What is High-Quality Research in the 21st Century

David Sweeney
Executive Chair, Research England
The Royal Society

‘No-one can predict the 21st century counterparts of quantum theory, the double helix and the internet. But there is little doubt that advances in science and technology will continue to transform the way we live, create new industries and jobs, and enable us to tackle seemingly intractable social and environmental problems.’
National Objectives (1)

• Intellectual leadership in the development of new knowledge

• ‘International Comparative Performance of the UK Research Base’ – ‘better than world average in all subject fields based on field-weighted citation impacts

• ‘Well-rounded portfolio’
National Objectives (2)

- Optimal Contribution to Society from that new knowledge – ‘Impact’ and Innovation
- Culture change & broad engagement of universities/academics
- Greater investment from business but to support shared objectives
National Objectives (3)

• Develop highly-skilled individuals who will take forward the challenge of developing and applying new knowledge
UK Distinctiveness

- Dual Funding (Project and Block Grant)
- Charity Funding
- Stable Funding
- Academic Freedom
- Academic Mobility
- Performance-Based Funding
- Universities as the major focus
The Numbers

- UKRI has a **combined budget of around £7bn** per year

- University **Block-Grant** of **£2bn** per year

- **3,900** research and business grants issued every year

- **151** universities receiving research funding

- **38** institutes, laboratories, units, campuses and innovation catapults
University research income vs. expenditure

- Research Council grants = £2.0bn
- Research England and devolved funding councils = £1.9bn
- Other government depts = £1.1bn
- PGR income = £1.1bn
- EU research grants = £0.75bn
- UK charity grants = £1.2bn
- Industry research income = £1.1bn
- Other contributions to research = £0.4bn

Total university research income = £9.6bn

University expenditure on research (full economic cost) = £12.8bn
Current Strategy

- Performance-based funding
  - Past success is a good guide to future success in a stable environment with long cycles
  - A mixture of metrics, peer judgement and expert advice to determine past and future ‘excellence’

- Public funding to unlock private funding

- Investing in people and facilities

- Investing in ‘infrastructure’ and projects

- Investing for long-term success e.g. e-infrastructure, graphene
Mission

UK Research and Innovation: benefiting everyone through knowledge, talent, and ideas

Delivering UKRI’s vision and the Government target of 2.4% of GDP spend

<table>
<thead>
<tr>
<th>Deliver economic impact</th>
<th>Create social and cultural impact</th>
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<tbody>
<tr>
<td>Push frontiers of human knowledge and understanding</td>
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<tr>
<td>Foundations for excellent research and innovation</td>
<td>Best environment for research and innovation</td>
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<tr>
<td>Trusted and diverse system</td>
<td>Leading talent</td>
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<td>Global Britain</td>
<td>Infrastructure</td>
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UKRI as an outstanding organisation (corporate plan)
Working towards 2.4%

The Government has committed to reaching:

- 2.4% of GDP investment in R&D by 2027
- Reaching 3% in the longer term
- Additional £7bn by 2021/22

In 2015 UK’s expenditure on R&D represented 1.7% of GDP – below the OECD average R&D intensity of 2.4%.
Foundations to the Industrial Strategy

5 foundations of productivity:

- **Ideas**
  - the world’s most innovative economy

- **People**
  - good jobs and greater earning power for all

- **Infrastructure**
  - a major upgrade to the UK’s infrastructure

- **Business environment**
  - the best place to start and grow a business

- **Places**
  - prosperous communities across the UK

Impact of UKRI:

- pushing the frontiers of human knowledge
- growing the talent base in areas of identified opportunity
- developing an infrastructure roadmap to improve understanding and capacity
- enabling industry-academia collaboration to build on excellent research
- capitalising on the excellent research that exists across the UK
ISCF and the Grand Challenges

**AI & Data**
- W1 Robotics for a safer world (£93m)
- W2 Audience of the future (£33m)
- W2 Next generation services (Pioneer £20m)
- W2 Quantum technology (Pioneer £20m)
- W3 Commercialising Quantum technology (£70m)
- W3 Manufacturing Made Smarter (£121m)

**Ageing Society**
- W1 Medicines manufacturing (£188m)
- W2 Data to early diagnosis and precision medicine (£196m)
- W2 Healthy Ageing (£98m)

**Clean Growth**
- W2 Prospering from the energy revolution (£102.5m)
- W2 Transforming construction (£170m)
- W2 Transforming food production (£90m)
- W3 Driving the electric future (£78m)

**Future of Mobility**
- W1 Faraday battery challenge (£246m)

**Other**
- W1 National Satellite Test Facility (£99m)
Industrial Strategy Challenge Fund

The 2018 Autumn Budget announced and increase to the ISCF of £1.1bn, including:

Three new challenges for wave three:

• Up to £121 million for **Made Smarter** to support the transformation of manufacturing through digitally-enabled technologies, such as the Internet of Things and virtual reality

• Up to £78 million for the **Stephenson Challenge**, supporting innovation in electric motor technology, making vehicles lighter and more efficient than ever before

• Up to £70m for the **Commercialising Quantum Technologies Challenge**.
What is Block Grant Funding for?

Our grant for research is allocated to enable universities to:

- Maintain a research base of world leading quality across the full range of disciplines
- Create capacity which enables the sector to respond flexibly to changing needs of stakeholders, the economy and society
- Undertake research funded from other sources
- Support innovative research, including in new fields and opening new lines of enquiry, and making connections across the full range of disciplines
What is Block Grant Funding For?

- The priorities of universities and academics - unhypothecated
- Including support of new areas of work, early career researchers, infrastructure, staff between grants, dissemination, career development….
- Rewards excellence, rewards below-cost research for charities and business
- Support doctoral students
- University Museums, Galleries and Collections. Research Libraries of national and global significance
Research Assessment in UK

- Research Assessment Exercise – RAE, now Research Excellence Framework
  - Periodically since 1986 every 6 years or so.
  - Primarily a peer review exercise for all disciplines (34 now) – metrics play a strictly limited part
  - Carries the confidence of academics and universities- because it is run by academics
  - A selective exercise, not an assessment of all UK research
  - The single most important driver for academics and universities in the United Kingdom.
  - Liked by Government as allows funding on the basis of quality.
  - Reputation attached is a very significant factor
  - Embedded in university management systems
REF assesses the quality of research in all UK universities, in all disciplines. It is carried out by 36 expert panels, grouped into 4 main panels.

<table>
<thead>
<tr>
<th>Main Panel A:</th>
<th>Medical and life sciences</th>
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<tr>
<td>Main Panel B:</td>
<td>Physical sciences and engineering</td>
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<tr>
<td>Main panel C:</td>
<td>Social sciences</td>
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<tr>
<td>Main Panel D:</td>
<td>Arts and humanities</td>
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</table>

**2011 -12**
**Preparation**
Panels were appointed. Guidance and criteria were published.

**2012 – 13**
**Submissions**
Universities made submission in whichever subjects they chose to.

**2014**
**Assessment**
36 expert panels reviewed the submission, guided by the 4 main panels.
## Outputs – criteria

### Originality
- The extent to which the output makes an important and innovative contribution to understanding and knowledge in the field

### Significance
- The extent to which the work has influenced, or has the capacity to influence, knowledge and scholarly thought, or the development and understanding of policy and/or practice

### Rigour
- The extent to which the work demonstrates intellectual coherence and integrity, and adopts robust and appropriate concepts, analyses, theories and methodologies

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**Scored one to four star (or unclassified)**
- Each main panel sets out its own understanding of the starred quality levels
- All outputs meeting REF definition of research are eligible, with all forms of output considered equitably
- Panels will not use journal impact factors or hierarchies of journals in assessment
Impact – criteria

<table>
<thead>
<tr>
<th>Reach</th>
<th>Significance</th>
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<tr>
<td>• the extent and/or diversity of the beneficiaries of the impact, as relevant to the nature of the impact. (It will not be assessed in geographic terms, nor in terms of absolute numbers of beneficiaries.)</td>
<td>• the degree to which the impact has enabled, enriched, influenced, informed or changed the performance, policies, practices, products, services, understanding, awareness or well-being of the beneficiaries.</td>
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- Case studies describing any type(s) of impact welcomed (extensive – but not exhaustive – list of examples of impact and indicators at Annex A)
- Case studies describing impacts through public engagement welcomed
- Case studies must provide a clear and coherent narrative supported by verifiable evidence and indicators
### Environment – criteria

**Assessment criteria:**

<table>
<thead>
<tr>
<th>Vitality</th>
<th>Sustainability</th>
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<tr>
<td>• the extent to which a unit supports a thriving and inclusive research culture for all staff and research students, that is based on a clearly articulated strategy for research and enabling its impact, is engaged with the national and international research and user communities and is able to attract excellent postgraduate and postdoctoral researchers.</td>
<td>• the extent to which the research environment ensures the future health, diversity, well-being and wider contribution of the unit and the discipline(s), including investment in people and in infrastructure.</td>
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</table>
What was assessed:

Panels judged the **overall quality** of each submission

- **65%**
  - Quality of research **outputs** 34
  - Discipline Panels 1000 reviewers
- **20%**
  - Impact of research on society
- **15%**
  - The research environment

The review was based on data and information about the environment.

- **191,150** research outputs by **52,061** staff were reviewed
- **6,975** impact case studies were reviewed
The research of 154 UK universities was assessed. They made 1,911 submissions including:
- 52,061 academic staff
- 191,150 research outputs
- 6,975 impact case studies

The overall quality of submissions was judged, on average to be:
- 30% world-leading (4*)
- 46% internationally excellent (3*)
- 20% recognised internationally (2*)
- 3% recognised nationally (1*)
Dimensions of Excellence

• Originality - Prizes for coming first, praise for coming second, nothing for coming third
• Rigour – replicable, recorded, thorough, deep
• Significance
• System appears to work well for the development of new knowledge- adaptation for impact made in REF
• Impact – reach, significance, economic contribution?
What is Excellence in Research?

• Published outputs (of different kinds) at the heart of quality assessment
• Peer judgement is the main tool
• National Assessment (Research Excellence Framework)
Assessing Quality – Impact Agenda

To identify and reward the contribution that high quality research has made to the economy and society:

• Making these explicit to the Government and wider society
• Creating a level playing field between applied and theoretical work but recognising only impact based on excellent research
• Encouraging institutions to achieve the full potential contribution of their research in future
• Intellectually coherent with the historical purposes of universities
Impact: Definition for the REF

• An effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia

• Impact **includes** an effect, change or benefit to:
  • The activity, attitude, awareness, behaviour, capacity, opportunity, performance, policy, practice, process or understanding
  • Of an audience, beneficiary, community, constituency, organisation or individuals
  • In any geographic location whether locally, regionally, nationally or internationally

• It **excludes** impacts on research or the advancement of academic knowledge within HE; and impacts on teaching or other activities within the submitting HEI
REF Case Studies: Outcomes

- Universities and academics galvanized due to the importance of REF
- 6975 case studies
- Many focused on the long-term contribution of research to society
- Offering every discipline the opportunity to make its case in its own terms
- Stunning opportunity to build multi-disciplinary work into an exercise based around disciplines – although you may be doing that better
- Evaluation by Rand Europe now underway
Myths and Anxieties

- Some impact is negative (Yes, but Panels can handle)
- All research must have impact (No)
- Only economic impact counts (No)
- The best impact does not come from the best research (Perhaps but we need to know that)
- Arts and Humanities cannot demonstrate impact (No)
- Impact cannot be ‘measured’ (Yes, but it can be assessed)
- It takes time for happen (Yes, so allow for it)
- The expectation of impact is a threat to academic freedom (No)
- Impact will become an industry (Only if you let it be so)
- Measures will become targets (Depends if you own the agenda)
Impact: Case Studies

• Each case study is limited to 4 pages and must:
  • Describe the underpinning research produced by the submitting unit
  • Reference one or more key outputs and provide evidence of the quality of the research
  • Explain how the research made a ‘material and distinct’ contribution to the impact (there are many ways in which this may have taken place)
  • Explain and provide appropriate evidence of the nature and extent of the impact: Who / what was affected? How were they affected? When?
  • Provide independent sources that could be used to verify claims about the impact (on a sample audit basis)
Challenges of Assessment

- **Time lags** – we will look at impacts that are evident during from REF period (2008-2012), underpinned by research over a longer timeframe

- **Attribution** – case studies to tease out how the research *contributed* to the impacts

- **Limitations of metrics** – expert panels will assess rather than *measure* impact; indicators to be used as supporting evidence

- **Corroboration** – scope for third party verification, and expert panels to judge credibility of the evidence
REF: A UK-Wide Framework

- Aiming to maintain the capacity of higher education to undertake world-leading research across a range of academic disciplines, promote economic growth and national well-being and the expansion and dissemination of knowledge
- Delivered by the REF team on behalf of the four UK funding bodies

- The REF:
  - Drives our selective allocations of research funding, supporting excellence wherever it is found
  - Provides international benchmarks and reputational yardsticks
  - Provides accountability and demonstrates the benefits of public investment in research
2021 framework

**Overall quality**

- **Outputs**
  - FTE x 2.5 = number of outputs required
  - 60%

- **Impact**
  - Impact case studies
  - 25%

- **Environment**
  - Environment data and template
  - 15%
The Stern Review

Key principles

• Lower burden
• Less game-playing
• Less personalisation, more institutionally focused
• Recognition for investment
• More rounded view of research activity
• Interdisciplinary emphasis
• Broaden impact
Key changes since REF 2014

Overall framework
• Submission of all staff with significant responsibility for research
• Transitional approach to non-portability of outputs
• Decoupling of staff from outputs
• Open access requirements
• Additional measures to support interdisciplinary research
• Broadening and deepening definitions of impact

Panel criteria
• Aim for continuity with 2014 and greater consistency across main panels, where possible.
Staff submission

- All staff with significant responsibility for research should be returned to the REF

- ‘Teaching and Research’ or ‘Research only’
- Independent researcher
- Minimum of 0.2 FTE
- Substantive connection

Accurately identifies staff with significant responsibility for research

Some T&R staff do not have significant responsibility for research

100 per cent returned

Staff with significant responsibility returned, following process developed, consulted on and documented

• Approach may vary by UOA where employment practices vary at this level
Significant responsibility

Staff for whom:

- **Explicit time and resources are made available...**
  - proportion of time allocated for research, as determined in the context of the institution’s practices and applied in a consistent way
  - research allocation in a workload model or equivalent.

- **...to engage actively in independent research...**
  - eligibility to apply for research funding as the lead or co-applicant
  - access to research leave or sabbaticals
  - membership of research centres or institutes within the HEI.

- **...and that is an expectation of their job role.**
  - current research responsibilities as indicated in, for example, career pathways or stated objectives
  - expectations of research by role as indicated in, for example, job descriptions and appraisals.
Codes of practice

Code of practice to cover:

- Process for ensuring a fair approach to selecting outputs
- Process(es) for determining who is an independent researcher
- Process(es) for identifying staff with significant responsibility for research (where not submitting 100%)

- Draft Guidance on codes of practice, including template at [www.ref.ac.uk](http://www.ref.ac.uk).
- EDAP will examine the codes and advise the funding bodies.
- Publication intended by end of 2019.
Interdisciplinary research

- **Interdisciplinary identifier**
  - For the purposes of the REF, interdisciplinary research is understood to achieve outcomes (including new approaches) that could not be achieved within the framework of a single discipline. Interdisciplinary research features significant interaction between two or more disciplines and/or moves beyond established disciplinary foundations in applying or integrating research approaches from other disciplines.
  - No advantage or disadvantage in the assessment in identifying outputs as IDR.
- **Specific guidance to panels on applying assessment criteria to IDR outputs**
Interdisciplinary research

• Panel structures
  • IDAP:
    • oversee application of agreed principles and processes
    • provide advice and support for cross-panel collaboration
  • Main panel interdisciplinary leads:
    • facilitate cross-panel liaison
    • oversee calibration exercise for IDR outputs
  • Sub-panel interdisciplinary advisers:
    • offer guidance to sub-panels on assessment of IDR outputs
    • liaise with advisers on other panels
Outputs – open access

- Outputs deposited as soon after the point of acceptance as possible, and **no later than three months** after this date from 1 April 2018.

- Deposit exception from 1 April 2018 – outputs remain compliant if they are deposited up to three months after the date of publication.

- Additional flexibility – 5% tolerance band per submission
Impact

Consistency with REF 2014

- Impact remains non-portable
- 2* quality threshold
- Timeframe:
  - 1 January 2000 - 31 December 2020 for underpinning research
  - 1 August 2013 - 31 July 2020 for impacts

Refinements

- Impact template integrated into Environment statement
- Impact on teaching within (and beyond) own HEI is eligible
- Enhanced clarity on scope of underpinning research – bodies of work
- Guidance on submitting continued impact case studies
- Aim for enhanced clarity in guidance on public engagement
Environment

• Structure:
  a. Unit context, research and impact strategy.
  b. People, including:
     • staffing strategy and staff development
     • research students
     • equality and diversity.
  c. Income, infrastructure and facilities.
  d. Collaboration and contribution to the research base, economy and society.

• Information on impact to be included across the four sections

• Advice from working group of Forum for Responsible Research Metrics on use of quantitative indicators to support the narrative
Institutional level assessment of environment

- Institutional-level information will be appended to the UOA-level environment template and will be taken into account by the sub-panel when assessing the unit-level statement.
- Pilot of the standalone assessment of the discrete institutional-level environment will draw on this submitted information.
- Outcomes from the separate pilot exercise will not be included in REF 2021 but will inform future research assessment.
Panel criteria

- One statement of combined criteria
- Supplementary criteria boxes relevant to individual main panels – colour coded
## Timetable

<table>
<thead>
<tr>
<th>Timeframe</th>
<th>Events</th>
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<tbody>
<tr>
<td>Spring 2018</td>
<td>Panels met to develop criteria</td>
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<tr>
<td>Summer to Autumn 2018</td>
<td>Consultation on draft guidance and criteria</td>
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<tr>
<td></td>
<td>Draft guidance on codes of practice</td>
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<tr>
<td></td>
<td><strong>Consultation deadline:</strong> noon, 15 October 2018</td>
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<tr>
<td>Early 2019</td>
<td>Publish final guidance and criteria</td>
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<tr>
<td>2019</td>
<td>Complete preparation of submission systems</td>
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<td><strong>Submission deadline for codes of practice:</strong> noon, 7 June 2019</td>
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<tr>
<td>2020</td>
<td>Submission phase</td>
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<td><strong>Submission deadline:</strong> noon, 27 November 2020</td>
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<td>2021</td>
<td>Assessment phase</td>
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<td><strong>Publication of results:</strong> December 2021</td>
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Further information

- www.ref.ac.uk