



The University of Manchester

Understanding the Impact of the Industrial Doctorates: The Case of the EngD in the UK

Fumi Kitagawa^a

^aManchester Institute of Innovation Research (MIOIR), Manchester Business School, University of Manchester

COMPANY-BASED RESEARCH

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This presentation is about -

- A form of Industrial Doctorate scheme in the UK – the **Engineering Doctorates (EngD)**, which has been recently re-named as **Industrial Doctorate Centres (IDC)**
- Research in company, doctoral research programmes
- A variety of forms of impacts to industry sponsors, and individual career development

The Engineering Doctorates (EngD)

- Supported by the UK **Engineering and Physical Sciences Research Council (EPSRC)**
- Created in 1992 following the Parnaby report
- **EngD Centres** – from manufacturing to broader areas
- **Industry-based scheme “an alternative to PhD”**
- Academic and industry supervisors
- Research Engineers (REs) – higher stipend than PhD students; plus Doctoral students called employee REs
- 75% based in industry; Taught courses including business and management courses
- **19 Industrial Doctoral Centres (IDCs)** in 2009

The EngD Impact Study contexts

- A qualitative pilot study aiming to ***understand the nature of the EngD impact and to identify how it can be best evidenced***
- March-October 2013
- Sponsored and supported by the Association of the Engineering Doctorates (**AEngD**) and the Engineering and Physical Sciences Research Council (**EPSRC**).
- Preliminary findings presented at the AEngD annual conference in November 2013
- Final report submitted to the AEngD and EPSRC in April 2014, approved in August 2014.

Purpose of the EngD Impact Study

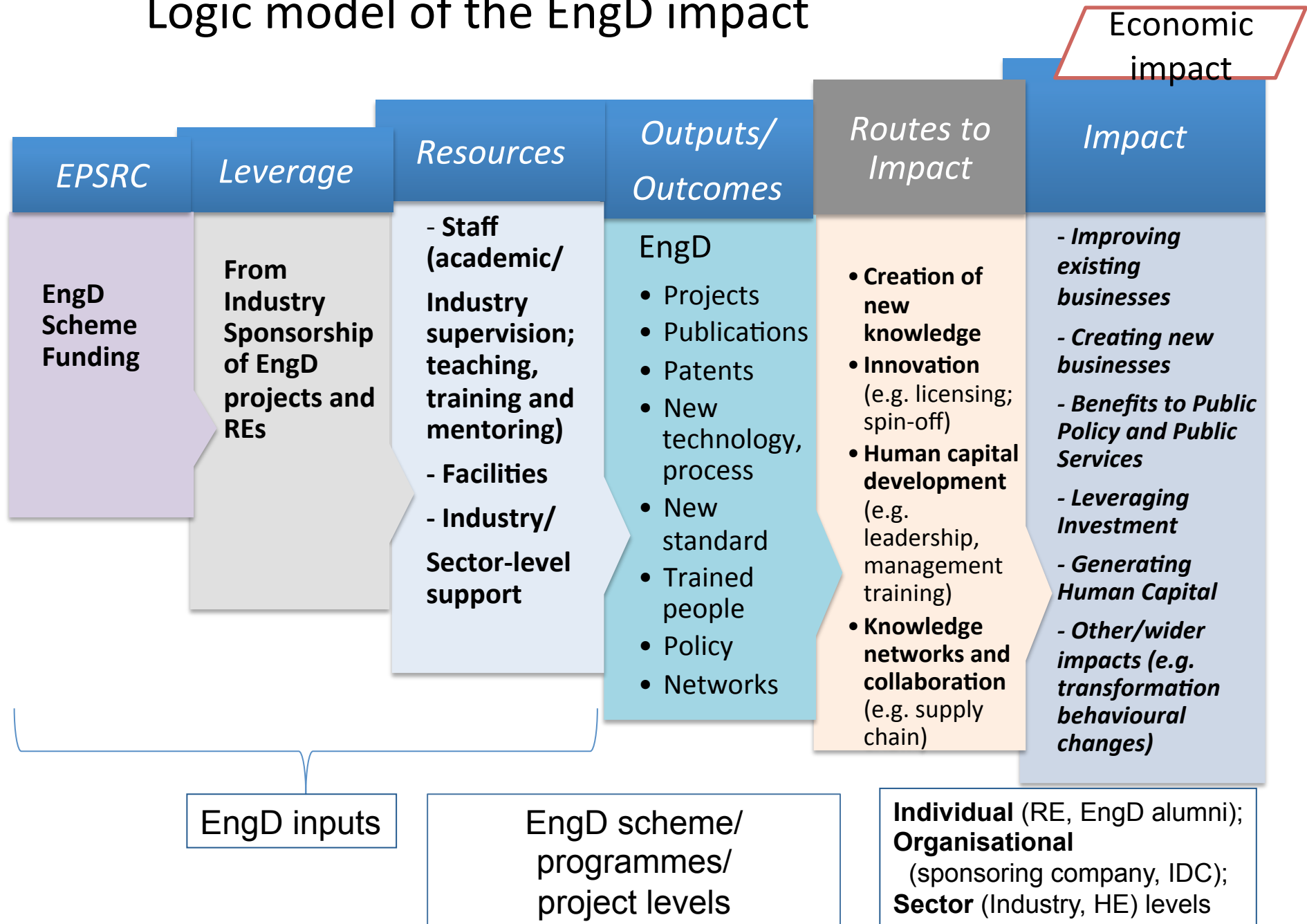
The primary target of the study is to understand the **impact of the EngD** with specific focus on:

- 1) **impact on industry partners** - providing evidence of the value of EngD project to industry
- 2) **career pathways of REs**- identifying how the EngD experience shapes the career paths of EngD graduates (EngD Alumni)

The Study - Research Design

- *Desk top research*
- *The 2009 IDCs mid-term review (May 2011) –*
18 IDCs (the AEngD member centres)
- *Semi-structured interviews (June-August 2013)*
 - **20 EngD alumni** (from IDCs/EngD centre)
 - **15 Industry partners** (10 types/sectors)
- As a supplement, *HESA Destinations of Leavers from Higher Education (DLHE) survey 2008/9-2010/2011*
125 EngD[from earlier EngD Centres]; 201 Industrial CASE PhD graduates and other PhDs in S&T area

Logic model of the EngD impact

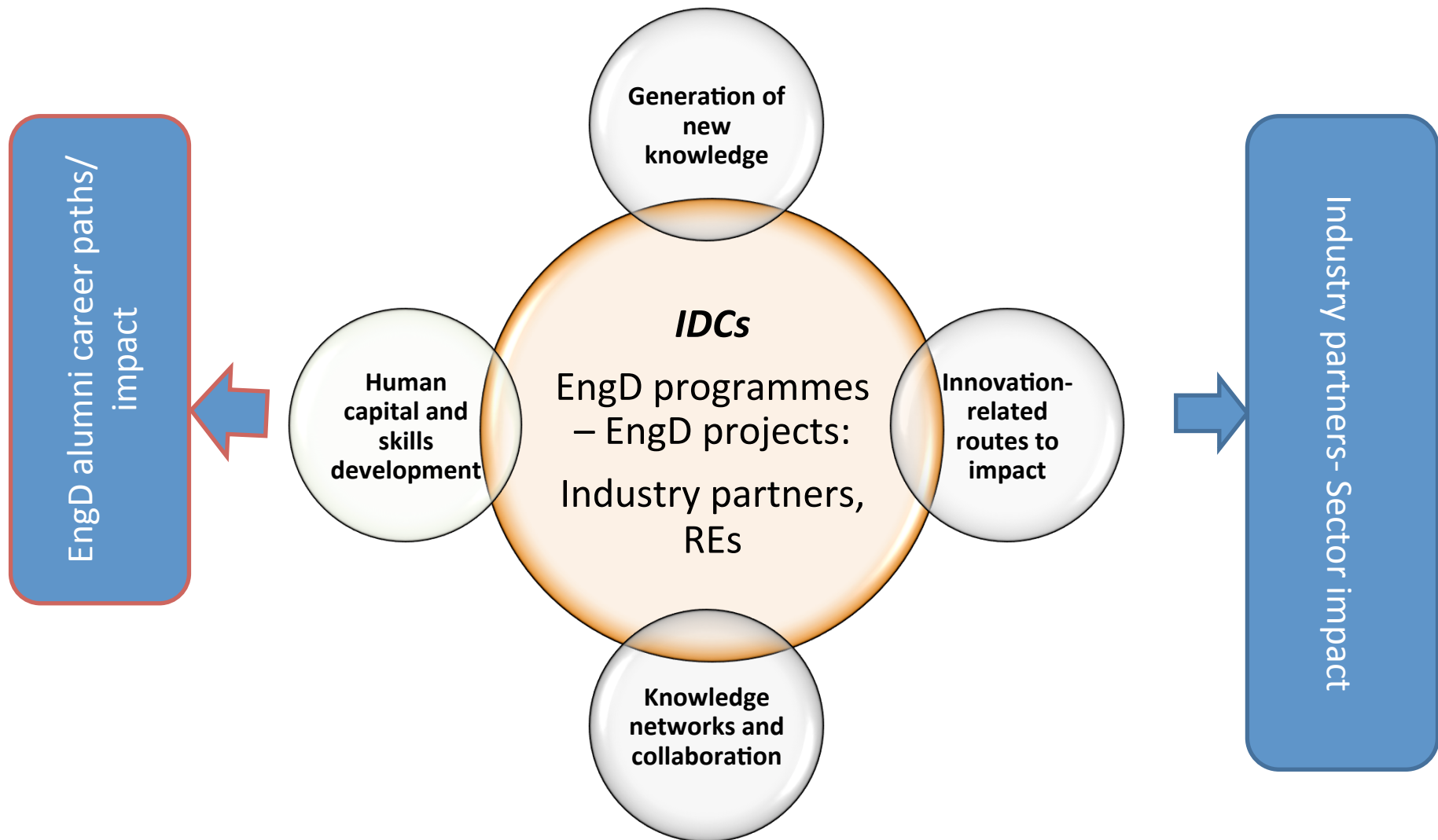


The graph illustrates a complex network of research groups and their associated research topics. The nodes are color-coded: red for primary research groups, green for secondary research groups, and blue for tertiary research groups. The research topics are listed in a hierarchical manner, with the primary topic at the top and sub-topics below it. The graph is a dense web of connections, with many nodes having multiple links to different research topics.

Primary Research Groups (Red Nodes):

- (1) Innovative and Collaborative Construction Engineering
- (1) Sustainability for Engineering & Energy Systems (SEES)
- (1) Efficient Fuel Energy Technologies
- (1) Micro and Nanomaterials and Technologies
- (1) Nuclear Engineering
- (1) Systems
- (1) Optics and Photonics Technologies
- (1) Manufacturing Technology Engineering Doctoral Centre
- (1) Biopharmaceutical Process Development
- (1) Formulation Engineering
- (1) Non-destructive Evaluation
- (1) Bioprocess Engineering Leadership
- (1) Transport and the Environment
- (1) Large-scale Complex Information Technology
- (1) Digital Entertainment
- (1) Urban Sustainability and Resilience
- (1) Diverse Bharadwaj Innovation
- (1) Technologies for Sustainable Built Environments
- (1) NHS
- (1) Sainsbury
- (1) AEDOM
- (1) Marks & Spencer / Matrix
- (1) BAM Construct UK Ltd
- (1) Hallow Group Limited
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- (1) Ford Motor Company
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- (1) VEIV
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- (1) Camden BRI
- (1) Pfizer
- (1) Sandvik
- (1) Kraft Foods
- (1) Procter & Gamble
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- (1) EDF Energy
- (1) Texas Instruments
- (1) Advanced Laser Technology Ltd
- (1) Edinburgh Instruments
- (1) Frazee-Nash Consultancy
- (1) Trumpf Plc
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- (1) Nanoco Technologies
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Understanding the EngD impact



Highlights from the Industry interviews

The EngD programme is seen as a **unique scheme** and supported by the industry partners because of:

- 1) the “portfolio of the projects” compared to the specialised nature of the PhD;
- 3) the time REs spend within the industry, which is much longer than the PhD and
- 4) the direct contacts and control industry partners have over the nature of the project.

Key recommendations from the industry interview findings :

- The nature and **diversity of industry sponsors** – existing and potential ones - has to be better understood e.g. *their motivations, R&D and skills needs and perceived barriers for collaboration*.
- A **strategic monitoring and support** to the RE by the sponsoring firm would help better **capture and roll-out** the outcomes of the EngD during the programme.
- A broader impact of the EngD programme through **supply chain relationships** needs further investigation.

Highlights from the EngD alumni interviews

- **Career Typology of the EngD alumni**
 - Prior / Post EngD
 - a business/management related qualification seems to advantage their professional status
- **Expanding from purely technical/R&D backgrounds to more managerial roles**
 - Link to the **Chartered Engineering status**

Key factors influencing the EngD impact

- ***RE's individual factors*** (e.g. age, gender, industry experiences);
- ***characteristics of the EngD projects ; the nature of the technology*** e.g. 'technology readiness level' , areas of scientific disciplines;
- ***the academic environment and organisational factors*** e.g. the history and characteristics of the IDC/EngD Centre;
- ***the nature of the sponsoring firm and the sector*** e.g. HR policies, R&D and skills needs; industry problems;
- ***broader social and institutional conditions*** e.g. labour market conditions, corporate governance structures and R&D investment in the scientific fields.

Key recommendations from the EngD alumni findings :

- **Diverse career development and pathways** of the former REs - more data sets and comparative analysis needed.
- **Former REs** - vital agents who can communicate the value and impacts of the EngD
- **Closer alignment** could be made between IDCs and the AEngD, and professional bodies for alumni and professional relationship building.

HESA Destinations of Leavers from HE Survey

2008/09-2010/11 (restricted population)

- The data on destinations and career development of the EngD graduates have not been systematically collected and analysed.
- ***Initial analysis of the HESA Destinations of Leavers from Higher Education (DLHE) Survey data between 2008/09 and 2010/11 was conducted.***
- There are **125 EngD graduates** across the three cohorts and **201 Industrial CASE PhD graduates** funded by the EPSRC; **Other PhDs in STEM subject areas- 14,400 graduates** for the same period.
- *These groups are not comparable; the aim is to illustrate some characteristics of some of the impacts.*

HESA Destinations of Leavers of HE Survey 2008/09-2010/11 (restricted population) – *Initial analysis*

EngD destinations

**85% of the EngD graduates
work in non-academic sector**

Manufacturing sector	32%
Professional, scientific and technical activities	27%
Education	15%
Electricity, gas, steam and air conditioning supply	5%
Construction	5%
Public administration and defence; compulsory social security	2%
Information and Communication	2%

CASE Industrial PhD destinations

**66% of Industrial CASE PhD
graduates work in non-academic
sector**

Education	34%
Professional, scientific and technical activities	19%
Manufacturing	14%
Information and Communication	7%
Public administration and defence; compulsory social security	3%

HESA Destinations of Leavers of HE Survey
2008/09-2010/11 (restricted population) – *Initial analysis*

- How they found employment


24% of the EngD graduates found a job as they “already worked” there (e.g. the sponsoring firm), whilst 10% of the Industrial CASE PhD graduates got a job where they worked already.

- 6 months after the qualifying of the programmes

91 % of EngD graduates are in full time paid work which compares favourably to Industrial CASE PhD graduates (80%) and other PhD in S&T (78%).

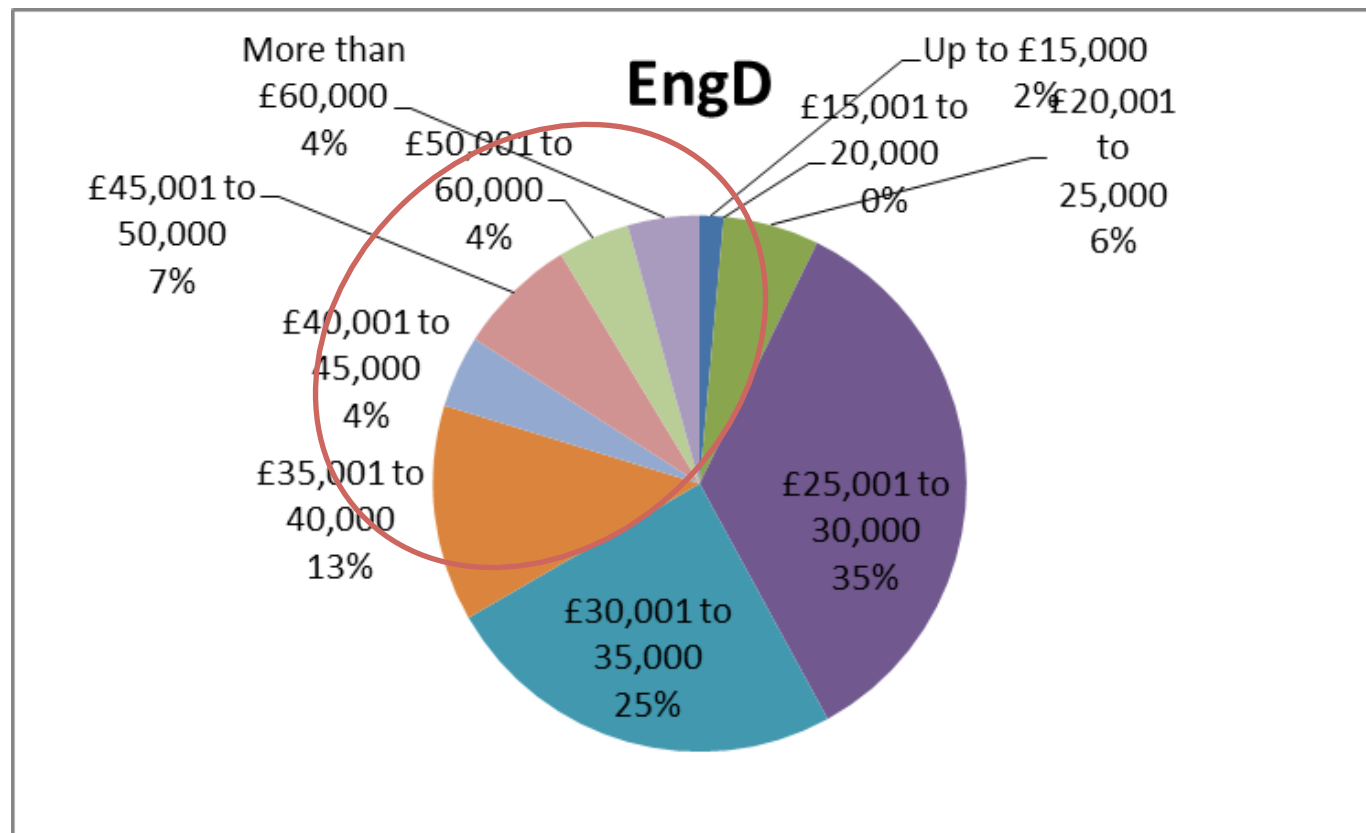
How did the doctoral graduates find their jobs?

	EngD	CASE	Other PhD
Own institution's Careers Service	6%	7%	3%
Newspaper/magazine advertisement	2%	2%	4%
Employer's web site	10%	13%	13%
Recruitment agency/website	9%	12%	9%
Personal contacts, including family and friends, networking	21%	22%	18%
Speculative application	-	4%	2%
Don't remember	1%	1%	2%
Other	10%	4%	8%
Already worked there	24%	10%	16%
Question not answered (default)	14%	10%	12%
Not applicable	5%	13%	12%
	100%	100%	100%



One EngD industry sponsor says 80% of the REs stay after the programme

HESA Destinations of Leavers of HE Survey 2008/09-2010/11 (restricted population) – *Initial analysis*



- For those who are in full-time employment, 33% of the EngD graduates earn more than £35K per year, which compares favourably to 12.6% of the CASE PhD graduates and other PhD
- These are combination of factors - sectors graduates work, prior experiences.

Previous economic impact study
by PA Consulting Group/SQW Consulting (2007) shows

- *EngD graduates, relative to other PhD graduates in similar disciplines, enjoyed significantly **higher salaries (between £100,000 and £300,000 over their careers)** as a result of their training.*
- *The aggregate salary benefit **as £80 million**, if all achieve the highest salary benefit, for an EPSRC investment of around £12 million. (p.43)*

Based on case studies of early EngD Centres;
a number of scenarios and assumptions
a positive picture of the EngD economic impact

HESA Destinations of Leavers of HE Survey 2008/09-2010/11 (restricted population) –

Only a small number of data available; not generalisable; however, the initial analysis of the data seems to indicate that -

- The EngD students tend to be **more experienced older students** than the Industrial CASE PhD and Other PhDs;
- The EngD graduates tend to **have higher rate of full time paid work** which compares favourably to other PhD and Industrial CASE PhD graduates;
- Majority of the EngD graduates - likely **to work in industry** than in academia
- About **One in four REs** seems to get a job at the sponsoring firm after the completion of the programme but various across industry;
- The EngD graduates seem to **earn relatively higher** than other PhD graduates when they are in employment.

Science and Technology (S&T) human capital –

“the sum of scientists’ and engineers’ scientific and technical knowledge, work relevant skills and social ties and resources”

(Bozeman and Corley, 2004, p.604)

Further evidence required to find the organisational characteristics, project natures, sectoral differences and **strategies of firms and universities**

Issues

- Branding of “EngD” – less known as PhD
- Academic’s recognition about EngD – training of supervisors
- Long term commitment from industry and continuity of supervision
- Continuity of the IDCs/EngD Centres when public funding ends

Summary of the presentation

- **Summary of the *EngD Impact Study*** (March-October 2013), covering 18 IDCs, submitted to the AEngD/ EPSRC April 2014;
 - Key findings from interviews and recommendations
 - **Destinations of the 125 EngD graduates** (HESA DLHE 2008/9-2010/11)
- **What makes the EngD/IDC unique?**

Thank you for listening-

- For further information please see

<http://www.aengd.org.uk/>

[http://www.epsrc.ac.uk/skills/students/centres/
2013cdtexercise/](http://www.epsrc.ac.uk/skills/students/centres/2013cdtexercise/)

Fumi.kitagawa@mbs.ac.uk