper if the QR function is to be administered by RUK, both streams of the dual support mechanism would be operated within a single organisation, resulting in a number of implications.

63. The most significant benefit for operating both streams of the dual support mechanism within one body is likely to be the potential for increased strategic oversight by RUK, while reduced administrative costs and improved coordination between the deployment of capital and resource spending may also be beneficial. Conversely, there are concerns within the engineering community that QR funding risks drifting from its original purpose of supporting research infrastructure and allowing universities to seize opportunities, to being subsumed into competitively awarded research project funding, either due to a change in policy or due to an expectation that QR funding should be used to 'top-up' incomplete research project funding. The Academy would favour the establishment of appropriate safeguards to ensure that this cannot happen in the event that dual support is to be operated within a single organisation.

64. Unlike the competitive project funding which is administered UK-wide by the Research Councils, the QR funding administered by HEFCE is only applicable to England. Therefore it is possible that RUK will be administering a mix of devolved and UK-wide functions. While it is essential to ensure there is strong representation of the devolved administrations in the governance of RUK, this may not be appropriate for matters concerning QR funding in England. This further complication would require sensitive and

¹⁷ Innovation matters: Reviving the growth engine, McKinsey&Company, 2013, http://www.mckinsey.com/global_locations/europe_and_middleeast/united_kingdom/en/latest_thinking

appropriate handling, and further clarification of processes within the devolved administrations may also be helpful.

65. Once again it will be essential to ensure transparent and effective communication of the new arrangements, and the safeguards embedded within them, to meet the scrutiny from the research and innovation community.

Higher Education Innovation Funding

66. HEFCE has a significant role in supporting innovation, business-university collaboration, and knowledge exchange at the institutional level in England through a number of different mechanisms which are implemented across the spectrum of teaching and research, including the Higher Education Innovation Funding (HEIF). HEIF is intended 'to support and develop a broad range of knowledge-based interactions between universities and colleges and the wider world, which result in economic and social benefit to the UK'.¹⁸ HEFCE allocates HEIF on the basis of performance to universities in England which have achieved certain threshold levels on a variety of income measures as a proxy for impact of knowledge exchange.

67. HEIF is an important and much valued funding mechanism for supporting universities' capacity to engage with businesses. The flexibility of HEIF and the speed with which universities can direct the funds to areas of demand makes it vital as a means of stimulating translational activity and collaboration. The Dowling Review highlighted the crucial, yet diverse, roles that HEIF plays in underpinning university knowledge exchange, including providing the funding on which many Technology Transfer Offices rely.¹⁹ Furthermore the impact of HEIF funding has been proven, with an estimated £6.30 gross additional income for universities for every £1 invested over the period 2003-2012.²⁰

68. The Academy would like to see this vital funding stream preserved. The current absence of communication regarding its future is unhelpful and clarity by the research and innovation community is sought.

Research Excellence Framework

69. The Academy is strongly supportive of the REF, including the introduction of the assessment of impact for REF2014, and has reservations regarding the idea that the same quality of assessment could be achieved for engineering research if there was a greater dependency on metrics. The Academy intends to respond in full to Lord Stern's Review of the REF's call for evidence when it is opened.

¹⁸ University HEIF strategies, <http://www.hefce.ac.uk/kess/heif/strategies/>

¹⁹ The Dowling Review of Business-University Research Collaboration, 2015, <http://www.raeng.org.uk/policy/dowling-review/the-dowling-review-of-business-university-research>

²⁰ Knowledge exchange performance and the impact of HEIF funding in the English Higher Education Sector, HEFCE, 2014, <http://www.hefce.ac.uk/pubs/rereports/Year/2014/keheifimpact/Title,92166,en.html>