Building on Success and Learning from Experience

An Independent Review of the Research Excellence Framework

July 2016

Contents

Foreword

This independent review of the Research Excellence Framework was commissioned by the Minister of Universities and Science, Jo Johnson in November 2015, and announced by the Chancellor as part of his Autumn Statement. We are grateful for the encouragement of Jo Johnson and are happy to submit the report to him.

It was guided by a distinguished Steering Group drawn from across academic disciplines, all of whom possessed great experience in past research assessment processes.
It benefited from the valuable support of an Advisory Group from across the UK and all types of institution.

BEIS appointed consultants Technopolis who undertook a comprehensive literature review and advised on international comparators for the REF exercise and how they worked.

The views and evidence provided by the community have been vital in shaping this review, through over 300 responses to the Call for Evidence; 40 interviews with universities, academics, research users and intermediaries; and a small number of stakeholder meetings.

The Steering Group played a strong and participatory role in producing this report. They support the principles and the broad thrust of the recommendations set out in in the report. They participated in their personal capacity and not as representatives of their institutions and disciplines.

This work has received outstanding support from an excellent team at BEIS led by Helen Cross, working with Sheila Honey, Patrick Abbey, Hannah Ledger and Tanya Gurung, and wise advice from Vicky Jones at HEFCE, and I owe them a great debt.

Lord Nicholas Stern

1. Introduction

1. Societies which invest in ideas and research are generally more creative, more productive, more resilient, more open, more profound and more equipped to face and understand challenge. They are better places to work, to live and to think: stronger, deeper and more dynamic communities. Whilst creativity, ideas and questioning are of value in their own right, economies and societies which invest more in research generally show faster rates of growth in output and human development. Whilst the UK spends less as a proportion of GDP on research and development than some of its counterparts, the productivity of that investment is very high. It is important to the future of the UK economy and society that this productivity of research, across all its dimensions, is maintained and increased.

2. One of the drivers of the UK's success in research is the provision of both competitive grant funding for proposed future research projects and programmes and a long-term, stable block grant that allows universities to invest strategically in research in ways which foster its future development. This is our 'dual support' system. Both investment streams must focus our limited resources on excellent research. This is why it is vital that the block grant, or quality-related 'QR' funding, is driven by an assessment of quality[1]. The Government has made clear its commitment to this dual support system, with proposals before parliament to enshrine this key principle in legislation for the first time.[2] The two strands of the dual support system are essential, intertwined and mutually supportive.

3. Focussing QR funding on excellence should, in large measure, be based on strong evidence of excellence in past performance. That means examining carefully what use universities and research institutions have made of their resources in terms of the assessed excellence of their research. Therefore we need a research excellence framework, a REF.

4. However, it is clear that the costs and burdens of the current exercise – both in money and in human resource – have been rising, with the estimated costs growing from £66m for the 2008 Research Assessment Exercise (RAE) to £246m for the 2014 Research Excellence Framework. The importance of research for the UK's society and economy, the need for excellence and the concerns for these costs and burdens prompted the government department responsible (then BIS), the minister in charge of research, and the Chancellor of the Exchequer to commission this report with the rubric of how to make a REF more effective and efficient in identifying and fostering excellence whilst keeping down costs, and reducing the burdens and distortions of the processes employed to these ends.

[1] This funding, based on research excellence, is provided in all four nations of the UK, although it takes different forms.
[2] BIS (2015) Success as a Knowledge Economy, teaching excellence, social mobility and student choice. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/523546/bis-16-265-success-as-a-knowledge-economy-web.pdf

5. Given this task and recognising the importance of research to the UK's economy and society, this report will examine and present:

   - The purpose and benefits of the REF
   - The problems and issues that arise from the current system
   - Principles and high-level recommendations for shaping future exercises
   - Our vision for the future of the REF within the proposed organisation, UK Research and Innovation (UKRI) and a programme for implementation of the recommendations.

   There are also brief discussions of REF2014 (Appendix A), the history of earlier assessments in the UK (Appendix B), and international experience (Appendix C). A summary of the findings from our Call for Evidence are in Appendix D.

6. We start by setting out some basic assumptions. They are our point of departure:

   - The dual support system including a block grant driven by quality is of great value
   - To deliver quality-related research funding we need a REF
   - Past Research Assessment Exercises and the 2014 REF have contributed productively to driving competition and fostering research excellence
   - Impact as a principle is important and, even though it can and should be improved, it made a useful contribution as part of REF2014.

7. The challenge for the Review is to suggest ways forward for the REF that reduce distortions and burdens whilst maintaining and improving incentives for research excellence wherever it may be found. We have also been mindful of the great potential of interdisciplinary research and the fostering of institutional collaboration and possible perceived disincentives to such work within current structures.

8. We have not tried to identify precise formulae or rule structures for each of our recommendations. Our purpose has been to establish clear principles and directions for reform that we are confident can be turned into specific and detailed structures for the next REF. We indicate how the next steps to produce these specific structures could be undertaken.

Our method of work

9. Appendix E provides the Terms of Reference for the review and an account of our method of work.

2. The purposes of the Research Excellence Framework

10. Thirty years ago, the UK became the first country to undertake an assessment of the quality of research undertaken in universities[3]. It remains a leader in the field. The OECD has identified a clear international trend towards more competitive funding with the introduction of performance-based elements in core institutional funding, that is, a move towards regimes with similar characteristics to the UK dual-funding mechanism[4].

11. The four UK higher education funding bodies[5] allocate about £2 billion per year of research funding to UK universities. They aim to support "a dynamic and internationally competitive UK research sector that makes a major contribution to economic prosperity, national wellbeing and the expansion and dissemination of knowledge."[6] The original objective of research assessment was to inform the allocation of that funding. That objective remains central to the REF system.

12. The funding is provided as an unhypothecated block grant to Higher Education Institutions (HEIs) on an annual basis. Such funding is critical to HEIs, enabling them to invest strategically and to maintain their own research capacity. Each individual HEI determines how best to use its allocated funding, allowing it to plan strategically for the long term, to sustain researchers between project grants, and to develop and respond quickly to emerging new areas of research.

13. However, the assessment has other important purposes:

    i. It provides a rich evidence base to inform strategic decisions about national priorities across science, social science, engineering, medicine and arts and humanities research.

    ii. It is an essential tool for accountability and information, showing the outcome of public investment in research and making the case for future investment.

    iii. It can create a strong performance incentive for universities and for individual academics.

    iv. It can be used by universities and other bodies to inform decisions on resource allocation.

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[3] The exercise has been known as the Research Selectivity Exercise RSE), the Research Assessment Exercise (RAE) and the Research Excellence Framework (REF).
[4] OECD (2014) OECD Science, Technology and Industry Outlook 2014, OECD Publishing, Paris. Available: http://dx.doi.org/10.1787/sti_outlook-2014-en
[5] The Higher Education Funding Council for England (HEFCE), the Scottish Funding Council (SFC), the Higher Education Funding Council for Wales (HEFCW), and the Department for the Economy, Northern Ireland.
[6] REF 2014: Key facts. Available: http://www.ref.ac.uk/media/ref/content/pub/REF%20Brief%20Guide%202014.pdf

v. It provides a periodically updated reputational benchmark, which is based on rigorous peer judgement by fellow academics.

These purposes span benefits to Government, to institutions and to funding agencies, charities and businesses making choices about where to make investments.

Benefits of the REF

14. The 'burden' of REF is rightly a matter of concern. Institutions understand that there is a cost in the planning, assessing and preparation for submission to REF. However many respondents to our consultation stated that research and the HE sector would be poorer without it and that largely the benefits far outweigh the costs. In other words, whilst it can be improved, it has broadly speaking been serving its purpose.

15. Feedback gathered from institutions which participated in REF2014 confirmed that they consider that it acted as a driver of research quality, and raised the profile of research activity within institutions[7]. Studies have demonstrated how the new impact element of the REF has contributed to an evolving culture of wider engagement, thereby enhancing delivery of the benefits arising from research, as captured through the impact case studies[8]. Other feedback confirmed that the approach influences international perceptions, incentivises university leaders to act for long-term success, and that the incentive framework provides reward for strong performance.

16. Many, but not all, universities state that they use the REF intensively to manage research performance as the assessment process and results provide an independent measure and driver of research quality. Universities can get a broad picture of their strengths and weaknesses from the REF results; the external scrutiny and benchmarking complement internal performance management and aid strategic planning and decision making.

17. REF results can also lever opportunities. For example, strong REF performance is required for eligibility to some RCUK Doctoral Training awards and for some research funding calls. The reputational leverage REF provides helps to focus new and existing collaborative research opportunities and enables universities to attract and retain better students. HEIs and business leaders have told us that REF information is sometimes used by companies and public agencies to select collaborators and areas of excellence to invest in.

18. The introduction of impact into REF2014 yielded valuable insights into institutions' wider social and economic activities and achievements. While requiring further thought and fine-tuning, it can help foster institutional strategy to encourage greater societal engagement by researchers and act as a platform for marketing and internal learning.

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[7] Funding Councils (2015) Evaluating the 2014 REF: Feedback from participating institutions. Available: http://www.hefce.ac.uk/rsrch/REFreview/feedback/

[8] RAND (2015) Preparing impact submissions for REF 2014: An evaluation: Findings and Observations. Santa Monica, CA: RAND Corporation. Available: http://www.hefce.ac.uk/pubs/rereports/Year/2015/REFimpacteval/Title,103726,en.html

19. Other benefits of the REF that have been identified in the course of the review[9] include: the impetus to develop improved institutional research management systems, improved marketing and promotional material, improved awareness of equality and diversity issues, improvements in student and staff recruitment, the launch of new strategic partnerships and the strengthening of links with other partners.

Benefits to the UK

20. Much UK research is world-leading and the trend in quality continues in an upward direction, in part driven by and dependent upon the selective allocation of funding. This is demonstrated through external indicators such as citation information, where the UK share of articles in the top 1 percent of cited papers has increased from 11% in 1996 to 16% in 2012.[10]

21. REF has helped to develop research norms and expectations at a discipline level, brought a focus on research quality and excellence, and REF2014 has driven an increased awareness across all research communities of issues of impact. REF raises the awareness of researchers to the rigour, novelty and significance of their research, as well as the importance of international collaborations.

22. Over thirty years the RAE / REF has supported a sustained improvement in the quality and productivity of the UK research base. It is used by universities to attract students, staff and external funding. Over that period, development of the process has delivered an exercise that is credible and transparent. But it has also increased in complexity, with an increasing cost to participating HEIs, to researchers and to those doing the assessment.

[9] This section has been informed by a survey of relevant stakeholders (including Vice Chancellors, Pro Vice-Chancellors, Directors of Professional Services for Research, users and government bodies) undertaken by Professor Hilary Lappin-Scott of the review's Advisory Group, supported by colleagues at Swansea University, to capture information about the wider benefits of the REF.

[10] Elsevier (2013) International Comparative Performance of the UK Research Base, A Report by Elsevier for the UK's Department of Business, Innovation & Skills (BIS). Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/263729/bis-13-1297-international-comparative-performance-of-the-UK-research-base-2013.pdf

3. Problems and issues with the current REF

23. Successive research assessment processes have helped to drive up the quality of research undertaken in the UK. This review has concluded that an assessment of quality of research is vital and serves a number of important purposes.

24. However there are some problematic features of the REF which give rise to costs, burdens and distortions which could be reduced or avoided. They can also give rise to negative and perverse incentives. In this chapter we set out the main problems we have identified with the current REF structure, the burdens or distortions that have been recognised, and explore the rising costs of the REF / RAE exercise.

Costs

25. The REF Accountability review[11] estimated that the total cost to the UK of running REF 2014 was £246m. The report found that the cost of submitting to the REF was 133% more than that of the 2008 RAE.

26. £14m of those costs were those for the four UK higher education funding bodies, and £19m for the panellists' time. The large majority of the costs (£212m) were borne by the HE community in the process of preparing their submissions, including £55m for the impact element.

27. The report notes that the £212m may be an overestimate due to the challenge of distinguishing the cost of REF from 'business as usual'. However, it is clear that to tackle the rising cost of the REF, our focus should be on the factors that have led institutions to undertake practices such as hiring consultants and elaborate mock-assessments to attempt to maximise returns from the REF.

[11] Technopolis (2015) REF Accountability Review: Costs, benefits and burden. Available: http://www.technopolis-group.com/?report=ref-accountability-review-costs-benefits-and-burden

Table 1: A breakdown of the costs to universities in preparing their REF submission, REF Accountability Review 2015

Cost elements	Estimated cost	As a percentage of total submission cost
Central management and coordination	£44M	20.7%
Other central costs (non-pay)	£2M	0.9%
Unit of Assessment review groups and academic champions	£76M	35.8%
Unit of Assessment support staff	£8M	3.8%
Submitted academic staff	£17M	7.9%
Other eligible academic staff (not submitted)	£4M	1.9%
Other staff or consultants (critical friends)	£6M	2.9%
Costs of efforts involved in deciding not to submit to given Units of Assessment	<£1M	0.2%
Cost for impact statements and case studies	£55M	25.9%
Total cost (submission)	**£212M**	

Scope for "gaming"

28. In our call for evidence, we asked about how institutions have "gamed" the REF system. Higher Education institutions will and should have strategies for shaping their research endeavour and recognising excellence. However, we are wary of tactics designed to maximise REF performance that may not be harmonious with the longer-term fostering of quality research and staff development in the sector as a whole.

29. Much of the behaviour identified as gaming was linked to the hiring of staff to enhance institutions' REF returns. This included the recruitment of staff on fractional contracts who were based at institutions abroad and played a very limited role in the UK institutions for which they were submitted; and the movement of staff to new institutions shortly before the REF census date.

30. The recruitment of key researchers close to the REF census date is also an unhelpful driver of asymmetric salary inflation, as institutions compete to attract and retain key individuals.

31. Secondly, concern was expressed about the practice of making a highly selective submission to the REF that does not represent the overall research activity in that area in the institution. Other negative consequences cited were the exclusion of good research staff who do not fit the HEI selection strategy, potentially demotivating some staff, and reducing the completeness of the picture of UK research strength.

32. Lastly, some respondents cited REF impact case study thresholds as a driver of restricted submissions. Some institutions took care to confine the number of (full-time equivalent) staff submitted in order to remain below the thresholds detailed at Table 2 mandating an additional impact case study, with negative consequences for individuals excluded as a result.

Table 2: Number of impact case studies required in REF 2014 submissions

Number of Category A staff submitted (FTE)	Required number of case studies
Up to 14.99	2
15 – 24.99	3
25 – 34.99	4
35 – 44.99	5
45 or more	6 plus 1 further case study per additional 10 FTE

Selectivity

33. Many of the costs on institutions, in terms of the administration of the REF, relate to the need to select individuals who can return 4 high-quality outputs, or where less than four outputs are submitted, in documenting particular individual circumstances.

34. Measures to promote equality and diversity and mitigate the impact of individuals' special circumstances in the REF are vital. HEFCE analysis of staff selection for the REF[12] showed a marked difference between the rate of selection for men and women. 67% of men were selected, compared with 51% of women. Black, Asian UK and non-EU nationals had lower selection rates, and the selection rate for staff with declared disabilities was lower than for those without.

35. In the REF, arrangements were made for enabling staff whose circumstances had constrained their ability to work productively throughout the assessment period, to be returned with fewer than four outputs without penalty in the assessment. These were successful in improving the number of staff submitted with "individual staff

[12] HEFCE (2015) Selection of staff for inclusion in the REF 2014. Available: http://www.hefce.ac.uk/pubs/year/2015/201517/

circumstances" as 29.2% of staff were submitted with less than 4 outputs, up from 12.2% of staff in RAE 2008. However, respondents questioned whether the focus on evidencing individuals' circumstances actually resulted in additional pressure and even distress to those individuals. Some respondents to the Call for Evidence advocated instead exploring how best to reward departments and research units that demonstrate best practice on equality and diversity measures.

Peer Review

36. Responses to the Call for Evidence reiterate the importance of peer review. They argue that, with the exception of some sub-disciplines, metrics capture only some dimensions of output quality. However, applying the 'gold standard' of peer review does depend on panels having a very broad range of expertise and sufficient time to analyse each output in detail. At best, peer review is not a perfect 'measure', and with the time pressures on some REF panels, maintaining consistency and quality of review is very challenging. There is a therefore a trade-off between considering a larger volume of outputs for each unit to provide more accurate benchmarking information, and the accuracy of an exercise based solely on peer review.

Effects on research

37. Our review of the literature and responses to the call for evidence both signal that desire to be included in the REF, and associated pressures from within the institution, could strongly influence academics in their choices about what problems they choose to tackle. This can drive them towards safe topics and short-termism, and a reluctance to engage in risky or multidisciplinary projects, in order to ensure reliable, high quality publication within the REF period, and may be discouraging innovative thinking and risk taking. The nature of the issue makes robust evidence difficult to garner, but there remains a concern that the REF does influence the way researchers design and conduct their work, in ways that sometimes compromises and obstructs long-term, high-risk research endeavours. Such distortions could be of real significance.

38. Finding ways to ensure that the REF can encourage researchers to explore big or fundamental problems, in ways that may not deliver a steady stream of papers or a quick monograph; to deliver academically excellent synthesis of evidence and meta-analysis to support policy making; and to develop game changing ideas that, for example, can lead to the development of new disciplines, or that have significant impact outside their discipline, is a priority.

Interdisciplinarity and Collaboration

39. Interdisciplinary approaches and collaboration between institutions and other sectors can enhance both the academic and socioeconomic creativity and impact of research. Furthermore as universities increasingly commit to addressing complex, intrinsically difficult 'Grand Challenges' of global importance there is a clear recognition that such issues and problems require a range of different perspectives that interdisciplinarity and collaboration can foster.

40. Despite these perceived advantages the Call for Evidence revealed a sense that interdisciplinary work was disadvantaged by the current REF through the disciplinary 'silos' embodied in the Unit of Assessment panel structures[13] and that interdisciplinary work was often regarded less favourably than mono-disciplinary research. Such perceptions may have contributed to the relative underrepresentation of interdisciplinary outputs in RAE / REF compared with the known proportion of such work revealed by other bibliometric surveys of UK interdisciplinary research. In contrast the interdisciplinary contributions to impact case studies featured strongly.

41. Elsevier's report on interdisciplinary research shows that 8.4% of UK-based articles on the Scopus bibliographic database belong to the global top 10% in terms of interdisciplinarity, whilst only 6.4% of REF-submitted outputs fall into this group. This means that only around three quarters of the UK's highest quality interdisciplinary research is submitted to the REF.

42. In HEFCE analysis of the REF2014 data, interdisciplinary research scored similarly to outputs from a single discipline[14]. This suggests that once research is entered into the REF the assessment is undertaken even-handedly. However, we remain concerned that the entry of high-quality interdisciplinary work into the REF may be discouraged; because individual scholars are wary about how it might be perceived or assessed, or because HEIs are cautious about presenting such research, and that disincentives to do such research may be present. This is linked to a wider issue of concern for the community that "'excellence-based' journal rankings exhibit a systematic bias in favour of mono-disciplinary research"[15], which may also disincentivise researchers from participating in interdisciplinary work.

Effects on careers

43. The requirement to return a fixed number of outputs per individual may encourage a focus on 'safer' publication strategies, and this may involve short-termism in individual researchers' research strategies. More generally, the need for HEIs to "optimise" the output grade profiles from REF may lead to a distortion of career choices, where the outputs from researchers who do not produce the requisite number of outputs within the census period are not visible to the REF. This may also lead to the tying of research quality too closely with individual performance as opposed to the team-based research activity that characterises modern approaches to research in many disciplines, and indeed in multi-disciplinary teams. It might also discourage collaboration within departments in individual HEIs.

44. Movement of researchers between institutions should not be discouraged: researcher mobility is important for individual job satisfaction and intellectual development, and

[13] An explanation of the panel structures can be found at Appendix A
[14] Herbert, A. (2014). Available: http://blog.hefce.ac.uk/2014/12/18/research-excellence-in-numbers/
[15] Rafols, Ismael, Leydesdorff, Loet, O'Hare, Alice, Nightingale, Paul and Stirling, Andy (2012) How journal rankings can suppress interdisciplinary research: A comparison between Innovation Studies and Business & Management. Research Policy, 41 (7). pp. 1262-1282. ISSN 0048-7333. Available: http://sro.sussex.ac.uk/39285/

can improve productivity and impact in terms of the number of articles and citations[16]. However, the fact that institutions can make investments (in infrastructure and support for individuals) only to see the research outputs they helped to produce move to another institution is problematic. This type of uncertainty is inefficient in that sound investments are discouraged because the returns to the investments appear elsewhere. It also leads to rent-seeking behaviour as individual researchers seek to revise their employment contracts with institutions just before the census date.

45. As noted above, despite efforts to make allowances for those with "special circumstances", the requirement to submit 4 outputs to the REF disadvantages researchers who seek flexible career structures, whether this is to undertake work with industry or support government in policy making, or who work part-time for example to bring up a family or act as a carer.

Capturing the research environment

46. Research is a long-term process that requires commitment and support. The purpose of the environment assessment is to encourage and reward institutions which endeavour to develop the vitality and sustainability of their research environment, including its contribution to the wider discipline or research base. In the Call for Evidence there was a wide variety of views about how the research environment could be best recognised through the REF.

47. Many respondents felt there was scope for the environment statement to be reworked and simplified. There is a degree of duplication/repetition in HEIs' submissions in the environment template to different units of assessment because of strategies which apply across institutions. Conversely, environment statements representing the different units of assessment sometimes find it difficult to capture institution-wide strategies based around research themes.

48. Unlike research outputs it is generally felt that environment statements might be better suited to using metrics (e.g. the number of postgraduate students per academic; research income per academic; levels of citations for the unit's work) with some arguing that metrics representing the health of the discipline are more reliable than narrative statements in this area.

Impact

49. The responses to the review highlight the importance of the new impact section of REF2014 in broadening and in some ways deepening the nature of the REF exercise, in evidencing the importance of UK research to society, industry, the third sector and policy-makers, and cultural health, and in encouraging scholars to consider different constituencies for their work.

50. Nevertheless a number of issues have been identified. As described above, linking impact case studies to the numbers of individuals submitted to each Unit of

[16] OECD (2013) Researchers on the move: The impact of brain circulation. Available: https://www.oecd.org/sti/researchers-on-the-move-the-impact-of-brain-circulation.pdf

Assessment has added to the burden on institutions. It may also have contributed to (and distorted) the selection of individuals submitted to REF2014. It allows HEIs less freedom to adapt knowledge exchange and impact strategies to different academic units, with some involved more than others in impact activities.

51. The requirement to link impact case studies to key research outputs has meant that potentially very valuable channels whereby the UK's research base impacts on industry, public engagement, and policy advice are not being captured. This may also be a disincentive for universities recruiting individuals from business and other sectors part way through their careers.

52. Although many REF2014 impact case studies showed a degree of interdisciplinarity, the need to link back to research outputs may have constrained the submission of case studies where the impacts arose from collaboration across units of assessment, whether between departments in the same institution or between institutions.

53. Many HEIs argue that their research and teaching activities are closely intertwined. Indeed, some argue that research and teaching are 'jointly produced' and that the economies of scope in this joint production should be recognised in order to avoid the distortion of allocations and career choices, and indeed the strength and effectiveness of the UK academic base.

54. Efforts to capture case studies through which research can be shown to have had a major impact on university teaching might help to avoid such distortions. How a subject is taught, and what is taught in a discipline could be an important indicator of research impact. It will also be important to ensure that the introduction of the Teaching Excellence Framework (TEF) is carefully considered in developing the REF, to ensure that consistent approaches are taken, and that TEF and REF do not incentivise universities to separate inappropriately or dichotomise their research and teaching missions.

Periodicity and dynamism

55. The interval between RAE / REF exercises has varied considerably during the 30 year lifespan of research assessment in the UK. In recent years the interval has been longer, possibly due to the increasing complexity of the exercise and longer periods of evaluation and reflection after each iteration.

56. In the call for evidence there was a moderate level of support for extending the interval between exercises, which would allow the costs involved in undertaking the exercise to be spread over a longer period. The counterargument is that the accuracy of the exercise decreases over the time elapsed since the census date and that dynamic changes to the research system may not be adequately rewarded.

4. Recommendations

57. Over the last thirty years, successive research assessment processes have been associated with improvements in the overall quality of research undertaken in the UK and provided its institutions with significant incentives to direct their resources in pursuit of this aim. This review has argued that an assessment of quality of research is vital, not only to enable the efficient distribution of QR funding, but also for benchmarking, accountability and to support strategic decision making. In other words, REF is useful, and past research assessment has been a positive force in promoting research excellence.

58. Nevertheless, in the preceding chapters we have identified some problems with, and unintended consequences of, the past RAE and REF processes. These have included a significant rise in the cost of the exercise and some important distortions in behaviours of HEIs and the research and career choices of individuals.

59. In this chapter we set out recommendations on the future shape of the REF exercise with the objective of simplifying the REF, reducing the time and cost to institutions and the individuals involved in the process, providing flexibility to HEIs in developing their research strategies and activities, and tackling distortions and perverse incentives to make the UK research base even more productive and impactful. In our recommendations we set out basic principles that we think should shape future REF exercises. Further, we provide suggestions as to how this might be implemented, and indicate where further detail is necessary, including areas which may require further modelling or refinement.

60. We have also made some recommendations relating to the collection and use of REF data by Government and funding agencies so that the efforts of institutions to demonstrate the breadth and quality of their research can better inform strategic decision making.

61. In the responses to the Call for Evidence, the weight of argument was that the broad structure of the REF should not change. We agree that the processes used to assess research excellence - including the measures of output, impact and environment - are well understood by the community and have, broadly speaking, delivered well in their objective to improve quality. Whilst consideration was given to substantially different models (for example through examination of the international comparators at Appendix C) our appraisal is that a substantial reinvention of the REF would increase uncertainty, workload and burden at a challenging time for UK higher education.

62. On balance, the group saw an interval of 5-7 years between exercises as reasonable to provide stability in funding and allowing institutions to plan for the long term, and recognising and rewarding dynamism.

63. There are other matters of detail which we will not address in this report. For example, we think that the number and shape of the Units of Assessment used in REF2014 was about right. We have heard arguments for changes to specific Units of Assessment but believe that this is a matter best left to the funding bodies through consultation with the specific research communities which are likely to be affected.

Similarly we recognise and support the previously announced plans on open access, consistent with government policy and allowing exceptions for monographs.

Staff selection and outputs

64. Selecting who should be included in the REF is a significant factor in an institution's costs. At least as importantly, it can generate problems with career choices, progression and morale. In REF2014 the number of outputs, hence individuals included, scaled with the number of impact case studies submitted. Therefore, exclusion and the associated stigma are being driven by factors that are not wholly related to the quality of an individual's research contributions and potential. Both the literature review and responses to the Call for Evidence suggest that there are long-term consequences to individuals who are not returned in the REF. With these factors in mind we recommend that in future exercises all research active staff are returned in the REF, and allocated to a Unit of Assessment.

65. It is important that all academic staff who have any significant responsibility to undertake research are returned to the REF. A common dataset would support the accurate description of university research and teaching staff assessed in the REF and the TEF.

Recommendation 1: All research active staff should be returned in the REF.

66. We recommend that outputs are collated at Unit of Assessment level, breaking the direct link between the outputs and the individuals returned. The maximum number of outputs that must be returned in each Unit of Assessment will remain a function of the number of staff. However, rather than prescribing the return of four outputs for each submitted staff member with reductions only for agreed 'special circumstances' or early career staff, as was standard in REF2014, a future REF would prescribe maximum and minimum limits on the number of outputs that can be submitted for each individual submitted to a Unit of Assessment.

67. We suggest that in order to maintain the volume of outputs assessed at a similar level as REF2014 - given the increased number of staff to be submitted in the next REF - a maximum total should be submitted be based upon two outputs on average per submitted full-time equivalent (FTE) individual[17]. In other words, all faculty (N)[18] would be returned to a Unit of Assessment, but institutions would be required to submit 2*N outputs for that unit, and would be able to submit more than two outputs for some individuals (up to a prescribed maximum, say six) and less, (a prescribed minimum, potentially none), for others.

68. Flexibility in the number of outputs that may be returned per FTE will ensure that academics with a limited publication record are not required to have a full set of outputs; it will reduce the burden of demonstrating individuals' special circumstances,

[17] We anticipate that certain kinds of outputs will carry double weight, as in REF2014.
[18] We intend N to refer to full-time equivalents throughout. A half-time member of staff would contribute 0.5 to the total N.

and promote inter-sector mobility in keeping with the Dowling Review[19] (i.e. individuals being recruited from industry). Reducing the focus on individual members of staff and instead painting a picture of the submitting unit as a whole will reduce the current consequences for morale of non-submission. It could encourage cohesiveness and productivity within the submitting unit.

69. The workload of the task of assessment of submissions in the REF should not be increased. In the REF2014 exercise the works of just 50,000 academics were assessed, out of a potential population of up to 145,000 research active university staff. Therefore, any consideration of models for the submission of all staff needs to be accompanied by a strong reduction in the average number of outputs submitted per faculty member.

70. The total number of outputs per Unit of Assessment should be adjusted so that total number of outputs to be assessed in the next REF should not significantly exceed the 190,000 reviewed in REF2014. This may require the average number of outputs submitted per faculty member to be below 2, depending on the number of research active staff to be submitted. Further modelling will need to be undertaken to calibrate the total number of outputs to be submitted, and consultation with HESA on data issues.

Recommendation 2: Outputs should be submitted at Unit of Assessment level with a set average number per FTE but with flexibility for some faculty members to submit more and others less than the average.

71. An alternative method of reducing the workload in assessment itself is sampling of outputs by Unit of Assessment panels. While recognising that the outcome of such sampling for many institutions may not change things greatly, some inaccuracies could accrue as a result of sampling. There is also evidence that it would not moderate the overall cost of the exercise as it would not reduce the burden on institutions in selecting outputs (estimated cost in REF2014 £56m), only the burden on panels (estimated cost in REF2014 of £19m). On balance we would not recommend sampling by panels, unless for some small numbers of Units of Assessment subject panels are able to make the case, explicitly supported with reference to robust evidence, that bibliometric data could be used to reduce the workload on panels in assessing outputs. Instead the output selection will be made by institutions. To reduce the burden on panels, outputs should also not be submitted to more than one Unit of Assessment, though the ability to cross-refer should remain.

72. There is a problem in the current REF system associated with the demonstrable increase in the number of individuals being recruited from other institutions shortly before the census date. This has costs for the UK HEI system in terms of recruitment and retention. An institution might invest very significantly in the recruitment, start up and future career of a faculty member, only to see the transfer market prior to REF drastically reduce the returns to that investment. This is a distortion to investment

[19] Dowling, A (2015)The Dowling Review of Business-University Research Collaborations. Available: http://www.raeng.org.uk/policy/dowling-review/the-dowling-review-of-business-university-research

incentives in the direction of short-termism and can encourage rent-seeking by individuals and put pressure on budgets.

73. We therefore recommend that outputs should be submitted only by the institution where the output was demonstrably generated. If individuals transfer between institutions (including from overseas) during the REF period, their works should be allocated to the HEI where they were based when the work was accepted for publication. A smaller maximum number of outputs might be permitted for the outputs of staff who have left an institution through retirement or to another HEI. Bearing in mind Recommendation 2, which recommends that any individual should be able to submit up to six outputs, a maximum of three outputs from those who have left the institution in the REF period would seem appropriate.

74. HEIs hiring staff during the REF cycle would be able to include them in their staff return. But they would be able to include only outputs by the individual that have been accepted for publication after joining the institution. Disincentivising short-term and narrowly-motivated movement across the sector, whilst still incentivising long-term investment in people will benefit UK research and should also encourage greater collaboration across the system.

Recommendation 3: Outputs should not be portable.

Assessment of outputs

75. The Review's Steering Group members are clear in their agreement with the majority of respondents to the Call for Evidence that REF panels should continue to assess outputs through peer review. We recognise the findings of *The Independent Review of the role of metrics in research assessment* that it is not currently feasible to assess research outputs in the REF using quantitative indicators alone.

76. However, the Call for Evidence also found significant support for judicious use of metrics. We support the appropriate use of bibliometric data in helping panels in their peer review assessment, and recommend that all panels should be provided with the comparable data required to inform their judgements. Panels should set out explicitly how they have used bibliometric data in their working methods. For instance bibliometric evidence could be useful to panels in determining whether there is a significant discrepancy between the grade profile for outputs for a Unit of Assessment as determined by peer review, and citation data.

Recommendation 4: Panels should continue to assess on the basis of peer review. However, metrics should be provided to support panel members in their assessment, and panels should be transparent about their use.

Impact

77. Impact is clearly one of the success stories of REF2014, providing a rich picture of the variety and quality of the contribution that UK research has made across our society and economy. The resulting database of case studies is a unique and valuable source of information on the impact of UK research. Despite the high cost of

the impact element (estimated at £55m[20]) evidence shows that it has contributed to an evolving culture of wider engagement, enhancing delivery of the benefits arising from research. Respondents to the call for evidence have argued that a proportion of the costs relating to the impact element will reduce for future exercises as participating institutions now have processes in place to capture the information required.

78. We think that, whilst the nature of impact will vary greatly across disciplines and activities, it is in all academics' interests to be able to indicate the impact of the research that they undertake. Therefore it is important that each Unit of Assessment is required to submit case studies. However, there are a number of reasons to believe that it would be beneficial to relax the tight coupling between the number of staff submitted to a Unit of Assessment and the number of case studies required, and give institutions greater flexibility to submit case studies which may cross the boundaries of different units. Giving institutions some flexibility in the distribution of their case studies would allow them to demonstrate their strengths more effectively, and make it easier to submit strongly interdisciplinary case studies.

79. If the number of case studies required from an institution or Unit of Assessment were calculated on the same basis as the last REF this would significantly increase the costs and burden of the next REF. Whilst the formula for determining the number of case studies required from each institution and Unit of Assessment should be a matter for the funding bodies, we note that the 2014 REF required the production of 6,975 impact case studies, and we recommend that the number of case studies required in the next exercise should not be a significant increase on this.

80. In order to gain an appreciation of impacts across all disciplines, we propose that institutions should be required to submit a minimum of one impact case study in each Unit of Assessment (down from a minimum of two in REF2014). We considered that the institution could have a modest amount of flexibility to vary where case studies could be submitted – between 10 and 20% of their total submissions - by transferring impact case studies between Units of Assessment. However, our main recommendation is that all institutions submitting to the REF should be required to submit some 'institutional' level impact case studies which arise from multi- and inter-disciplinary and collaborative work, which could cross several Units of Assessment. Institutional level case studies would be evaluated by a specialist institutional assessment panel, discussed further below.

Recommendation 5: Institutions should be given more flexibility to showcase their interdisciplinary and collaborative impacts by submitting 'institutional' level impact case studies, part of a new institutional level assessment.

81. We are clear that impact case studies should be based on research of demonstrable quality – over a period of time (which could be quite long). However, as set out in previous chapters, we are concerned that the mechanistic linkages made in REF2014 between specific outputs and eventual (often very specific) impact unduly

[20] Technopolis (2015) REF Accountability Review: Costs, benefits and burden. Available: http://www.technopolis-group.com/?report=ref-accountability-review-costs-benefits-and-burden

restricted the ability of institutions to submit examples of where an individual or group's research and expertise had led to impact, but where that impact could not sensibly be traced back specifically to particular research outputs. We think that a richer picture of the impact of research could be developed which encompasses the research expertise, facilities and networks of an individual, group or institution that underpin or lead to the eventual impact of research. Therefore we recommend that options are explored for linking case studies to research activity and a body of work, as well as to a broad range of research outputs.

Recommendation 6: Impact should be based on research of demonstrable quality. However, case studies could be linked to a research activity and a body of work as well as to a broad range of research outputs.

82. The definition of impact as set out in the REF is very broad. However, there is some evidence that some types of impact were narrowly interpreted, or not well understood by the community, or that they have been cautious about how their impact might be understood and assessed. We recommend that all panels should have the same broad approach to impact.

83. In calling for a broadening and deepening of the definition of impact we are recognising that in REF2014 there was room for a wider variety of impacts than were captured in the case studies. We are recommending that this potential breadth and depth should be emphasised and that we should go even further. In particular: we recommend that impacts on public engagement and understanding are emphasised and that impacts on cultural life be specifically included. Better to align the REF with the TEF, we also recommend that research leading to major impacts on curricula and /or pedagogy within or across disciplines should be included; and in order to encourage long-term, interdisciplinary research endeavours, we recommend that ground breaking academic impacts such as research leading to the creation of new disciplines should be included.

84. Realising the full impact of research is a continuing and sometimes long-lived process, some respondents to the call for evidence made the proposal that they should be able to resubmit a case study from the previous REF with additional evidence of the impact realised since the last exercise. This seems to be a sensible development.

Recommendation 7: Guidance on the REF should make it clear that impact case studies should not be narrowly interpreted, need not solely focus on socio-economic impacts but should also include impact on government policy, on public engagement and understanding, on cultural life, on academic impacts outside the field, and impacts on teaching.

Environment

85. Assessing the research environment in the REF is important. It can indicate strategy and potential for the future and contributions beyond research outputs narrowly conceived or measured. We should reward those institutions which have a dynamic

and creative research environment, a vision and direction for their research and related activities, and a plan to deliver impact through their research.

86. Some of these aspects of environment reflect the strategy, support and actions of the institution as a whole. This has not been assessed in REF2014 and we recommend that this should be captured in a new Institutional Environment Statement, which complements the Unit of Assessment Environment Statement.

87. Environment and impact are mutually supportive and should be seen together. The strategy and support of impact are closely linked to the environment for research at both Unit of Assessment and institutional level. Therefore, it is also recommended that the aspects captured by the Impact template of REF2014 should be incorporated into both the Unit of Assessment and Institutional level Environment statement.

88. Creating a new, dual level, Environment template should reduce the amount of duplication currently presented in the multiple individual submissions at Unit of Assessment level, and enable HEIs to explain, and REF reviewers to assess, the following:

- the features of the research environment that are the product of institutional level activity, including steps taken to promote interdisciplinary and other joint working internally and externally and to support engagement and impact, beyond that which is just the aggregate of individual units of assessment
- the future research and knowledge exchange strategy of the HEI, as well as the individual Units of Assessment, and the extent to which both have delivered on the strategies set out in the previous REF
- the individualism of the HEI and the eclecticism of academic life within it
- the contribution that its academics make to the wider academy ('academic citizenship').

89. Each statement would focus on how the institution or Unit of Assessment enhances the development of research capability within it, how it provides opportunities for high quality research and related activities, how it motivates and rewards researchers, and the contributions made to the wider academic community.

90. Having an institutional-level environment statement would provide a more holistic view of the HEI, allowing the REF to capture institution-wide strategic objectives and cross-cutting structures and initiatives. It would facilitate a wider assessment of the institution's contribution to the delivery on key agendas such as asset sharing and collaboration, and would eliminate the inefficient duplication of content in environment statements submitted to multiple units of assessment.

91. We propose that assessment of institutional level submissions for environment and impact should be made by a separate, cross-disciplinary panel including members from all four main panels. Whilst it is for the funding bodies to determine how funding should be apportioned, we suggest that quality profiles at Unit of Assessment level are continued and that a share of QR funding should be awarded to the institution based on its Institutional Environment statement and the institutional-level impact

case studies which it submits. This innovation will require careful testing and we recommend that the funding bodies explore options for piloting the institutional level assessment to test this proposal.

92. An Environment statement at the Unit of Assessment level would have the following purposes: to identify and reward the excellent Unit of Assessment level environments within an institution; alongside the Outputs, to enable sub-panels to acquire a thorough understanding of the health and future of their disciplines, which is subsequently shared through academic networks; and to enable metrics on research intensity to be appropriately contextualised and assessed at a disciplinary level.

93. In order to enable the sub-panels to assess the research environment of the Unit of Assessment, they should each be provided with a copy of the relevant Institutional Environment statement so that they can understand the context for each unit's research environment.

Recommendation 8: A new, institutional level Environment assessment should include an account of the institution's future research environment strategy, a statement of how it supports high quality research and research-related activities, including its support for interdisciplinary and cross-institutional initiatives and impact. It should form part of the institutional assessment and should be assessed by a specialist, cross-disciplinary panel.

Recommendation 9: That individual Unit of Assessment environment statements are condensed, made complementary to the institutional level environment statement and include those key metrics on research intensity specific to the Unit of Assessment.

94. It is important that there is guidance as to what content is expected in the Institutional Environment statement and that which is expected in the Unit of Assessment environment statement in order to avoid duplication. Boxes 1 and 2 provide illustrative examples of the types of information that could be expected in each.

Box 1 Illustrative examples of content for the Institutional Environment Statement

1. HEI research and knowledge, engagement and impact (KEI) strategies for the next REF cycle and progress made against plans from previous REF cycle
2. HEI actions to promote innovative and interdisciplinary research and cross-departmental working, for example seed funding, networks, shared facilities and cross-disciplinary networks or units
3. Institutional support for, and leading examples of, major external research collaborations with academic and non-academic partners, regionally, nationally and / or globally
4. Research facilities, e.g. laboratories, IT capacity, library, and research support services, e.g. research data management, gaining and managing research funding, and / or support for the commercialisation of research
5. Institutional support for research students and early career researchers, eg doctoral training centres institutional career development assistance for research staff
6. Diversity strategy, including for example, the institutional Athena Swan award recognising employment practices which promote gender equality.

Box 2 Illustrative examples of content for the Unit of Assessment Environment Statement

1. Unit of Assessment research and knowledge, engagement and impact strategy for the next REF cycle and implementation of strategic plans from the previous REF cycle
2. Innovative interdisciplinary research initiatives and participation in major regional, national or international research collaborations with other academic and non-academic partners
3. Contribution to the wider academic community such as journal editing, conference convening, working for learned societies, peer review, as well as other indicators of recognition and contribution
4. Contribution to the wider non-academic community through engagement and impact-related activities, including membership of major policy committees or industry partnerships
5. Provision of research facilities and research support which are specific to the unit
6. Numbers of PhD students and post-doctoral research fellows per academic FTE
7. Research grant income per academic FTE from competitive funding sources
8. Unit of Assessment diversity strategy (to the extent that is distinct from the institution's), including for example Departmental Athena Swan awards

Weighting

95. In considering the appropriate weighting for the elements of the REF formula, we were clear that there should be no diminution of the proportion of QR funding that is driven by the assessment of research outputs. The weighting for outputs should stay at 65%.

96. We think that environment and impact are mutually supportive and should be seen together, integrated at the institutional level and with a stronger emphasis on mutual support of these elements at the Unit of Assessment level. As set out above, we recommend the introduction of a new institutional level assessment encompassing the research environment and institutional impact case studies, which has sufficient weighting to incentivise the proposed stronger emphasis on future strategy, on dynamism and support for interdisciplinarity and collaboration.

97. With the other proposed changes to the system (including the proposal that the REF2014 impact statement should become part of the environment assessment) it is important that the total weighting for impact does not comprise less than 20% in the next exercise.

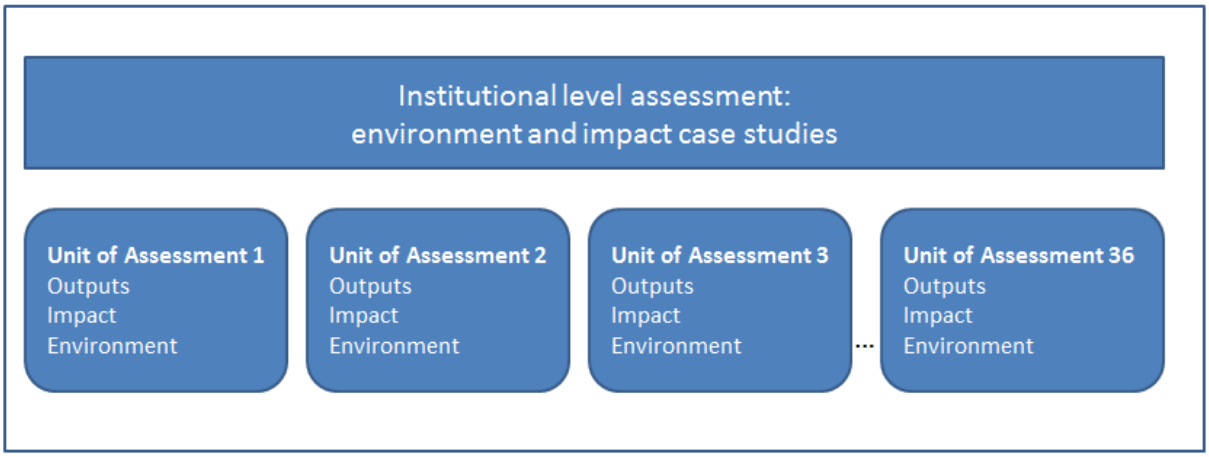

Diagram 1: An illustration of the proposed relationship between elements of the REF

Supporting excellence wherever it is found

98. The UK benefits from a diverse higher education sector, with institutions of very different sizes, specialisms, histories and different relations with local communities. It is right that they should have different strategies in respect of their focus on teaching, research and impact. It is important that the REF supports excellence in research wherever it is found across these different kinds of institutions. We expect a number of our recommendations to be helpful to small institutions, and to those which are less research intense, with strategies which focus their research activities in a limited number of areas in order to achieve excellence.

99. We anticipate that the following changes will help to ensure we support excellence wherever it is found:

    i. The new flexibility in relation to the number of outputs submitted by each staff member should help with allowing greater emphasis on the longer term and risk-taking, on building new areas of research, supporting less experienced staff, and for smaller groups

    ii. The reduction in minimum number of Impact Case Studies per Unit of Assessment to one should help small groups

    iii. The renewed emphasis on the range of research and scholarship based activities that can be used for Impact Case Studies, and their broadening to include, for example, the impact of research on innovation in teaching theory and practice

    iv. The non-portability of outputs when an academic moves institution should be helpful to all institutions including smaller institutions with strong teams in particular areas which have previously been potential targets for 'poaching'

    v. The encouragement of collaboration, for example in institutional strategies described in the Environment statements, both in terms of intention and delivery.

Supporting interdisciplinary research

100. A recent report by the British Academy[21] identifies the essential role of interdisciplinary research in addressing complex problems and research questions posed by global social, economic, ecological and political challenges. There appears to be little evidence of discrimination by panels against treatment of interdisciplinary research in the REF, but as noted above, there is a concern that institutions were risk averse in submitting interdisciplinary work. We think that it is vital that interdisciplinary work is submitted, assessed and rewarded through the REF and propose the following actions are taken to enable this:

    i. The work of panels should better support the identification of interdisciplinary outputs. Strong guidance should be given to panels on the importance of recognising interdisciplinary research. We recommend the appointment of interdisciplinary 'champions' on the sub-panels with interdisciplinary expertise, who would take on specific duties in the sub-panel for fostering a more open and skilled assessment of interdisciplinary research submitted.

    ii. In our recommendations we have proposed the introduction of a new institutional level assessment, which will encompass elements of the environment and impact components of the REF and reward collaboration on interdisciplinary activities.

    iii. The flexibilities that we have introduced to the number of outputs submitted will allow researchers to explore longer-term and riskier projects such as the development of new collaborations to undertake interdisciplinary research.

[21] British Academy (2016) Crossing Paths: Interdisciplinary institutions, careers, education and applications. Available: http://www.britac.ac.uk/interdisciplinarity

iv. Explicit encouragement must be given to the submission and identification of interdisciplinary research in the REF. In REF2014 a submitting institution was able to identify those outputs it considered to be interdisciplinary, to draw this to the panels' attention. However, there was a varied use of the identifier by institutions, and some uncertainty around its purpose. Consistency of use could be improved through making the interdisciplinary identifier a mandatory field in the submission system.

v. If there continues to be a discrepancy between the proportion of interdisciplinary research undertaken and that submitted to the REF, consideration might be given in future exercises to giving extra weighting to outputs that are strongly interdisciplinary.

Recommendations on the use of the Research Excellence Framework

101. The world is, and will be, changing rapidly - and the challenges being faced here and across the globe are increasingly complex and inter-related.

102. The UK has long been a world leader in research but our international competitors are not standing still. We need a REF that will support academic leaders and policy makers by giving them the information they need to make the critical choices to ensure that the UK continues to produce excellent research and harnesses the impact of that research.

103. The proposals set out in the UK Government's Higher Education and Research Bill will also influence the way that the next REF will be implemented. In concluding this review, we think that is important to set out a vision for the Research Excellence Framework within UK Research and Innovation (UKRI) and how it can help the UK tackle the important challenges we are facing.

104. Reducing the burden of the REF is a key aim of this review; particularly given the added burdens of TEF and uncertainties around our future relationship with the EU. The considerable activity undertaken in the academic community to deliver a high quality assessment of UK research should be put to further use. We must make still better the use of the REF outcomes and the data produced in undertaking the exercise.

105. While issues around data infrastructure lie beyond the scope of this review, we recognise that there are significant issues for the sector here. Data and metrics are increasingly used by HEIs and funders to manage and assess research. Yet the data infrastructure systems that HEIs depend on are typically not interoperable, research funders' data collection processes require HEIs and researchers to gather and supply different and often incompatible information, and the data sources themselves are typically not open, standardised or easily combined.

106. The protocol for future REF exercises must make it easier to reuse the abundant information that currently exists, enable it to be more easily accessed and analysed, and reduce the effort and cost of compiling and submitting information. But beyond this, work is needed to break down barriers between systems, to improve the quality and transparency of data sources, and to streamline data collection requirements.

The UK Forum for Responsible Research Metrics, being set up by HEFCE in partnership with RCUK, the Wellcome Trust, Jisc and Universities UK, should have a role in bringing stakeholders together to improve the data infrastructure and address these issues.

Recommendation 10: Where possible, REF data and metrics should be open, standardised and combinable with other research funders' data collection processes in order to streamline data collection requirements and reduce the cost of compiling and submitting information.

107. The ambition is that UK Research and Innovation should make our research system more integrated, strategic and agile. UKRI will have a role to consider the overall health of the research and innovation system. REF has much to offer here, providing key information about the shape of the UK's research system and allowing UKRI to identify and address gaps and opportunities for collaboration.

108. It is vital that the REF contributes information that will support UKRI to assess not only our strengths and weaknesses in terms of disciplinary level activity; but with the tools to understand our growth proposition in respect of interdisciplinary and transformative research. A key purpose of UKRI is to provide a powerful coherent and strategic voice for research in the UK. The REF can and should contribute strongly to this, both in terms of its effort on the quality of research hand in terms of the insights and data it can offer.

109. Some have expressed concern about the extent to which panel results are grounded in solid evidence about the comparative strengths of different disciplines, which may limit the usefulness of the REF in comparing their performance. It is important that the REF panels have the means to identify and distinguish between the highest quality research. In future exercises panels should be supported more strongly by external evidence in delivering a robust grading of their discipline, to ensure funders can understand and support the health of disciplines. This would be supported by the independent appointment of international academics and assessors to the discipline panels. The profiles that emerge from this analysis should then be usable to make informed decisions about which subject areas may need strengthening with additional investment.

Recommendation 11: That Government, and UKRI, could make more strategic and imaginative use of REF, to better understand the health of the UK research base, our research resources and areas of high potential for future development, and to build the case for strong investment in research in the UK.

110. It is important that the way the REF is designed continues to support initiatives that promote equality and diversity such as the Athena Swan charter to support gender equality. It should also act as a positive contribution to the sharing of research through its requirements over open access and open data. Looking forward, a

mandate for unique identifiers like ORCID[22] numbers will allow better tracking of individuals over time.

111. When the next REF exercise takes place, universities will also be participating in the UK Government's counterpart exercise for teaching, the Teaching Excellence Framework. We think that successful institutions do not sharply separate out their teaching and research missions and it is vital that the introduction of the TEF does not result in the reintroduction of a binary divide. We understand the desire to drive up the quality of teaching in universities and to encourage the possibility of different paths where academics can build a career in teaching as well as in research or a combination of both. In line with recommendation 10 above, we suggest the building of a common dataset that can describe university research and teaching staff.

112. Links between teaching and research are key to the quality of the learning and research environment at the institutional level. We welcome the confirmation that TEF criteria for teaching quality will include the extent to which it is informed by the latest in research, scholarship or professional practice. And similarly we are recommending that the REF impact element more broadly recognises the impact of research on teaching.

113. Full details of how the TEF will operate by 2020 are yet to be finalised. Care must be taken to ensure that TEF and REF deliver mutually reinforcing incentives and drive positive and constructive behaviours, and that deadlines and timescales have the flexibility that can enable institutions to plan and schedule the demands of the two systems. Taken together the TEF and REF will provide a set of data that Government, the Office for Students and UKRI can use to better understand the sector, ensure its sustainability and drive strategic decisions.

Recommendation 12: Government should ensure that there is no increased administrative burden to Higher Education Institutions from interactions between the TEF and REF, and that they together strengthen the vital relationship between teaching and research in HEIs.

[22] ORCID stands for "Open Researcher & Contributor ID", a permanent digital identifier for researchers.

5. Next Steps

114. In last year's Green Paper, Higher education: teaching excellence, social mobility and student choice, the Government committed to hold the next REF exercise by 2021. Many respondents to the Call for Evidence told us that it was vital for institutions that the guidance underpinning the next REF exercise should be issued as soon as possible in order for them to set in place the mechanisms to collect the information that will be required to complete their submissions.

115. In order to fulfil the Government's ambition and complete the next REF by 2021, we propose the following timetable.

116. Through the summer and autumn, the UK Governments and funding councils should work together to translate the principles outlined in this report into the structures and formulae for submissions. Work will be required to test the impact of our proposals on scope for game playing and to mitigate against unintended consequences. Further work might also be required to model or pilot new ideas.

117. By the end of the year a formal consultation should be issued so that the community can offer their views on the proposed process and the future REF formula. The decisions arising from this consultation should be published in the summer of 2017.

118. As the shape of later years of the TEF exercise are revealed, Government should check the consistency of the two exercises and work to promote complementarity and mutual support and to alleviate tensions and burdens.

119. The proposed process will allow sufficient time for universities to prepare for submissions to be collected in 2020 and the assessment to take place in 2021, with the final outcome of the next REF exercise to be published by the end of 2021 for implementation of the funding settlement in 2022.

6. Conclusions

120. The Research Excellence Framework and the Research Assessment Exercises that preceded it have been a success. The UK is at the forefront of world research and has the most productive science base in the G7, ranking first amongst comparable major research nations for Field Weighted Citations Impact.[23] [24] Its great strengths in research are a special asset and comparative advantage and are crucial to the future of the UK in a rapidly changing and sometimes turbulent world. These assets also make a valuable contribution to tackling the great global challenges of our time. Maintaining and enhancing these strengths in a competitive environment will depend on making our research resources still more productive. But they will also depend on increased investment in research. It is basic economics and common sense for a nation to invest resources where the productivity of the investment is high and to focus on its comparative advantages.

121. The recommendations of this Review build on the success of earlier assessment exercises. We have learned much about how to do these assessments. Indeed, we have been at the forefront internationally and others have followed suit, in turn generating experience in the UK from which we can learn. In large measure, however, our recommendations have been based on our own experience and from this we identify areas of improvement. For the most part our recommendations are designed to tackle important distortions and to deal with some of the cost implications. Taken together, we think that they could provide a major step forward. We see them as evolutionary and arising from learning about a process that is basically strong and which has delivered.

122. Specifically, we argue that the recommendations would help greatly in dealing with the following issues. First, problems of cost, demotivation, and stress associated with the selectivity of staff submitted. Second, strengthening the focus on the contributions of Units of Assessment and universities as a whole, thus fostering greater cohesiveness and collaboration and allowing greater emphasis on a body of work from a unit or institution rather than narrowly on individuals. Third, widening and deepening the notion of impact to include influence on public engagement, culture and teaching as well as policy and applications more generally. Fourth, they will help to reduce the overall cost of the work involved in assessment, costs that fall in large measure on universities and research institutions. Fifth, they help support excellence wherever it is found. Sixth, they help tackle the underrepresentation of interdisciplinary research in the REF. Lastly, they could provide for a wider and more productive use of the data and insights from the assessment exercise for both the institutions and the UK as a whole.

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[23] Elsevier (2013) International Comparative Performance of the UK Research Base, A Report by Elsevier for the UK's Department of Business, Innovation & Skills (BIS). Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/263729/bis-13-1297-international-comparative-performance-of-the-UK-research-base-2013.pdf

[24] Field-weighted Citation Impact indicates how the number of citations received by an entity's (in this case, the UK's) publications compares with the average number of citations received by all similar publications.

123. The recommendations were designed as and should be taken as a complementary package where the logic of one depends on and is strengthened by the others. They are set out as a Table of Recommendations, presented as 12 recommendations in four blocks below: outputs, impact, environment, wider context. The broad thrust of our recommendations is as follows.

124. On *outputs* we recommend that all research active staff should be presented and outputs should be submitted at the level of Unit of Assessment, loosening the tight link or searchlight on the individual and shifting the focus to the Unit of Assessment. We recommend that outputs should not be 'portable', thereby encouraging a longer-term approach to investment by removing the 'market distortion' that comes from excessive uncertainty about loss of staff in whom investments have been made. That could also reduce excess rent-seeking and 'transfer activity' in the last period before a REF cut-off date. We have confirmed the centrality and importance of peer review but suggested extra scope for the use of metrics.

125. On *impact* we have recommended a significant broadening and deepening of the notion as described above. In many cases the exercise has been very narrowly interpreted as linking a particular publication to a particular activity or policy decision. We have recommended that impact should be interpreted much more subtly and broadly to link bodies of work and disciplinary or collaborative activity to outcomes understood from a more nuanced and deeper perspective.

126. We have argued that *impact and environment* should be seen in a more integrated way and at a more institutional level. Thus they would become more strategic and forward looking whilst retaining a strong evidence base in past performance. For this to work well, attention will have to be paid to the quality and comparability of databases. That is an issue which applies for the sector as a whole and the new UKRI. We have maintained an international approach to impact. The research world and its influences are global.

127. We have also argued that our recommended package of reforms, and the data advances that go with it, by concentrating on overall outputs and contributions of institutions, and on their activities and strategies, would help with the broader use of the data including for national policy for the fostering of research. Finally, we have emphasised the importance of integration of *teaching and research*. We do not yet know how TEF will work but it is vital that TEF and REF are mutually supporting.

128. Two of our objectives have been to foster *interdisciplinary research* in circumstances where institutions seem to be somewhat hesitant about submitting such work and to *foster excellence wherever it is found*, for example in a HEI which has lower average research performance than some others, but has built, and wishes to strengthen, specific areas of excellence. We set out arguments in section 4 that the combination of recommendations we have proposed, could deliver strong progress on both these objectives.

129. We have offered in the preceding section specific proposals for *implementation* together with a timetable. That timetable is set with the objective that a full set of arrangements for the next REF should be in place before the end of 2017. The REF structure and detail is intended to provide a framework for improved quality and quantity of research. An assessment date of 2021 is the latest if our recommended 5-

7 year period between REFs is to be observed. In our view, 4 years is necessary, for considered reaction by institutions given the long investment periods in academic research and teaching, if the new incentive and assessment structure is to work effectively. We argue that 5-7 years is an appropriate period given the nature and timescale of academic planning and investment.

130. We have argued that our proposals will motivate still *stronger investment and dynamism*. In particular they strengthen the incentives for investment in quality and provide for greater cohesion which, with commitment, is crucial to productivity. They incentivise collaboration, foster interdisciplinary work, support excellence and initiatives wherever they are found, and place stronger emphasis on strategy and forward planning to encourage and resource research.

131. Our recommendations are at a high level but give strong sense of direction and clear principles. There is much work to do on detail, on testing that detail, and consultation on the specifics. Hence the need for concentration on, and speed of, implementation over the next year.

132. Finally we stress the centrality of research to the future of the UK. Measured by the fraction of GDP (both public and private) *we underinvest in research and innovation* relative to our comparators in advanced countries. And the evidence shows clearly[25] both that our investment in research is very productive and that such investment is a major factor in growth. It is also a critical part of our culture, our understanding of what it means to be human and our well-being.

133. In our work we have begun with the clear understanding of the importance of dual funding in our system and in particular the crucial role played by QR in allowing strategic investment in research. QR is quantitatively the smaller part of the dual support system and should be a priority for future investment in research. We have argued not only that QR is vitally important to the success of UK universities but also that REF is critical to QR. And further, that the REFs have been a success. We have sought to build on that success whilst learning from experience and would argue that our recommendations will raise the outstanding quality of research in the UK still higher.

134. Quality alone is not enough. We live in a world where intellectual enquiry is global and competition is increasing so that our outstanding leadership requires constant investment: key competitors are increasing theirs. The reasons for increasing investment go, however, way beyond international competition and increasing economic growth, greatly important though these are. We live in turbulent as well as competitive times where understanding who we are, what we can contribute, how we can collaborate and how we can bring communities and people together are of vital and increasing importance. The UK, building on its strengths and past achievements, has a vital role to play in this changing world. Increasing still further the quality of our research and investing still more in it, must, in our view, be central to our nation's strategy and life in the coming years.

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[25] UK National Academies (2015) Building a stronger future: Research, innovation and growth. Available: https://royalsociety.org/topics-policy/publications/2015/stronger-future/

7. Table of Recommendations

A: Outputs
Recommendation 1: All research active staff should be returned in the REF.
Recommendation 2: Outputs should be submitted at Unit of Assessment level with a set average number per FTE but with flexibility for some faculty members to submit more and others less than the average.
Recommendation 3: Outputs should not be portable.
Recommendation 4: Panels should continue to assess on the basis of peer review. However, metrics should be provided to support panel members in their assessment, and panels should be transparent about their use.
B: Impact
Recommendation 5: Institutions should be given more flexibility to showcase their interdisciplinary and collaborative impacts by submitting 'institutional' level impact case studies, part of a new institutional level assessment.
Recommendation 6: Impact must be based on research of demonstrable quality. However, case studies could be linked to a research activity and a body of work as well as to a broad range of research outputs.
Recommendation 7: Guidance on the REF should make it clear that impact case studies should not be narrowly interpreted, need not solely focus on socio-economic impacts but should also include impact on government policy, on public engagement and understanding, on cultural life, on academic impacts outside the field, and impacts on teaching.
C: Environment
Recommendation 8: A new, institutional level Environment assessment should include an account of the institution's future research environment strategy, a statement of how it supports high quality research and research-related activities, including its support for interdisciplinary and cross-institutional initiatives and impact. It should form part of the institutional assessment and should be assessed by a specialist, cross-disciplinary panel.
Recommendation 9: That individual Unit of Assessment environment statements are condensed, made complementary to the institutional level environment statement and include those key metrics on research intensity specific to the Unit of Assessment.
D: Wider context
Recommendation 10: Where possible, REF data and metrics should be open, standardised and combinable with other research funders' data collection processes in order to streamline data collection requirements and reduce the cost of compiling and submitting information.
Recommendation 11: That Government, and UKRI, could make more strategic use of REF, to better understand the health of the UK research base, our research resources and areas of high potential for future development, and to build the case for strong investment in research in the UK.
Recommendation 12: Government should ensure that there is no increased administrative burden to Higher Education Institutions from interactions between the TEF and REF, and that they together strengthen the vital relationship between teaching and research in HEIs.

Appendix A: Description of REF2014

REF 2014 Submissions

Each submission in each Unit of Assessment contained a common set of data comprising:

a. Information on staff in post on the census date, 31 October 2013, selected by the institution to be included in the submission.

b. Details of publications and other forms of assessable output that selected staff have produced during the publication period (1 January 2008 to 31 December 2013).

c. A completed template describing the submitted unit's approach during the assessment period (1 January 2008 to 31 July 2013) to enabling impact from its research, and case studies describing specific examples of impacts achieved during the assessment period, underpinned by excellent research in the period 1 January 1993 to 31 December 2013.

d. Data about research doctoral degrees awarded and research income related to the period 1 August 2008 to 31 July 2013.

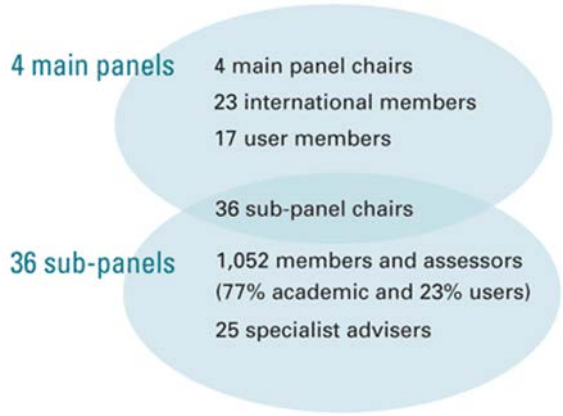
e. A completed template describing the research environment, related to the period 1 January 2008 to 31 July 2013.

HEIs could choose which Units of Assessment to submit in, but can normally make one submission only for each.

1. The REF is based on rigorous peer judgement by fellow researchers and expert research users of selected research outputs (which are clearly identifiable and recognised by the community, and limited to 4 per researcher), the research environment in which is produced and, introduced in the latest exercise, selected examples of the impact arising from excellent university research (limited to one case study to 10 researchers).

2. In 2014, Institutions were invited to make submissions in 36 Units of Assessment. The submissions were assessed by an expert sub-panel for each Unit of Assessment, working under the guidance of four main panels. The members of the REF panels were appointed by the four UK funding bodies. The main panels included international members to provide assurance about the international benchmarking of standards.

3. The main and sub-panels carried out the assessment according to the published 'Panel criteria and working methods'. At the end of the assessment, each main panel and its sub-panels produced an overview report detailing how they operationalised the criteria, and providing general observations about the assessment and the state of research in their discipline areas.



© diagram reproduced with permission from HEFCE

4. The sub-panels assessed three distinct elements of each submission, against the following generic criteria:

   - **Outputs**: assessment of the quality of submitted research outputs in terms of their 'originality, significance and rigour', with reference to international research quality standards. This element accounted for **65 per cent** in the overall outcome awarded to each submission.
   - **Impact**: assessment of the 'reach and significance' of impacts on the economy, society and/or culture that were underpinned by excellent research conducted in the submitted unit, as well as the submitted unit's approach to enabling impact from its research. This element accounted for **20 per cent**.
   - **Environment**: assessment of the research environment in terms of its 'vitality and sustainability', including its contribution to the vitality and sustainability of the wider discipline or research base. This element accounted for **15 per cent**.

5. The REF exercise involved 154 of the 164 HEIs across the UK submitting the work of over 52,000 researchers, over 191,000 research outputs and nearly 7,000 impact case studies. The results of REF2014 showed significant improvements in the quality of research from UK universities since 2008, confirming other independent evidence of the UK's world-leading position and enhanced performance, as well as the strong impact that has resulted from university research:

   - overall quality was 30% "world-leading" (4*) and 46% "internationally excellent" (3*).
   - quality of research outputs were 22% "world-leading" (4*) quality (up from 14% in RAE2008) and a further 50% were "internationally excellent" (3*) quality, (up from 37%).
   - 44% of submitted impacts were judged "outstanding" (4*) by over 250 external users of research. A further 40% were judged "very considerable" (3*).

Appendix B: A short history of Research Assessment in the UK

RSE 1986 & 1989

1. The initial incarnation of the REF began as the Research Selectivity Exercise (RSE) in 1986, launched by Peter Swinnerton-Dyer, Chair of the University Grants Committee. Its purpose was to standardise and assess the information received from existing 37 subject-based committees; with the objective of being "more selective in its support for research… to redistribute resources for research between institutions and to encourage redistribution within institutions towards work of special strength or promise"[26].

2. It was used to distribute a relatively small portion of funds at the time, based on research income and expenditure, student numbers, research planning priorities and University's best 5 publications from the previous 5 years against each of the 37 subject-based units. A subsequent consultation on the RSE resulted in another exercise in 1989. This time it was made more transparent and comprehensive, and formalised peer review as the system of evaluation. It invited universities to define their own Units of Assessment and submit two 'publications' from each member of staff within these (resulting in 152 different units).

Reforms & RAE 1992

Major change	Increase in the funding distributed on the basis of the RAE results Introduction of research active staff selection from those employed after census date Two publications and two other forms of output for only the research active staff, together with summary of publications and other outputs Rating scale of 1-5 27 Units of Assessment
Elements	Overall staff summary Data on Active research staff return, Students and studentships External research income Funding awarded based on combination of volume of submitted staff and the quality of output

3. An Act of Parliament in 1992 established the Higher Education Funding Councils (HEFCs), for England and Wales. The respective Governments were now responsible for setting the amount of research funding and its distribution. Following the 1992 Further and Higher Education Act, 35 of the former polytechnic universities

[26] Jones, P.K. and Sizer, J. (1990) The Universities Funding Council's 1989 Research Selectivity Exercise. Available: http://www.bzh.bayern.de/uploads/media/4-1990-jones-sizer.pdf

became eligible for research funding. Most of these had been formed during the 1960s in the expansion of higher education. As a result of the 1992 Act, and because the former polytechnic universities had a large teaching staff, the funding formula needed to be adjusted ensure that it continued to be focused selectively.

4. The renewed purpose of the next exercise, which was launched in 1992 and was named the Research Assessment Exercise (RAE), was to inform funding of basic research but the HE Funding bodies also sought to assess the quality of research in general. Over 90% of their research funds were subsequently distributed on the basis of the results of the exercise.

RAE 1996

Major change	Increase in the number of publications submitted per research active academic for review from 2 to 4 New rating scale 1, 2, 3, 3b, 3a, 4 ,5, 5 * 69 Units of Assessment
Elements	Overall staff summary Data on research active staff details, Research students, Research studentships External research income Research environment and plans General observations and additional information (indicators of research excellence and indicators of peer esteem) Funding awarded based on combination of volume of submitted staff and the quality of output

5. As before, the main objective of the RAE 1996 was to produce ratings of research quality that the HE Funding bodies could use to allocate money for research; the drive towards transparency and robustness continued. Several major changes to the exercise were introduced:

   - HEIs were required to submit four publications per member of 'research active' staff. Though some academics found it difficult to select among eligible publications because it was unclear how e.g. joint papers and frequently cited papers were reviewed.
   - Units were invited to include 'indications of peer esteem' (journal editorships and conference presentations)
   - Unlike for the previous exercises, there no longer was a requirement to submit a list of all publications.

6. Evaluation of RAE 1996 resulted in a long list of recommendations and received many complaints that not enough time had been given to introduce new software which had caused complications with submissions. However, the majority of points were minor, and overall the consensus was that minimal changes should be

introduced into the next exercise. The RAE was seen as having a positive influence on the internal management and strategy of the institutions, by generating a planning cycle as well as a broad programme review. The Dearing Report (1997) noted that, albeit it had some imperfections, the system had become generally accepted within the community and had provided a relatively cost-efficient way to allocate funding for research.

RAE 2001

Major change	Expectation from panelists to treat each publication or output on its merits. More emphasis placed on accountability. Assessment results were made public Staff with special circumstances allowed to submit less outputs
Elements	New rating scale 1, 2, 3, 3b, 3a, 4 ,5, 5 * 69 Units of assessment Staff details: individual selected as research active and data on other academic staff, postdoctoral research assistants, postgraduate research assistants, other staff Research outputs: up to four research outputs produced by each member of selected staff Date on research students and studentships Research income textual commentary

7. By the time of RAE 2001, the exercise had become the principal means of assurance of the quality of research. The approach was modified to address some of the concerns about aspects of previous exercises, including issues of publication behaviour, interdisciplinary research, and consistency of scores, equal opportunities, and staff movement.

8. Under RAE 2001, assessment panels examined research in each of 69 areas. There was no limit on the number of units of assessment an institution could submit to, nor was there any limit on the number of staff submitted. Each panel published a set of assessment criteria and working methods.

9. Following the RAE 2001, there was a growing dissatisfaction within the HE Sector because of the burden the RAE placed on academics. There was a question as to whether a metrics based system could help soften the burden.

10. There were also criticisms of the scoring approach, which allocated a single point score to each Department. The RAE 2001 distributed substantial funding to larger institutions when they received 5* funding for the academics submitted, concentrating research funding in these institutions. However, excellent researchers in lower rated departments were unable to secure substantial funding. This approach ignored

"pockets of excellence" within average departments; could hide poorer quality researchers in good departments; and encouraged game playing by institutions.

11. Consequently, Sir Gareth Roberts was invited to review research assessment. In 2003 he recommended that a metric system was not a viable option to help reduce the burden of the RAE and that peer review should remain central to the evaluation of research excellence. Roberts also recommended a move away from a "single" score system towards a more graduated quality profile. This was built into the 2008 RAE to better reflect a wide range of excellence distributed across the HE system. Various other changes were also introduced, including reducing the point scale to 4 (1*, 2*, 3* and 4*).

RAE 2008

Major change	Introduction of quality profiles which made it possible to identify and reward 'pockets of high-quality research Rating Scale 1*, 2*, 3* and 4* Description of research environment
Elements	67 Units of Assessment Staff details (research active staff selected) and individual staff circumstances Research output: up to four research outputs produced by each member of submitted staff (minimum 50%) Data on research students, research studentships funding, external research income (minimum 5%) and esteem indicators (minimum 5%)

12. The RAE 2008 changed the threshold of quality definition. The introduction of the quality profile, as recommended by the Roberts Review, was an important change as it made it possible to identify and reward 'pockets of high-quality research wherever these may be located'. By distributing funding on the basis of quality profiles, the RAE 2008 made the system slightly more dynamic. In fact, the outcome of the RAE 2008 suggested that high quality research was distributed across the HE sector, allowing additional HEIs to receive core research funding and some who had previously received very little funding saw an increase.

Move to the REF: the first Metrics pilots

13. Although the RAE was judged as cost-effective, there were still questions about whether the peer review based system was as effective and efficient as it could be. The REF was initially proposed in 2005 as a metrics-based, target-driven exercise by Her Majesty's Treasury (HMT) to replace the RAE after the completion of the 2008 exercise. It was intended to reduce the administrative burden on the academic community and to better demonstrate and incentivise the economic and societal contribution, and justify continued investment in, public funding for Science & Research.

14. In 2007, HEFCE issued a formal consultation with the community on proposals for a new overarching framework for funding and assessment, within which there would be a differentiated approach for groups of disciplines (bibliometrics-based assessment for science and peer review based for non-science disciplines). The outcome of the consultation, and of a subsequent bibliometrics pilot exercise in 2009, was that such an approach was robustly rejected by the community and that expert (peer-review) assessment should remain the core of the REF. The pilot exercise showed that citation information should not be used formulaically or as a primary indicator of quality; although it was concluded that there was scope for it to inform and enhance the process of expert review.

Developing the Impact methodology

15. Towards the end of 2009, the HE Funding bodies issued a consultation on all aspects of the new Research Excellence Framework, building on the outcome of earlier consultations and other work since 2006. This consultation also included proposals to assess the impact of research in a similar way to the assessment of research outputs.

16. Across the responses there was overwhelming support for:

    - the continuation of block-grant research funding as part of the dual support system, to be allocated on the basis of research excellence
    - research excellence to continue to be assessed through a process of expert review, informed by indicators, and to be assessed on a UK-wide basis with reference to international standards
    - the quality of research outputs to continue to be the primary factor in the assessment, and the vitality of the research environment also to be a significant factor.

17. The HE Funding bodies proposed a pilot impact assessment exercise, which was undertaken over Summer 2010, through which to develop a robust assessment methodology. This involved 29 HEIs, expert assessors from academia and a broad range of research users across a sample of disciplines (from English, Social Work, Physics, Medicine to Earth Science).

18. It was intended that impact would not solely focus on commercialisation but extend to changes and benefits to the economy, society, culture, public policy or services, health, the environment or quality of life. The methodology aimed to assess the contribution of excellent research to economy and society in a similar way to the assessment of research excellence, i.e. through peer review of case studies and department impact statements.

19. It was originally intended that the appropriate weighting for impact in the REF should be 25%, but this was discounted in the first REF exercise to 20%, as an acknowledgment of the views of stakeholders that this was a developmental assessment process. The remainder of the REF assessment elements were to be weighted at 65% for research outputs and 15% for research environment.

REF 2014

Major changes	Introduction of assessment of impact Introduction of the use of citation information in certain sub-panels to supplement the peer-review process Strengthened measures to promote equality and diversity 36 Units of Assessment
Elements	Rating system Rating Scale 1*, 2*, 3* and 4* Environment: data on research doctoral degrees awarded, the amounts and sources of external research income and research income-in-kind (15%) Staff details (research active staff selected), including individual staff circumstances Research outputs: up to four research outputs produced by each member of submitted staff (65%) Impact Case Studies: one per 10 academics submitted

20. As a result of the consultations between 2006 and 2009, the Research evaluation approach – and consequently the allocation of funding from HEFCE for research – took a new shape in the REF2014. For the first time, it recognised the highest levels of research excellence along with an assessment of the past impact that it had achieved. The REF arrangement included:

    i. The quality of research outputs - 65% of the assessment;
    ii. The impact of research beyond academia - 20% of the assessment;
    iii. The research environment - 15% of the overall results.

21. These changes meant that REF2014:

    - Recognised achievements outside academia, encouraging academics to work with and spend time in industry, by recognising achievements researchers could make beyond academia and to applied research;
    - Encouraged collaboration between institutions and businesses by recognising their respective contributions to collaborative research;
    - Recognised applied research, as research outputs in all forms including applied, practice based and policy based research equally, as well as not-yet-applied research outputs.
    - Took thorough account of the “environment” for both research and impact.

22. Under the REF it was intended that all types of research and all forms of research output across all disciplines would be assessed on a fair and equal basis. As with RAE, the REF Panels did not make use of “journal impact factors”, rankings or lists,

or the perceived standing of the publisher in assessing the quality of research outputs submitted.

23. New measures were introduced to strengthen Equality & Diversity practices which included: Panel criteria to improve working methods, guidance on individual staff circumstances, new codes of practice to be developed by institutions, documentation for fair and transparent selection of staff, new assessment criteria for the environment element, and analysis of staff selection at sector level.

24. Specific changes were introduced that were intended to reduce the burden of REF:

- Introduction of a template for the narrative elements of submissions;
- Aligning the data definitions to use HESA data to validate REF returns;
- Omission of 'Esteem' as an element of the submission process and assessment;
- Reduction in the number of units of assessment, from 67 to 36 and ensuring greater consistency in the panel criteria and working methods;
- Simplifying the categories of staff that were eligible for selection;
- Removing or simplifying any items of data that had been collected in the RAE that were unnecessary for the REF.

25. However, these were not entirely successful. The costs involved in undertaking the REF, both for institutions and for HEFCE/HE funding bodies, were estimated at £246m for UK HE sector, considerably more than estimates for the 2008 framework which cost around £66 million.

Appendix C: International comparisons

1. In international practice, the nature and methodologies adopted for research assessments guiding institutional funding differ widely. The key design parameters include the model used for the assessment of research quality, the scope of the activity included and the types of indicators used to measure that activity. Systems also vary in terms of the balance between contested and other funding and the weights attributed to various indicators.

2. Technopolis produced an overview of international practice in systems that could be compared to the REF, covering 9 countries (Belgium/Flanders, Czech Republic, Denmark, Finland, Italy, New Zealand, Norway, Sweden, UK). They also looked at 2 countries where research assessment at the national level is not linked to funding, ie Australia and the Netherlands.

Model of assessment

3. In terms of the model of assessment the key choice is between metrics or peer review and cost plays a role in the decision. Systems that rely entirely on metrics are generally considered to be less expensive to administer and less compliance-heavy than systems that use peer review. Peer reviews for nation-wide performance assessments are seen as cost-intensive and time consuming.

4. Current practice in across countries varies, for example, the UK and New Zealand rely close-to-uniquely on peer review, whilst Belgium, Denmark, Finland and Norway use bibliometrics for the assessment of research quality. However, there are an increasing number of systems choosing models that combine the two approaches. In Italy for example, the VQR 2011 used an informed peer review process but in the 'hard' sciences, the assessment was predominantly bibliometrics-based. In Australia a broad range of assessment tools were used, including bibliometric and non-bibliometric indicators, as well as peer review.

5. Internationally, there is a trend towards greater use of bibliometrics and simple indicators. However, these systems allocate a much lower proportion of institutional funding. Systems allocating a large proportion of institutional funding such as in the UK and Finland have to be methodologically very robust; those allocating a small proportion (e.g. Sweden, Norway) can be less rigorous while still being accepted by the community.

Scope and indicators

6. The other key design parameters are the scope of the research assessment and type of indicators used. The current trend is that the research assessments not only look at scholarly outputs, but are also beginning to encompass their impact on research, innovation and society at large. Like the UK, other countries are showing increasing interest in non-scholarly impacts of research. Indicators used can be grouped into four categories: indicators directly assessing research outputs, external funding indicators, systemic indicators and outcomes/impact indicators (which measure effects of research outputs on science or the wider society). The UK REF 2014

stands out as the first major concerted attempt - in a performance-based research funding system - to demonstrate research impact in a systematic way through the use of case studies.

Table 1: Indicators used in research assessment exercises

		Belgium /FL (2009)	Czech Republic (2013)	Denmark (2009)	Finland (2015)	Italy (VQR, 2011)	New Zealand (2003)	Norway (2006)	Sweden (2008)	UK (REF 2014)
Output indicators	Academic outputs	√	√	√	√	√	√	√	√	√
	Non-academic outputs		√			√			√	√
	Innovation-related outputs (IPR)		√			√				√
External funding indicators	Competitive funding / national			√	√	√	√	√	√	√
	Competitive funding / international			√	√	√	√	√	√	√
	Contract research funding			√		√	√		√	√
	Non-competitive funding			√		√	√			√
Systemic indicators	Esteem (conferences, editorships, rewards etc.)					√				√
	Collaborations / national					√		√		√
	Collaborations / international					√				√
	International mobility				√	√				√
	Collaboration research-industry					√				√
	PhD recruitment/awarding	√		√		√	√	√		√
Outcomes/ impact indicators	Academic impacts (citations)	√	√			√			√	
	Socio-economic outcomes/impacts (e.g. spin-offs)					√				√

7. The table shows that the assessment of research productivity and research quality or excellence is important in all countries and that most also assess the universities' capacity to attain external funding as a proxy indicator for research quality and/or relevance. It also shows that the UK REF and the Italian VQR stand out for the breadth of the indicators they use, covering all indicator categories and focusing more than other PRFS on the use of systemic indicators.

Performance-based research funding as a component of the research funding mix

8. The percentage of institutional funding that depends on the research evaluation is a key feature of assessment exercises and varies substantially among the countries, reflecting the historical context and especially, the policy objectives.

9. Generally, governments fund the majority of research through institutional rather than project-based funding. The UK, French, Flemish and Irish systems stand out as providing 50% or less of research funding to the universities in the form of institutional funding.

10. Research assessments are generally seen as useful ways to add an element of competitive pressure to institutional funding. In many institutional funding systems a considerable proportion remains unconditional. Consequently, most research assessments make up a small component of the overall funding system for research and higher education; only Finland, Denmark, the Czech Republic and the UK allocate more than 20% of the institutional funding through these processes. The research assessment component affects only a small part of the total funding for a given institution and its use abroad has normally resulted in only marginal changes to the funding mix.

Weight of indicators

11. The weights attributed to the indicators and assessment criteria, which ultimately define the funding allocations, depend on the policy objectives and the needs in the research system. The UK, New Zealand and the Czech Republic stand out for the high weight attributed to the quality of the research outputs, while the systems in Finland, Norway and Belgium (the Flanders) attribute high importance to the effects of the activities on the research system (e.g. research-industry collaborations). Italy stands out for the weight set on innovation-related outputs and activities. Denmark and Sweden attribute higher than average weights to the capabilities of the universities to attract external funding for research.

Conclusion

12. The UK stands out as the country where the quality of research outputs influences more than 10% of the universities' overall institutional funding. The average in other countries is around 5%. This is the result of the high weight set on the research quality criterion in the RAE/REF, combined with the high share of overall institutional funding guided by it.

13. The UK is also one of the few countries where the assessment of the research quality aims at rewarding 'excellence' and the concentration of resources on the 'best' research wherever it is found. In the RAE/REF, a *non-linear* calculation of the institutional funding allocations is used, purposely skewing rewards towards those with the strongest performance. Other systems all have a more or less linear relationship between the production of quality publications or any other indicator/assessment criterion and monetary rewards.

Taken from a report by Technopolis to the REF Review Steering Group

Appendix D: Call for Evidence

Summary of findings

A paper by Technopolis, published alongside this report[27], provides a synthesis of the 301 responses provided by the UK Higher Education community to the Steering Group's 'Call for Evidence,' combined with the key messages arising from a supplementary programme of 40 qualitative interviews with universities, academics, research users and various intermediaries, from industry associations to learned societies.

This table provides a summary of the level of support for various options synthesised from the Call for Evidence.

Table 4: Level of support for policy options and positions, by respondent group

Issue	Option	Higher Education Institutions	Individuals	Other respondents*
Number of outputs	Reduce number	*Moderate support*	*Limited support*	*Limited support*
	Keep 4 outputs per person	*Limited support*	*No support*	*Limited support*
Staff selection	Submit all staff	*Moderate support*	*Moderate support*	*Moderate support*
	Retain staff selection	*Moderate support*	*No support*	*Limited support*
Impact	Broaden definition of impact	*Moderate support*	*Moderate support*	*Moderate support*
Metrics	Extensive use of metrics	*Limited support*	*Limited support*	*Limited support*
	Metrics as support for peer review	*Very strong support*	*Limited support*	*Strong support*
	No role for metrics	*Limited support*	*Limited support*	*Limited support*
Units of Assessment	Keep current Units of Assessment	*Very strong support*	*Moderate support*	*Strong support*

[27] Technopolis (2016) Synthesis of responses submitted to the REF Review Call for Evidence and follow-up interviews, Available: https://www.gov.uk/government/publications/research-excellence-framework-review-summary-of-views

Issue	Option	Higher Education Institutions	Individuals	Other respondents*
Link between outputs and individuals	Keep current link	*Moderate support*	*Limited support*	*Limited support*
	De-couple individuals from outputs	*Strong support*	*Limited support*	*Moderate support*
Aggregation	Aggregate parts of environment and/or impact elements	*Strong support*	*Limited support*	*Moderate support*
Influence of the REF	REF has negative influences	*Strong support*	*Very strong support*	*Strong support*
	REF has positive influences	*Strong support*	*Limited support*	*Moderate support*
Solutions to gaming	Restrict portability of outputs	*Moderate support*	*No support*	*Limited support*
	Change eligibility of staff	*Strong support*	*Limited support*	*Moderate support*
	Selectivity *(see above)*			
	Reduce use of unweighted scores	*Limited support*	*Limited support*	*Limited support*
Forward planning as assessment criterion in REF	In favour of enhanced role of future planning in REF	*Moderate support*	*Limited support*	*Limited support*
	Against enhanced role of future planning	*Moderate support*	*Limited support*	*Moderate support*
Allocation of QR funding	Keep un-hypothecated	*Strong support*	*Limited support*	*Moderate support*
	Earmark QR funding	*No support*	*Limited support*	*Limited support*

(*) The group “Other organisations” includes all categories of respondents other than HEIs and individuals

Appendix E: Method of work

Terms of reference

1. The review will investigate different approaches to the evaluation of UK higher education research performance which can encourage and strengthen the emphasis on delivering excellent research and impact, while simplifying and reducing the administrative burden on the HE sector.

2. The review will draw on the evidence from the evaluation of REF2014 and will consider other models of research performance assessment, which could provide robust means of informing future research funding allocations.

3. The review will provide options for future iterations of the REF focusing on a simpler, lighter-touch method of research assessment, that more effectively uses data and metrics while retaining the benefits of peer review. The review should ensure that a future process identifies and supports excellent research across the UK, including dynamic changes in research quality and emerging areas of research excellence, retains the frequency of approach of the current REF arrangements (at 5-6 year cycle) and secures the confidence of the HE/Academic sector.

Steering Group membership

4. The review was chaired by the President of the British Academy and Professor of Economics at the LSE, Lord Nicholas Stern. He was assisted by a high-level steering group of experts, including:

    - Professor Julia Black, Professor of Law and Pro-director for Research, London School of Economics
    - Professor Sir Leszek Borysiewicz, immunologist and Vice-Chancellor, Cambridge University
    - Dame Professor Vicki Bruce, psychologist, Newcastle University
    - Professor Linda Colley, historian, Princeton
    - Gareth Davies, Director General of Business and Science, BEIS
    - Professor Alex Halliday, geochemist, Oxford University and Vice-President and Physical Secretary, The Royal Society
    - The Baroness Brown of Cambridge, Professor Julia King, engineer and Vice-Chancellor, Aston University
    - Professor Anton Muscatelli, economist, Principal and Vice-Chancellor, Glasgow University
    - Professor Sir John Tooke, medical scientist, UCL and Past President, Academy of Medical Sciences
    - Dr Alex Marsh, HM Treasury

5. The Steering Group met four times between January and July 2016. During the meetings they were presented with various papers on key themes and latterly the review document and recommendations. There was strong participation from the Steering Group throughout.

Advisory Group membership

6. The Review's Advisory Group was chaired by Rebecca Endean, Director of Science and Research at the Department of Business, Innovation and Skills. Its membership comprised of:

- Rebekah Widdowfield, Head of Higher Education Scottish Government
- Professor Julie Williams, Chief Scientific Advisor for Wales
- Sian Kerr and Heather Cousins, Department for Employment and Learning Northern Ireland
- David Sweeney, Director (Research, Education and Knowledge Exchange) Higher Education Funding Council for England
- Professor David Maguire, Vice-Chancellor of the University of Greenwich
- Professor Roderick Watkins, Deputy Vice Chancellor Research and Innovation Anglia Ruskin University
- Professor Hilary Lappin-Scott, Senior Pro-Vice-Chancellor (Research and External Recognition) University of Swansea
- Professor David Price, Vice-Provost (Research), University College London
- Harry Robinson, HM Treasury

7. The Advisory Group met three times between January and July 2016, and produced a number of papers that were considered by the Steering Group when shaping their recommendations.

Secretariat

8. Secretariat support for the Review was provided by the Department for Business, Energy and Industrial Strategy, with technical advice on the operation of the REF provided by HEFCE.

Technopolis

9. Consultancy support for the review was provided by Technopolis, who produced a literature review, an overview of international comparative systems and presented a series of papers to the Steering Group outlining their findings and conclusions.

10. They also undertook the analysis of the Call for Evidence[28] and undertook 40 qualitative interviews with universities, academics, research users and various intermediaries, from industry associations to learned societies, in order to get a better understanding of particular issues (e.g. REF and interdisciplinary research) or to plug gaps in the responses to the call for evidence (e.g. the business community).

[28] Technopolis (2016) Synthesis of responses submitted to the REF Review Call for Evidence and follow-up interviews. Available: https://www.gov.uk/government/publications/research-excellence-framework-review-summary-of-views

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