Engineering and Physical Sciences
Research Council

EPSRC
Investing in research for discovery and innovation

Centres for Doctoral Training: Past, Present and Future

Dr Jim Fleming, Building Leadership

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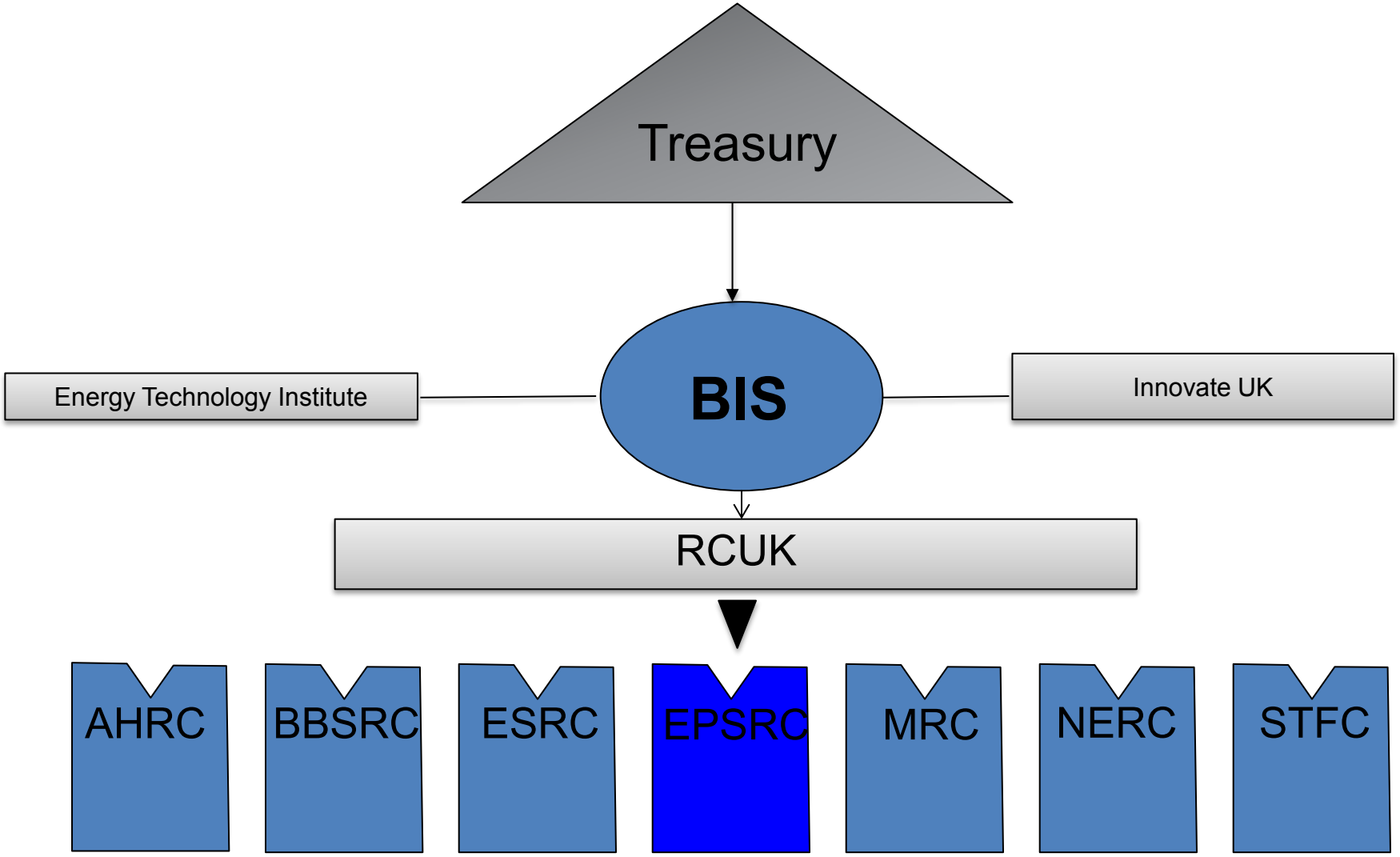

Key facts

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£2.5bn
RESEARCH PORTFOLIO

£800m
ANNUAL BUDGET

53%
OF RESEARCH PORTFOLIO IS COLLABORATIVE

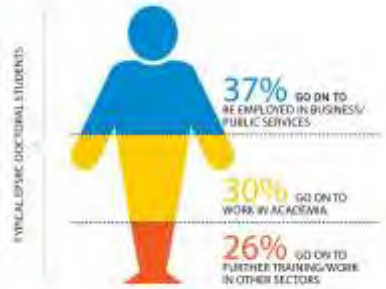
54%
OF RESEARCH PORTFOLIO
IS MULTIDISCIPLINARY

6,000
RESEARCHERS SUPPORTED

£1.69bn
OF OUR PORTFOLIO
IS RELEVANT TO THE UK GOVERNMENT'S INDUSTRIAL STRATEGY

£925m
OF LEVERAGE FROM

OVER **2,800**
ORGANISATIONS INVOLVED IN COLLABORATIVE GRANTS



Our three Strategic Plan Strategies

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Building Leadership

- Nurturing the visionary leaders who set research agendas and inspirational team leaders who act as role models;

Accelerating Impact

- Embedding impact throughout our portfolio by creating an environment in which it arises naturally, in whatever form, from the knowledge base;

Balancing Capability

- Ensuring we have the right people, with the right resource, in the right places to deliver the highest quality long-term research in areas where the UK leads internationally and where there is current or future national need;

Building Leadership

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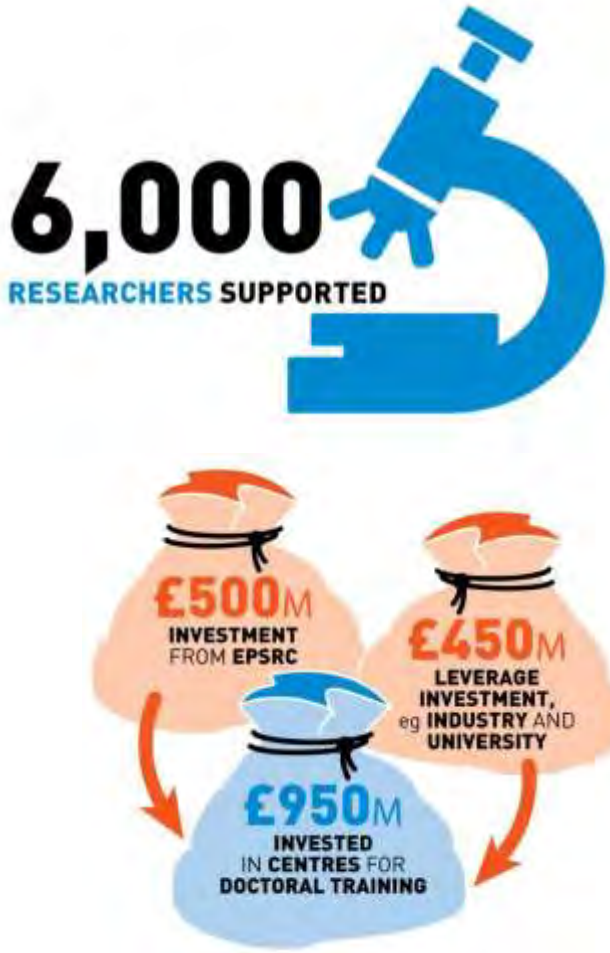
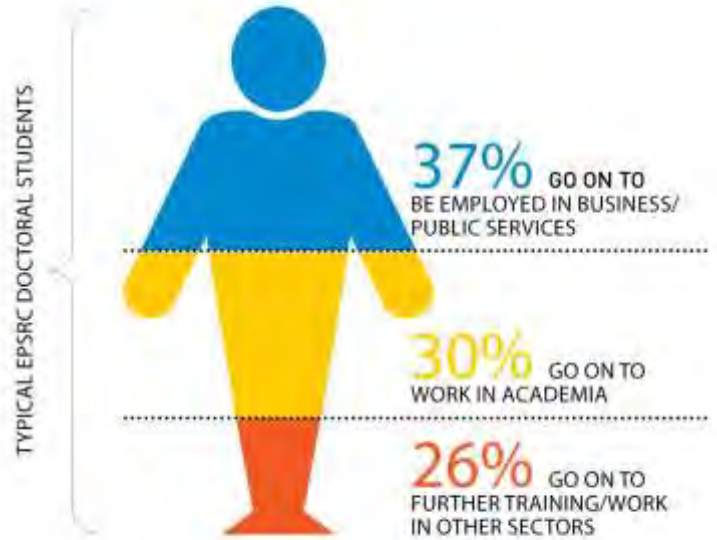


9,000

DOCTORAL STUDENTS SUPPORTED



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CENTRES FOR DOCTORAL TRAINING

EPSRC Doctoral training

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- Quality of the Training is paramount
- 3 Main routes
  - Doctoral Training Partnership (DTP)
  - Centres for Doctoral Training (CDTs)
  - Industrial Case (iCASE)

RCUK Doctoral Training Partnerships (DTP) and Centres (CDT)

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Council	Category	Grants	HEIs	Non-Academic CDT Partners	Student New Starts (approx.)
AHRC	Doctoral Training Partnership (DTP)	11	55		
AHRC	Centres for Doctoral Training (CDT)	7	34	45	730
BBSRC	Doctoral Training Partnership (DTP)	14	35		220
ESRC	Doctoral Training Centres (DTC)*	21	46		>600
EPSRC	Centres for Doctoral Training (CDT)	115	33	1100	
EPSRC	Doctoral Training Partnership (DTP)	124	38		2850
NERC	Centres for Doctoral Training (CDT)	3	29¶	~20	20
NERC	Doctoral Training Partnership (DTP)	15	38		325
MRC	Doctoral Training Partnership (DTP)§	24	24		251
STFC	Doctoral Training Partnership (DTP)	55	40		220

* ESRC is moving to DTP terminology at next call

¶ NERC figure includes Research Institutes as well as HEIs

§MRC also funds studentships in its own centres

CDTs: History

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- EPSRC established EngD centres in 1992 - focus on collaborative research;
- Life Science Interface DTCs in 2002 – focus on interdisciplinary research;
- Major investment in 2009 spanning priority areas such as Energy, Digital economy, Industrial Doctorate Centres (most of which award EngDs as qualification) and other topics ranging from Condensed Matter Physics to Plastic Electronics);
- Subsequent gap filling in areas such as Mathematics, ICT and Manufacturing in a portfolio worth c£320M

- Evolution, not revolution - Centres are not a recent innovation. Growth has not been rapid.

CDTs: Key Features

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- (Multiple) Cohort approach
  - Copied by others
- Key Challenge
  - Could be topic, sectoral etc
- Skills training
- Generally multidisciplinary
- Need
- Often involve industrial partners
- Student focussed

Centres provide

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- Resources to develop new approaches
- Leverage on the same
- A meaningful quantum of scale for new approaches to prove their worth
- A space for innovation in delivering doctorate
- Spillover/transferability to rest of institution at low /no cost
- Culture change in research as well as training
- Cohorts provide mutual peer to peer support for Learning and development, problem solving, networking and team skills and an ongoing network beyond the doctorate

Quality – what is it?

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- Input
  - The joint Bristol/Bath CDT in Systems typically receives 500 applications for 10 places each year.
  - MASDOC intake quality rated “high compared to my own department at Oxford” by ‘an Oxford don’
  - “the multidisciplinary intake is consistent with that seen for PhD studies except that the EngD route attracts a higher quality of engineering graduate” (UCL)
- Diversity – centres attract from a broader talent pool - 40% of Systems CDT appointees have prior employment experience

Output quality: LSI CDT (Oxford)

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- 10 years
- 60 students completed
- 241 publications including;
  - 8 Nature
  - 3 Science
  - 5 PNAS
  - 100 other titles

Output quality: Entrepreneurship

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- LSI CDT students have come 1st three times and 2nd once in 6 years of "Oxfords leading business ideas competition" open to all Oxford postgraduates
- Spin-outs:
  - Cella Energy Ltd: safe and low-cost hydrogen storage materials developed in the M3S CDT (UCL). Cella Energy was the national winner of the 2011 Shell Springboard competition
  - The 2010 'DTC Den' competition spawned 2 spinout vehicles for students (*Anywhere*HPLC and KIGO). From 2011 the competition went National and continues

Working with Business

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- STORI: Quantifying risk of structural damage to offshore structures – first year project outperformed traditional approach and has been adopted by Shell
- "Without the work done by EPSRC funded Students, the Trent 900 would not have flown" Colin Small, RR
- The HalSTAR tool developed on the Systems Eng Doc Programme has changed Halcrow's approach to options analysis, creating a new business stream for the company yielding 30 new projects to date
- Bioprocessing at UCL: "Merck & Co have adopted our microscale automated methods to speed the development of recombinant proteins and **estimate labour savings of 80%** in a market sector worth $1.5billion"

2011 Review of CDTs: Main Messages

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- The majority of Centres have made good progress or better;
- In general an effective way of training a cohort of students - Continuing need to share best practice e.g. learning lessons about flexibility across IDCs;
- Attracted substantial leverage;
- The existence of centres is driving wider changes as a result of the perceived benefit of a cohort-based approach;
- There are benefits from maximising linkage with and/or co-location with other major investments;
- Strategic integration into the university, committed academics, strong management (with independent advice, and a student-centred approach were indicators of the best and most successful.

Our initial position:

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£350M budget

356 outlines

177 progressed

56 host universities

£2.7Bn total value

£1.7Bn requested from EPSRC

Expected to fund 75-80 Centres

What was actually happened after the interviews…….

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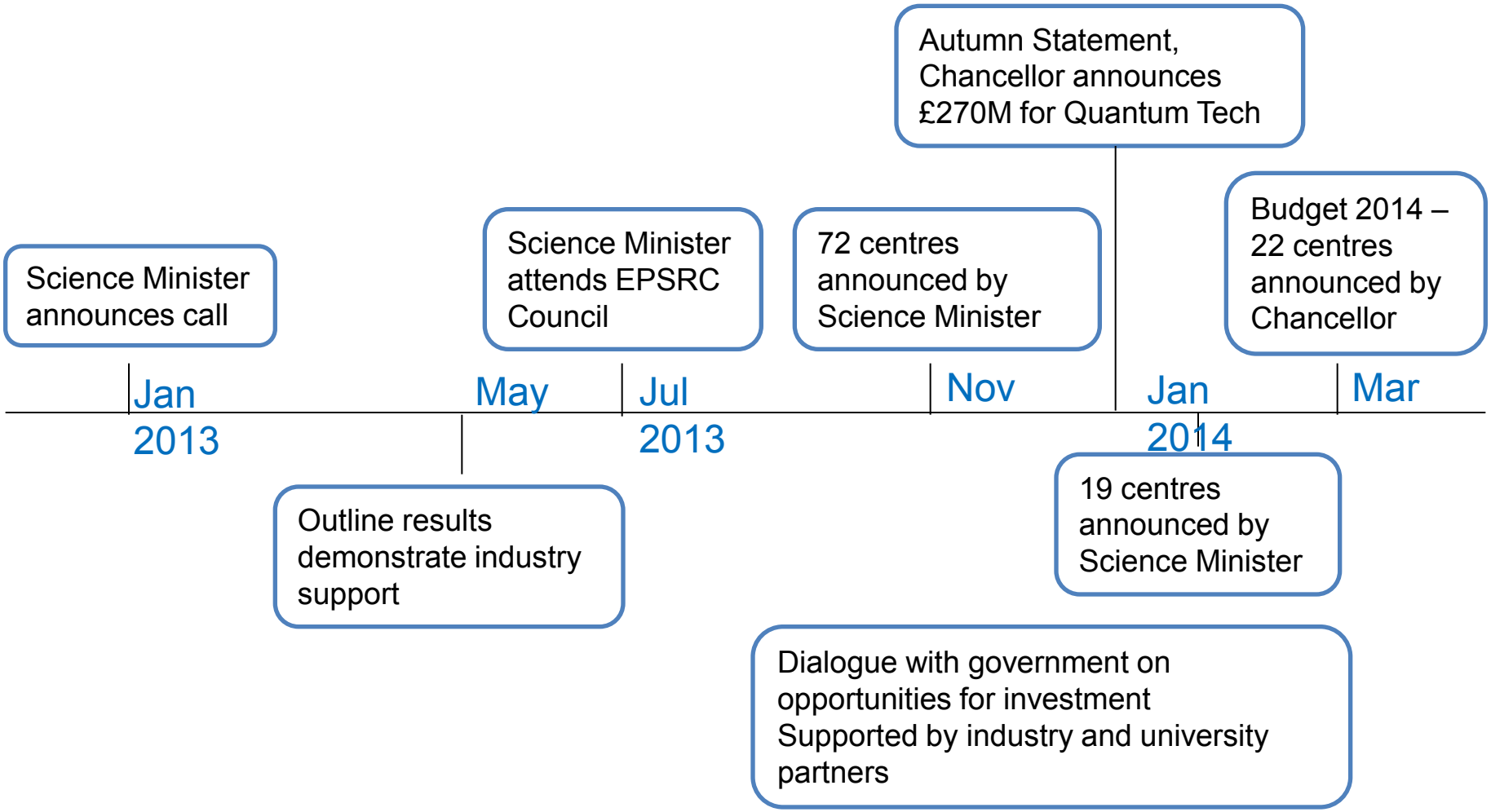

CDT case study – attracting investment

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“Our £500 million investment in Centres for Doctoral Training will inspire the next generation of scientists and engineers, ensuring Britain leads the world in high-tech research and manufacturing.”

Centres for Doctoral Training

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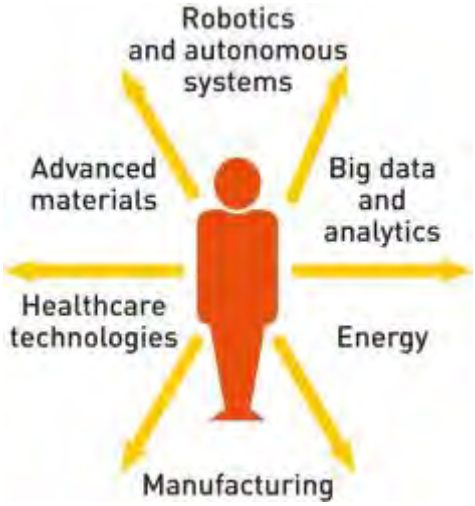

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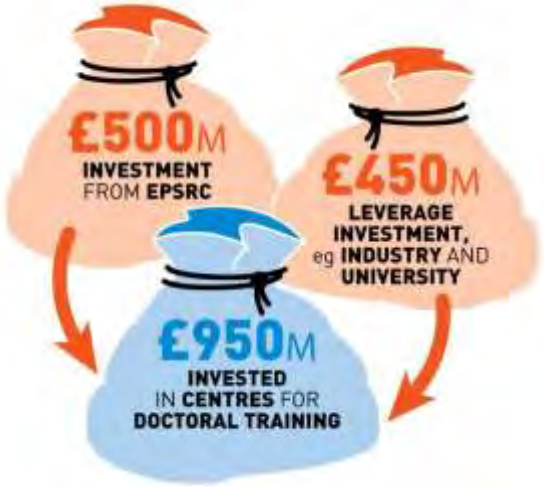
THE **NUMBER** OF **CENTRES**



7,000+
THE **NUMBER** OF **STUDENTS** THAT **WILL BE TRAINED** IN THE **CENTRES**

1,100
NUMBER OF **PARTNERING COMPANIES**

THE **NUMBER** OF **UNIVERSITIES**

Extra Capital EPSRC has received

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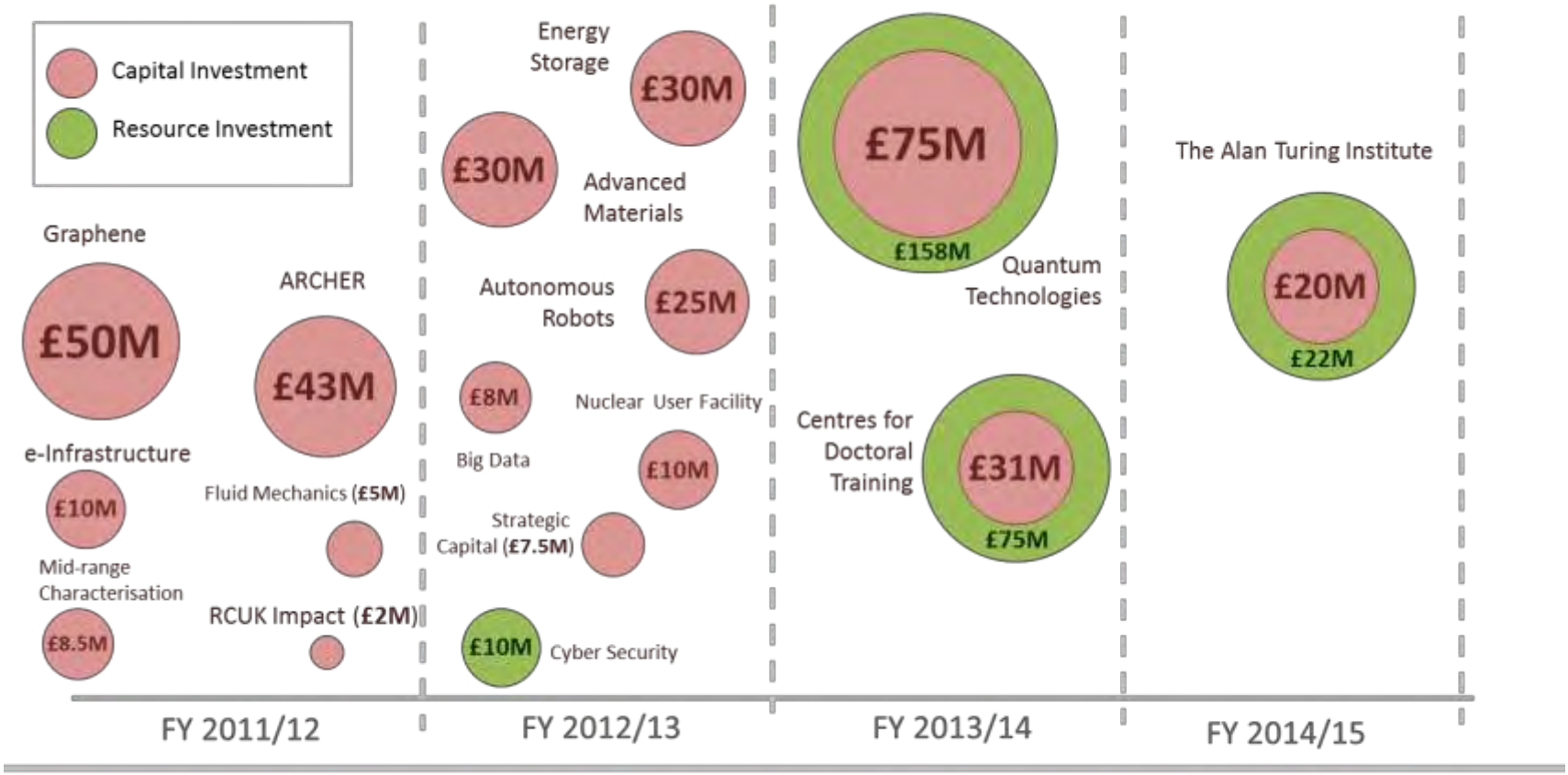
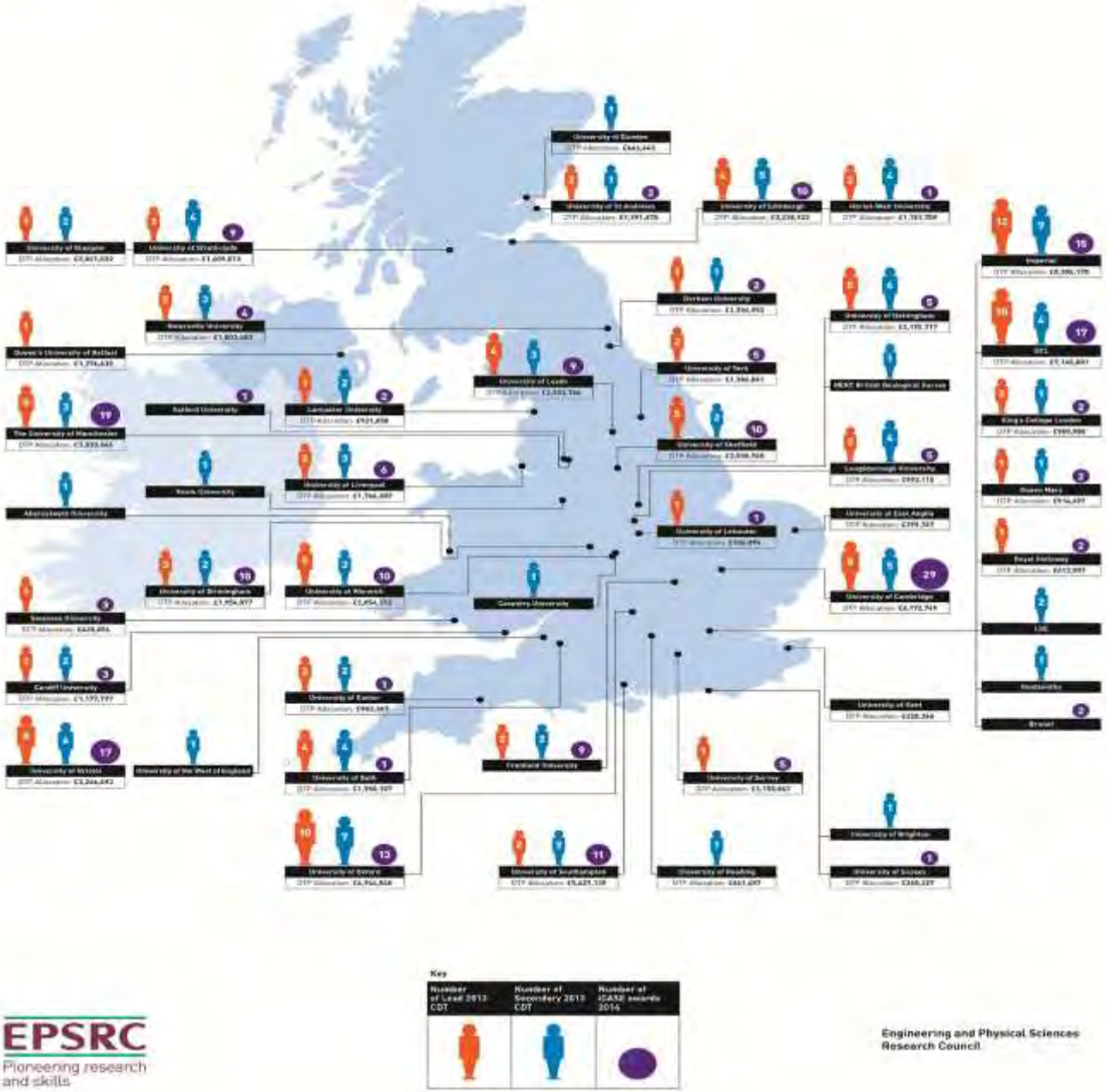
Additional EPSRC budget allocations from 2011



Allocation values represent announced budget from BIS. Actual spend against these projects cover more than one financial year.



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Notional EPSRC Student Population

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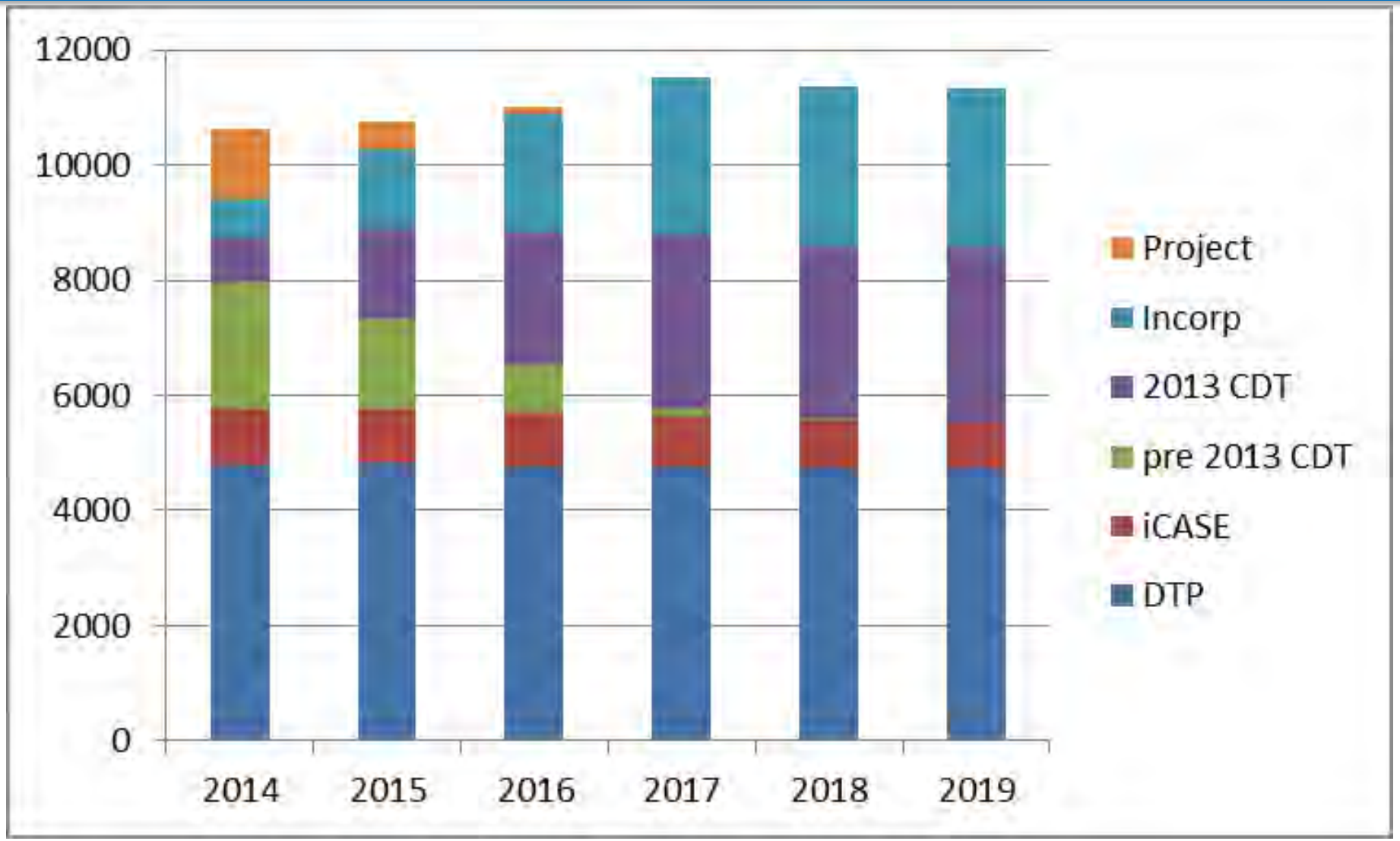

Notional EPSRC Spend on Training

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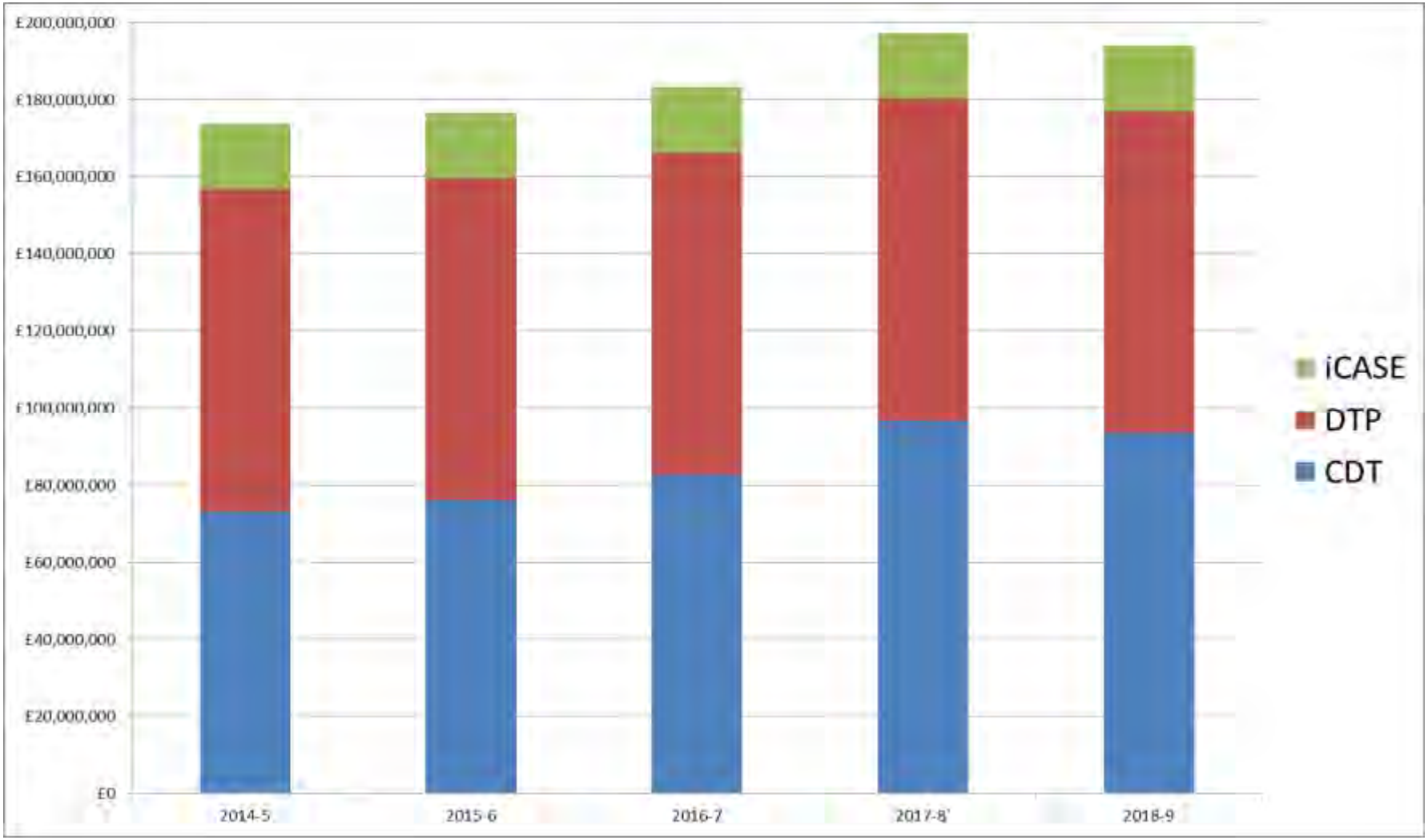

CDT Directors Meeting 7th & 8th July 2014

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- Best practice in Training
- Best practice in Centre Management
- Best practice in Communications
- Best practice in user engagement
- Best practice in Monitoring & Reporting

Governance structure

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- No standard model
- Reflect the need to:
    - Receive appropriate external advice – critical friends
        - Independence
    - Have a process for effectively delivering the training
    - Have a process for taking account of sponsors
    - Be able to monitor effectiveness and quality of centre
- All need to be comfortable with chain of command
- Centres can improve it from the case for support

Role of the PI

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- They are the boss!
- Responsibility to EPSRC:
    - To deliver objectives
    - Use resources effectively
- Leadership:
    - All students and supervisors identify themselves with CDT
    - Good relationships with sponsors and co-funders
- Sustainability

Portfolio Managers Role

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- First point of contact
- Regular meetings – given Priority Areas, *should* be a normal part of portfolio management
- Look out for warning signs
- Look at for case studies/areas of good practise

Early Feedback from Industry

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- Some isolated rumours
  - Partners would appreciate flexibility in their approach
  - Are some CDTs over-valuing IP?
  - Some companies are struggling with a variety of models at different CDTs
- Repeat - Centres can improve it from the case for support
- EPSRC would like to hear the CDTs thoughts?
  - Are negotiations difficult?
    - Is it a case of pain for 1st year followed by smooth running afterwards?
  - Is it different for new CDTs?

Early Feedback from EPSRC Themes

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- Possible problems with student recruitment (for CDTs announced late)?
  - No evidence for that
  - Some problems with reporting (next slide)
- Possible problems with Quality of students?
  - No evidence for that
- Are there enough good projects & supervisors?
  - Evidence to the contrary; CDTs facing expectation management for academics
- Issues on Diversity?
  - CDTs are actively looking at these issues

Student reporting

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Category	RCUK funded CDT students	CDT Incorporated Student*
Description	All CDT students that meet the harmonised T&Cs	Students that would be considered to be a core part of the CDT cohort but that do not meet the full requirements of the harmonised Ts&Cs
Reporting mechanism	Je-S SDP as ***EPSRC Centre for Doctoral Training Student - CDT***	Je-S SDP as ***EPSRC CDT Incorporated Student***

*New category

Students that do not form part of the core CDT cohort but benefit from the Centre could be 'aligned' to the Centre. ***'CDT aligned'*** students may be RCUK funded through other sources and should be reported via those routes on the Je-S SDP (e.g. DTP or ICASE students). They are not part of the 'core cohort'.

Monitoring and Evaluation – Why is it important?

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- Mr Osborne said: “A forward looking, modern industrial strategy is part of our long term economic plan to deliver security, jobs and growth to all parts of the UK. Our £500 million investment in Centres for Doctoral Training will inspire the next generation of scientists and engineers, ensuring Britain leads the world in high-tech research and manufacturing.”
- Science Minister David Willetts said: Scientists and engineers are vital to our economy and society. It is their talent and imagination, as well as their knowledge and skills, that inspire innovation and drive growth across a range of sectors, from manufacturing to financial services. I am particularly pleased to see strong partnerships between universities, industry and business among the new centres announced today. …

Monitoring and Evaluation – why is it important for all of us?

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- Health check of individual centre progress
- Health check of the landscape, raising our understanding the portfolio & shaping our priorities
- Better understanding of outputs from CDTs, with highlights & Case Studies
- Focus on models that work and best practise across key criteria

Monitoring and Evaluation – why is it important for all of us?

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- Understanding the demand (from all angles, including students and users)
- Assurance that the leverage promised for individual CDTs has been realised
- Evidence to make the case for continued support
- Plus perhaps most importantly….

Monitoring and Evaluation

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We are nurturing the next generation. Have we equipped them to be future leaders?

Monitoring & Evaluation

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- Annual collection of evidence
- Mid term review – important as health check and to build the case for future and continued investment
- Aim to flag up at the start the evidence we think we will need to make the best case and assess the performance of the Centres
- Aim to identify a core set of data across all centres enhanced by centre specific information
- Use existing data systems like JES as far as possible (see separate proforma for question) but envisage need for off-line reporting too e.g. on leverage, aligned students etc

Annual Monitoring

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Mainly quantitative; should help indicate the direction of travel

- Recruitment
- Changes
- Leverage
- Cohort Building
- Interactions with other CDTs
- Impacts & Outputs
- Plans for Next 12 months
- Any other achievements
  - Equipment and Infrastructure Annex

Evaluation Framework

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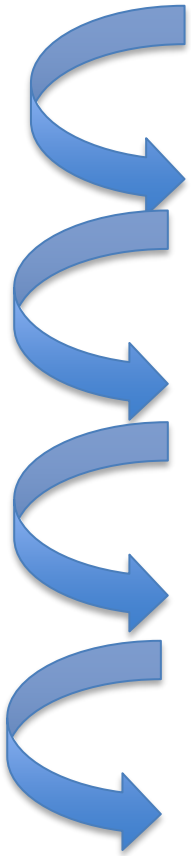

2011 Evaluation Framework

+ 2014 Centre Directors Meeting

+ EPSRC CDT Contacts

+ Discussions with other RCUK Partners

+ Sanity check with a few CDT Directors

Evaluation Framework

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- Will be a fairly large undertaking
- Framework the same across **all** current CDTs.
  - New CDTs will not be able to answer all the questions yet
  - But will have the indicators of what will be required for a later review,
  - Many questions require a narrative and will not have a single “right” answer
- Not all CDTs will have “good” answers for all questions
  - Some questions will be more important to certain CDTs
  - Which questions are most important will vary from CDT to CDT
- However, ALL CDTs expected to be able to show significant progress

Mid Term review

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- Summary of the CDT's Objectives and Key Achievements to Date
- Objectives and general CDT operation:
- Students attracted and student outcomes:
- Evidence of Value for money
- Taught component of CDT training:
- Impact in the wider community
- *Outputs from CDTs*
- Other issues
- Annexes
  - *Case Studies*
  - *Publications*

Opportunities from the MTR?

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- Better Outputs data from existing Centres?
- Diversity?
- Alumni?
  - ➢ Good information on 1st Destinations
  - ➢ Better career tracking through CDT alumni?
- Others?
  - Policy Internships?

- Monitoring & Evaluation are intended to be complementary to engagement with PM contacts
  - Feed in your good new stories as they happen

Networks of CDTs

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- Networks offer an opportunity to share best practise, resources
  - Digital Economy
  - Mathematical Sciences
  - Materials
  - *Energy*
    - Opportunity for Others*?*
      - Region?
      - Institution?

Timescales

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- Monitoring & Evaluation Frameworks to be by sent by PM contacts to CDTs by late July/Early August
  - For Information – no immediate action required
- Monitoring Template to sent out in October for completion in early December
- Evaluation Framework template to sent out as part of Mid Term Review in early 2017
  - Completion by Spring 2017
- Details of the process will follow nearer the time

From Eng Docs to LSI DTCs to IDCs to CDTs - Where We've Come From

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EPSRC Strategic Plan 2010

115 CDTs start
- **7000+ students**
- **£950M investmen**

EPSRC Delivery Plan 2011-2014

Parnaby review

Launch of EngD Centres (5)

Complexity CDTs (3) + **Review of Centres** (22)

£250M **Launch of new CDTS and IDCs** (26)

CSR 2010

AEngD Launch

New call For CDTs/IDCs

1990 **Powell Review** 1992 — 1994 — 2002 **CDTs** Life Sciences Interface (12) — 2007 — 2009 — 2010 — 2011 **Mid-term Review** of CDTs and IDCs — Nov 2012 — Jan 2013 — Oct 2014