

EPSRC

Pioneering research
and skills

The EPSRC Industrial Doctorate Centre Scheme Good Practice Guidance

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Purpose of the good practice guidelines

These guidelines form a basis for the operation of IDC programmes.

These guidelines are a supplement to, and should be considered in conjunction with, the grant conditions attached to the IDC awards.

These guidelines are based on the Good Practice Guidance Document for the EngD Scheme

It is expected that Directors will establish detailed procedures and standards taking account of their own specific requirements.

Section 1: IDC - Aims and Objectives

1. The Industrial Doctorate Centres were funded in 2009 for October 2009 starts as part of EPSRC's Centres for Doctoral Training (CDT). This approach to training has been extensively piloted by EPSRC through a number of Engineering Doctorate Centres and Doctoral Training Centres in Complexity Science, Systems Biology and at the Life Sciences Interface.
2. The Industrial Doctorate Centres (IDCs) are a development of EPSRC's EngD centres, and the objectives for IDCs are;
 - Innovative and exciting training environments across the EPSRC remit.
 - Drawing / building on a base of research excellence.
 - Production of highly skilled and talented people
 - User orientated i.e. strong business focus
3. The Engineering Doctorate (EngD) Scheme was established by EPSRC in 1992 following the recommendations of the Engineering Doctorate Report 1990, (working group chaired by Professor Parnaby). The scheme was aimed at providing engineers with an intensive, broadly based research programme, incorporating a taught component, relevant to the needs of industry. This doctorate-level training provided ambitious and able graduates (called "Research Engineers – REs") with the ability to innovate and implement new ideas in practice, and enabled them to reach senior positions in industry early in their careers.
4. EPSRC-funded centres for doctoral training provide a supportive and exciting environment for students to carry out a challenging PhD-level research project together with taught coursework. Building on the success of our existing centres, we have funded 45 new centres with a total commitment of £283M. The new centres will each take in around 10 students per year for five years starting in 2009. 19 of these Centres are IDCs;

Professor John McDermid	EngD in Large-Scale Complex IT Systems	University of York
Professor Nigel Titchener-Hooker	Industrial Doctoral Centre: Bioprocessing Engineering Leadership	University College London
Professor William Powrie	Industrial Doctorate Centre: Transport and the Environment	University of Southampton
Professor Phil Willis	Industrial Doctorate Centre: Digital Media, Special Effects and Animation	University of Bath
Professor Colin Snape,	Efficient Power from Fossil Energy and Carbon Capture Technologies (EPFECCT)	University of Nottingham
Professor Patrick Godfrey	Industrial Doctorate Centre: Systems	University of Bristol
Professor Julie Yeomans	Industrial Doctorate Centre: Micro- and NanoMaterials and Technologies	University of Surrey
Professor Marek Ziebart	Industrial Doctorate Centre: Urban Sustainability and Resilience	University College London
Professor Simon Parsons	Industrial Doctorate Centre: Skills Technology, Research, and Management (STREAM) for the UK Water Sector	Cranfield University
Dr Anthony Steed	Industrial Doctorate Centre: Virtual Environments, Imaging and Visualisation	University College London
Professor Jonathan Billowes	Industrial Doctorate Centre: Nuclear Engineering	The University of Manchester
Professor Elaine Martin	Industrial Doctorate Centre: Biopharmaceutical Process	Newcastle University

	Development	
Professor Hazim Awbi	Industrial Doctorate Centre: Technologies for Sustainable Built Environments	University of Reading
Professor Peter Fryer	Industrial Doctorate Centre: Formulation Engineering	University of Birmingham
Professor Andrew Harvey	Industrial Doctorate Centre: Optics and Photonics Technologies	Heriot-Watt University
Dr Lucia Elghali	Industrial Doctorate Centre: Sustainability for Engineering and Energy Systems	University of Surrey
Professor Nora De Leeuw	Industrial Doctorate Centre: Molecular Modelling & Materials Science	University College London
Professor Dave Gavaghan,	Industrial Doctorate Centre: Systems Approaches to Biomedical Science	University of Oxford
Professor Dino Bouchlaghem	Industrial Doctorate Centre: Innovative and Collaborative Construction Engineering	Loughborough University

Since then, seven other IDCs have been funded;

Bowen, Professor P	Doctoral Training Partnership(DTP) in Structural Metallic Systems for Gas Turbine Applications-universities of Cambridge, Swansea and Birmingham.	University of Birmingham
Prof P Cawley	Centre for Doctoral Training in Non-Destructive Evaluation	Imperial College London
Prof JW Brooks	Industrial Doctorate Centre in Advanced Forming and Manufacture	University of Strathclyde
Prof J Sienz	EDT MATTER- Manufacturing Advances Through Training Engineering Researchers	Swansea University
Prof K Ridgway	Industrial Doctorate Centre in Machining Science	University of Sheffield
Prof SM Ratchev	MTC Engineering Doctorate Centre	University of Nottingham
Prof Lord SK Bhattacharyya	Engineering Doctoral Centre in High Value, Low Environmental Impact Manufacturing	University of Warwick

5. The IDC research and training programme is undertaken as a partnership between industry and academia. This EPSRC-supported programme aims to:

- provide REs with experience of rigorous, leading edge research in a business context;
- develop competencies which equip REs for a range of roles in industry;
- provide a mechanism and framework for high quality collaboration between academic groups and a range of companies;
- contribute to the body of knowledge on a particular technical discipline, industrial sector or multidisciplinary theme.

Most IDCs will award an Engineering Doctorate rather than a PhD. The Engineering Doctorate (EngD) should be at least equivalent to the intellectual challenge of a PhD, but enhanced by the provision of taught material in both management and technical areas. The training provided should be flexible and should evolve in line with the emerging needs of the individual and the sponsoring companies/sectors

6. The test of intellectual contribution for the award of an Engineering Doctorate (EngD) shall be at least equivalent of that for the PhD degree (i.e. a distinct 'contribution to knowledge' or similar). Where the research work for the EngD consists of a series of

linked projects these must be brought together by an overarching document that establishes the overall theme(s) and synergistic links in the work that lead to the contribution(s) to knowledge claimed. (N.B. a series of essentially distinct projects would be unlikely to allow a contribution to knowledge to be demonstrated.)

7. The training programme should normally be of four years' duration. The Research Engineers are expected to spend around 75% of their time working directly with the collaborating company on project work and 25% on taught courses.
8. Private and public sector organisations as well as institutes and units of the Research Councils may all act as sponsoring organisations. However, since the scheme aims to produce the industrial research leaders of the future it is unlikely that a project based at an organisation primarily focused on research, without substantial commercial focus, would provide the optimal environment for EngD training.
9. EPSRC expects CDTs to be exemplars for the student training experience, specifically for developing and enhancing individuals' creativity. CDTs should provide students with an inspirational environment to enable their creativity to flourish.
10. All Centres will be monitored by EPSRC leading to a mid-term review (usually 3-years after the start date of the Centre's grant).

Section 2: IDC - Roles and Responsibilities

EPSRC

11. EPSRC funding for the IDC scheme is provided through individual grants to each IDC Centre.¹
12. EPSRC will monitor progress and performance of the scheme from data provided by the Director.
13. EPSRC will provide a named contact with responsibility for co-ordination of the IDC scheme on EPSRC's behalf. This individual should be invited to attend management meetings and will be the usual contact for advice on matters of EPSRC policy, training and operations related to the IDC programme.
14. EPSRC will also provide a named contact with responsibility for the research portfolio in which the IDC operates. This individual should also be invited to attend management meetings and will be the usual contact for advice on matters of EPSRC policy and strategy related to the research portfolio.
15. EPSRC will, with the support and advice of individual programmes, seek to publicise and promote the IDC as one of its key training programmes and qualifications.
16. EPSRC will arrange regular meetings of IDC Directors to encourage networking across the IDC scheme.

The host Higher Education Institution (HEI)

17. Host Higher Education Institutions (HEIs) are required to ensure that IDC programmes are conducted according to the grant conditions attached to the award and the policies of the HEI.
18. The HEI is responsible for awarding the EngD qualification. It should ensure the quality of research is at least equal to that expected in other doctoral level training and the examination process must reflect this. The examination process should also ensure that the industrial relevance of the work, together with the application of taught coursework and transferable skills learnt is assessed.
19. The HEI should ensure that an IDC Director is identified to lead on delivering the IDC programme.
20. It is expected that the HEI will provide the Director with the support and resources to deliver the IDC programme and to adequately support the REs both financially and pastorally, ensuring commitment to each RE cohort throughout their training.

The IDC Director

21. The IDC Director is responsible for delivery of the IDC programme.
22. The main roles of the Director are:

¹ EPSRC funding for the EngD scheme was currently provided through the Collaborative Training Account grant to the host institution

- to conduct governance of the IDC programme in accordance with the award grant conditions;
- to facilitate the participation of companies;
- to ensure appropriate project selection;
- to co-ordinate the recruitment of high quality REs;
- to ensure the provision of appropriate taught coursework and training;
- to provide appropriate guidance for academic and industrial supervisors;
- to ensure adequate supervision and pastoral care for REs;
- to ensure monitoring and reporting data meets EPSRC requirements ;
- to disseminate their programme good working practice across the IDC scheme e.g. share course content;
- to publicise and market the programme being offered as a quality training and qualification opportunity.

23. IDC Directors should put in place processes/methods to:

- establish policy and strategy for course development within the scope of the programme, in light of current and projected industrial need;
- advise the IDC Director on the conduct and content of the programme, taking into account the academic and industrial requirements;
 - experience from the EngD centres suggest that an Advisory Board should have some of the following characteristics:-
 - Be predominantly made up of industrialists, involving SMEs if possible
 - Be diverse
 - Appoint a high-quality Chairperson
- ensure that teaching material is appropriate and that it is monitored and developed as necessary in accordance with the programme strategy, ensuring strong industrial relevance;
- monitor and consider the progress of REs;
- monitor expenditure incurred by the programme and approve planned expenditure for the future.

24. Directors should ensure that sponsoring companies understand their roles and responsibilities (as outlined below) before the start of each project, including the ownership of intellectual property rights.

25. Directors should look to engage the industrial supervisors in the Centre Programme

26. Directors should ensure that academic collaborators and sponsoring companies have selected suitable projects, with respect to industrial relevance and academic quality.

27. Directors should develop a forward plan to develop their Centres portfolio of potential projects.

28. Directors should ensure that REs are selected both for their academic suitability for the research project, and for their anticipated ability to work effectively within sponsoring companies' research ethos. It is therefore important that REs are selected jointly by the IDC Centre and sponsoring company.
29. Directors should ensure that the training courses provided are at postgraduate level and are of high quality and auditable from a quality as well as financial perspective.
30. Directors should ensure that supervisory arrangements reflect the breadth and complexity of projects including management, financial or other expertise as appropriate.
 - Directors should ensure that the academic and industrial supervisors have understood their roles and responsibilities (as outlined below).
 - Directors should provide necessary guidance and advice to supervisors regarding the IDC scheme concept and its requirements.
 - Directors should establish a clear problem resolution process including a mechanism for managing any change of supervisors throughout the training period
 - Directors should develop appropriate support and administration structures to deliver the programme for their Centre.
31. Directors should always act in the best interests of the RE providing full support as necessary to facilitate the completion of their IDC programme.
 - Directors should ensure that the REs have understood their roles and responsibilities (as outlined below) when starting the programme.
 - Directors should ensure that REs are provided with the appropriate information regarding the range of courses available to enable them to make an informed choice.
 - Directors should ensure that, in collaboration with the supervisors the RE is mentored during their final preparation for the examination process
 - Directors should aim to establish an '*esprit de corps*' amongst the cohorts of REs and track progress of their Centre's alumni.
32. Directors are responsible for promoting the IDC programme that their institution offers as a high quality qualification relevant to UK Industry. It should be publicised with the aim of raising its profile with potential REs, sponsoring companies and future RE employers.
33. Directors are also encouraged to promote, in partnership with EPSRC, the IDC Scheme as a whole. This will require all Directors to establish close working links (a "Network") with each other and be proactive as a group.
34. Directors are encouraged to pursue professional recognition for the programme, to enable REs to gain chartered status wherever possible. It is recommended that they work with the Advocates (see later) on this as they have a specific role to promote the EngD award.
35. Directors are encouraged to provide opportunities for REs to network both within and across cohorts, and before and after graduation.

36. Directors should invite the named EPSRC representatives to IDC programme management meetings. Directors are welcome to contact the EPSRC representatives as needed.
37. **Creativity training:** the IDC administrative manager can play a key role in ensuring that students are exposed to creative problem solving and other approaches such as novel idea generation brainstorming sessions, sandpits, big pitch “dragon’s den” style approaches to funding adventurous ideas and so on. EPSRC would expect that the managers themselves receive training and support to allow them to do this.

The Sponsoring Company

38. The sponsoring company, in consultation with the academic partner, should undertake to provide a real and relevant industrial problem, or series of problems, of similar difficulty and intellectual challenge to a conventional PhD programme.
39. The company should provide an industrial supervisor who would be involved in the progress of the project(s), the development of the RE’s industrial experience, and assessment of their performance. Industrial supervisors should be individuals with experience of professional and career development, in addition to having technical or managerial knowledge of the industrial problem to be addressed by the RE.
40. It is expected that REs will carry out most of the project work in the company, however REs must be released to attend all courses associated with the IDC programme.
41. The company should allow the RE reasonable access to prior knowledge, IPR and patents associated with their project(s).
42. The company must properly resource the RE's project, including access to additional staffing on the project where appropriate.
43. Where the RE is supported by EPSRC, it is expected that the company will be responsible for enhancing the RE's stipend.
44. Sponsoring companies are encouraged to promote their involvement with the IDC scheme, both internally and externally.

The Supervisors

45. It is expected that the academic and industrial supervisors jointly oversee the overall development of the RE and provide advice and support regarding the project(s) on which the RE is working. They should, together with the RE, identify the competencies that the RE should gain and give advice on courses that would help them to develop these competencies.
46. The academic and industrial supervisors should maintain regular contact with each other and with the RE. In addition, they, the RE, and any other appropriate staff working on the project(s) should be involved in regular project meetings.
47. The academic supervisor must ensure that the academic and intellectual standard of the project work meets the requirements of the degree. They should ensure that the RE has a wide awareness of the subject area and there is sufficient depth of understanding and analysis within the RE’s project reports.

48. The industrial supervisor should ensure that the project retain its industrial relevance throughout and that the RE has the opportunity within the company to develop further the competencies given by the taught modules.
49. It is expected that the academic and industrial supervisors will work closely with the RE, facilitating preparation for the final examination.

The Research Engineer (RE)

50. REs should be actively involved in the detailed planning and scheduling of the project, including the identification of objectives, timescales, milestones and deliverables.
51. REs should be involved in planning the programme of taught courses they attend. The RE should ensure that their supervisors are aware of any additional training they feel is necessary to successfully complete their project.
52. REs should take responsibility for organising meetings with both academic and industrial supervisors, and any other appropriate project staff, to ensure the smooth running of the project.
53. It is expected that REs will keep their supervisors informed of any changes in their circumstances that might affect the completion of their training programme.
54. REs are expected to act as ambassadors for the IDC scheme. Where opportunities arise, they should promote the scheme during the course of their training programme and subsequent career.
55. EPSRC sponsored REs must acknowledge EPSRC support on any papers, posters and any other publications arising from the training programme.
56. An RE will be expected to have developed the following competencies as a result of their training:
 - expert knowledge of engineering/science areas relevant to their research project;
 - an appreciation of industrial engineering and development culture including:
 - the role of research;
 - product development;
 - marketing awareness;
 - environmental impact;
 - project and programme management skills - financial planning and control;
 - teamwork and leadership skills - communication skills – oral, written, technical, non-technical;
 - the ability to apply skills/knowledge to new and unusual situations;
 - the ability to seek optimal solutions to complex or multifaceted problems.
57. It is suggested that REs keep a logbook of all their work, including attendance on taught courses, and the progress of project work, as evidence of their professional development and as a contribution towards professional accreditation of their training.

The IDC Advocates

58. Following the “Review of the EPSRC Engineering Doctorate Centres 2007”, there will be opportunities to support a number of “Industrial Doctorate Advocates”, whose role will be to spread best practice in the management, operation and development of centres and act as champions for the scheme.
59. As part of the initial tranche of IDC awards, three IDC Advocates were appointed; Chris France (University of Surrey, Sustainability for Engineering and Energy Systems IDC/EngD), Patrick Godfrey (University of Bristol/Systems Thinking, Systems IDC/EngD) and William Powrie (University of Southampton, Transport and the Environment IDC/EngD).
60. The objectives for the IDC Advocates² are to ensure that Industrial Doctorate Centres are effectively developed and promoted. Specifically Advocates will:
- Lead on mentoring, coaching, assisting the IDC Directors.
 - Assist in the identification and dissemination of “best practice”.
 - Contribute to the development and implementation of monitoring and evaluation procedures and processes.

² *Scope : all IDCs are included (and these are the primary focus). However, all those EngDs that are continuing without renewed EPSRC funding are also included within the remit of the Advocates’ role.*

Thesis By Portfolio as a Contribution to Knowledge

59. The essence of a doctoral degree is that the candidate demonstrates that they have made a distinct 'contribution to knowledge'. For most doctoral degrees, the thesis is presented as a dissertation, which examiners use as the basis of a viva voce examination. Where the doctoral work consists of a series of linked projects these may be presented in stand-alone documents³ that are brought together by an overarching document that establishes the overall theme(s) and synergistic links in the work that lead to the contribution(s) to knowledge claimed. (N.B. a series of essentially distinct projects would be unlikely to allow a contribution to knowledge to be demonstrated.)

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³ e.g. *published papers / company reports / etc*

Suggested reading

EPSRC IP policy:

- <http://www.epsrc.ac.uk/funding/managing/Pages/ip.aspx>

Lambert model IP agreements:

- <http://www.ipo.gov.uk/lambert>

Joint statement on skills training:

- <http://www.rcuk.ac.uk/ResearchCareers/Pages/CareerDevelopment.aspx>

EPSRC information for PhD students that may also be helpful to REs:

- <http://www.epsrc.ac.uk/funding/students/help/Pages/default.aspx>