Industry view of Government support for industry & university collaboration

Professor Ric Parker CBE FREng
Recently-retired Director of Research & Technology
Rolls-Royce

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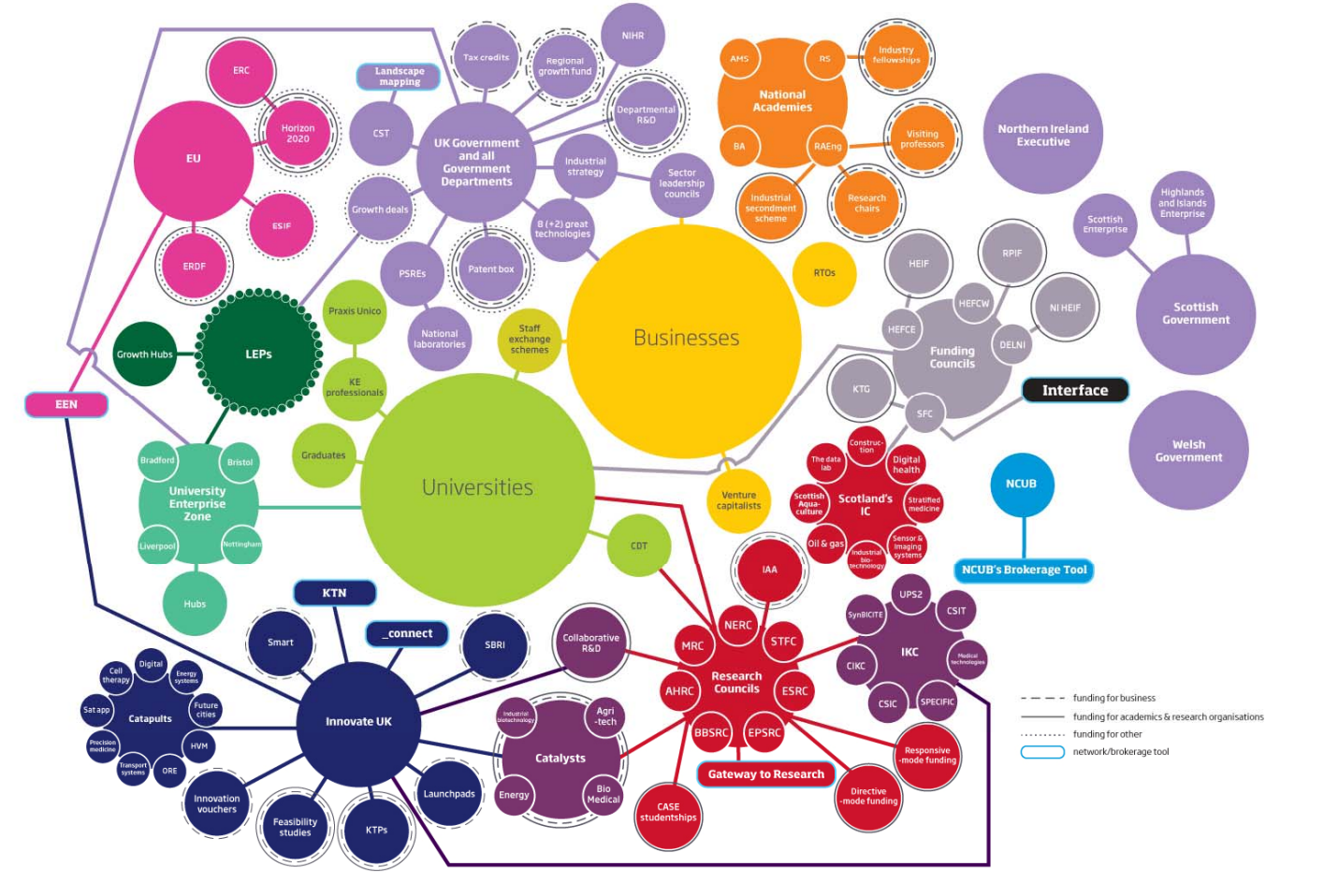
Technology Readiness Levels - Description

- TRL 1 Basic principles observed
- TRL 2 Technology concept formulated
- TRL 3 Experimental proof of concept
- TRL 4 Technology validated in lab
- TRL 5 Technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 6 Technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 7 System prototype demonstration in operational environment
- TRL 8 System complete and qualified
- TRL 9 Actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

Technology Readiness Levels – Description space for industry & university collaboration

- TRL 1 Basic principles observed
- TRL 2 Technology concept formulated
- TRL 3 Experimental proof of concept
- TRL 4 Technology validated in laboratory
- TRL 5 Technology validated at scale in relevant environment
- TRL 6 Technology demonstrated in relevant environment as part of complete system
- TRL 7 System prototype demonstration in operational environment
- TRL 8 System complete and qualified
- TRL 9 Actual system proven in operational environment

Dowling report – UK funding complexity map



Engineering and Physical Sciences Research Council

- The majority of EPSRC money is used to fund research directly with the Universities
- However, there are key schemes that support B-U* engagement
  - CASE PhD studentship (Co-operative Award in Science and Engineering)
  - DTC (Doctoral Training Centres)
  - IDTC (Industrial doctoral training centres)
  - EngD – Engineering Doctorate
  - Strategic alliance

*Business to University

Innovate UK

- Innovate UK
  - Originally the “Technology Strategy Board”
  - Created to promote collaborative research.
- Grants support the research programme with up to 50% funding
- More than half the total funding flows to Universities
- Can fund B-B (Business to Business) or B-U (Business to University programmes)

UK Catapults

- A new construct designed to create industrially-relevant research centres with strong ties to Universities
  - Modelled on the German Fraunhofer Institutes
- Funding model was 1/3 1/3 1/3
  - One third direct Government grants
  - One third funding won competitively
  - One third industry funded

UK Catapults

- Current catapults

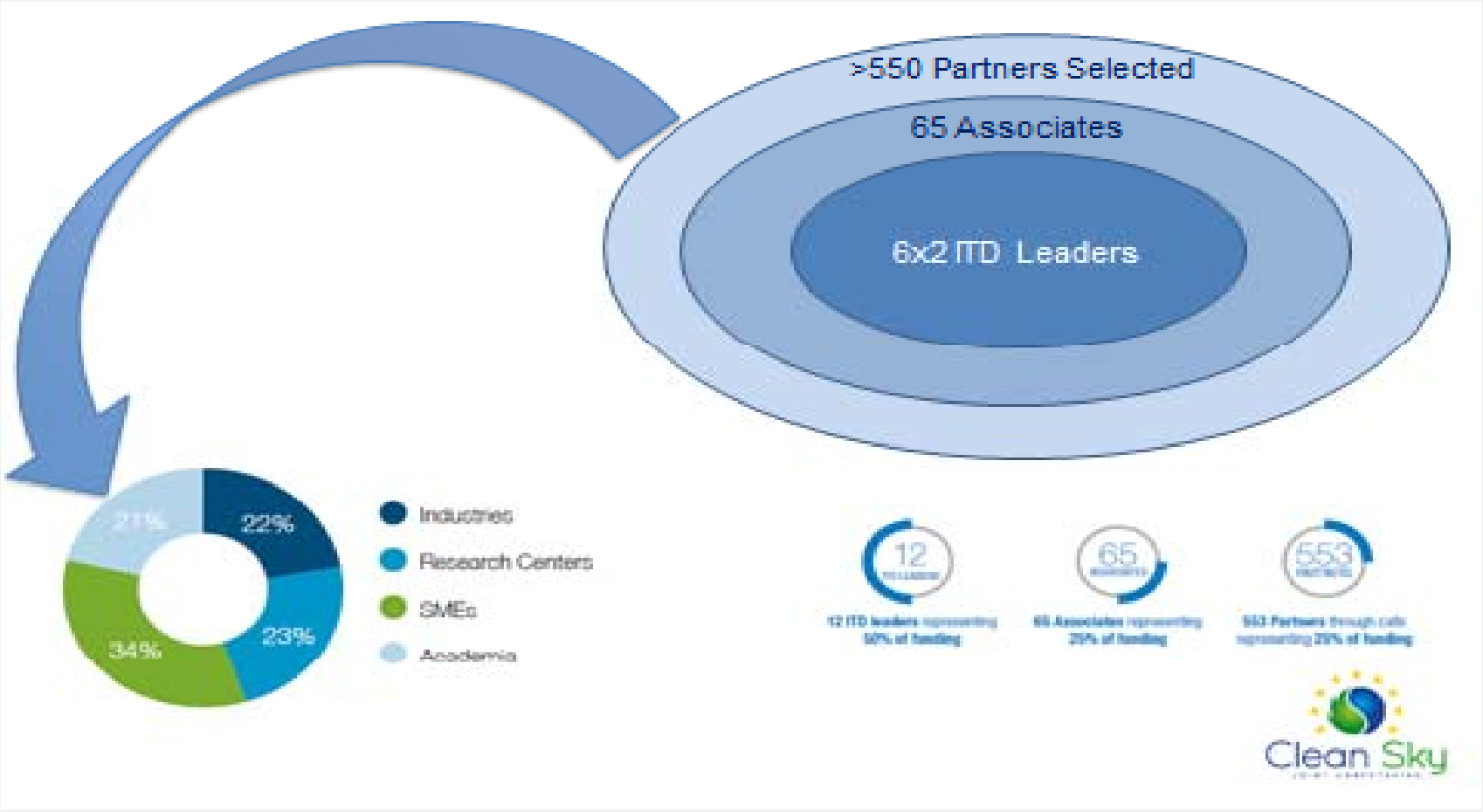
Royal Academy & Royal Society

- Professional bodies have their own schemes
- Royal Academy Research Chairs and Senior Research Fellowships
- RA Industrial secondments Scheme
- Royal Society Industrial Fellowships

European Horizon 2020

- The latest of the European “Framework Programmes”
- Seven year programme starting in 2015
- €80Bn
- Funding can be 100% of direct cost plus 25% of overheads

Horizon 2020 Example – Clean Sky

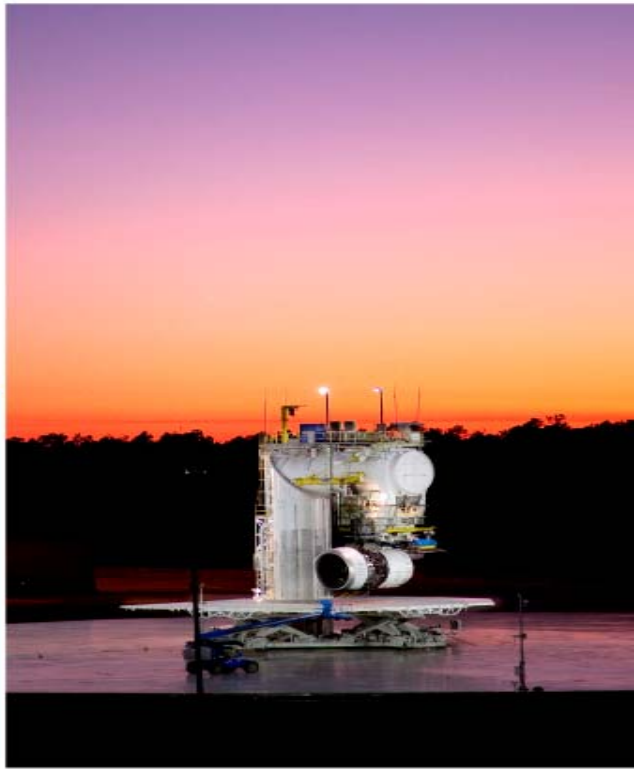


ROLLS-ROYCE CASE STUDY

Research and development

Rolls-Royce

We develop technologies and intellectual property that provide competitive advantage in our chosen markets.

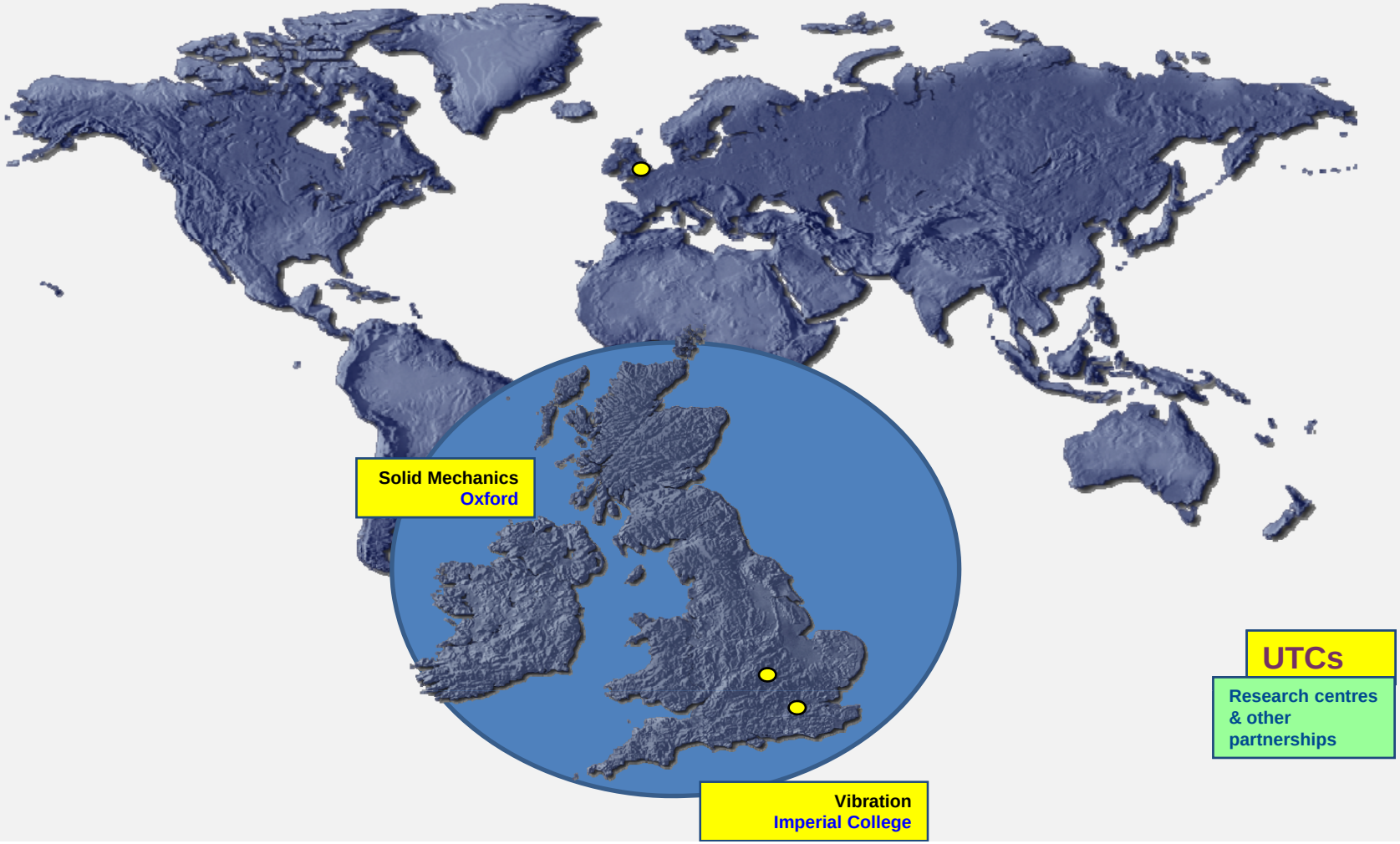


£1.25bn
Research and Development in **2015**

650
patent applications in **2015**

31
University Technology Centres worldwide

Research Network 1990



Benefits of University Research Environment

- Specialised skills
- ‘Time to think’
  - Escape from short term problems
- Challenge and dialogue
  - Multi-sectoral perspective
- Long term capability development
  - Recruitment & training skilled personnel

Critical success factors

- Partnership with Government agencies
  - Funding and support for university infrastructure
  - Support for complementary basic research
  - Support to attract key researchers
- Up front agreement on IPR, publication, etc.
- Joint review and measurement of quality, results, IPR capture, technology and skilled staff transfer
- Customisation of approach for different countries and cultures

Global Research Network 2000

Global Research Network 2015

Delivery of Capability Acquisition

Research - UTCs

Loughborough University
PURDUE UNIVERSITY
University of BRISTOL
UNIVERSITY OF SURREY
MANCHESTER 1824
b-tu Brandenburgische Technische Universität Cottbus
UNIVERSITY OF CAMBRIDGE
KIT Karlsruhe Institute of Technology
The University of Nottingham
The University Of Sheffield.

Validation

Programmes





TRL 1 2 3 4 5 6 7 8 9

CRL 1 2 3 4 5 6 7 8 9

NUCLEAR AMRC
Advanced Manufacturing Research Centre
BOEING
NATIONAL COMPOSITES CENTRE
mtc Manufacturing Technology Centre
CCAM COMMONWEALTH CENTER FOR ADVANCED MANUFACTURING

Pre-production - AxRCs

Full-scale manufacturing / Investment in capacity

Conclusion

- University & Industry collaboration is a three-way pact
  - University + Company + Government
- Together they can achieve more than they could individually
- This helps to bridge the “Valley of Death”