Guidance for EngD supervisors

Summary

The EPSRC Centre for Doctoral Training in Digital Entertainment places postgraduates studying for an Engineering Doctorate (EngD) in an industrial research environment for extended periods of time, up to 3 years in duration. During the placement, students are registered as doctoral research students at the University of Bath or Bournemouth University and are paid a student stipend by their home institution. They remain students throughout the placement and are not employees of the company. Each student will have at least one academic supervisor from one of the universities and at least one industrial supervisor from the company.

IP generated in the course of the project is retained by the company, which grants the student's university a license to use the IP in research and training and permits the publication of research outputs, subject to commercial sensitivities and agreement of all parties prior to publication.

At the beginning of each placement, a Research Plan should be developed by the student, academic supervisor and industrial supervisor so that all parties are clear on what is expected. The student and supervisory team should meet regularly to monitor and discuss progress.

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Centre for Digital Entertainment

Preamble

The purpose of the CDE is simple to state: *to develop Intellectual Property that has impact*. The delivery of this is not simple; a complexity which motivates this brief guideline. This guide is coalesced from the experiences of the management team from past projects to provide general advice intended to keep future projects "on track", and also offers pathways for "trouble shooting".

The CDE is a single community that comprises four parts. The management team runs the CDE, external partners provide problems to be solved, internal academics contribute their expertise, and students dedicate themselves to a solution through which they aim to be awarded the post-graduate degree of a Doctorate in Engineering.

The most successful projects tend to be those which integrate these four parts most seamlessly; this guide is built on best practice. It steps through what an EngD programme is, as seen from each of the four different perspectives. It explains too the roles of each of the four CDE components: what their responsibilities are and what they can expect from the CDE. It says how to develop and manage projects in partnership.

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1 Introduction

The Centre for Digital Entertainment (CDE) is a two-site Centre for Doctoral Training based at the universities of Bath and Bournemouth. It is funded by the Engineering and Physical Sciences Research Council (EPSRC) to train postgraduates registered on a four-year Engineering Doctorate (EngD) programme. EngD students are known as Research Engineers (REs) and undertake research projects as a partnership between industry and academia.

2 The EngD Programme

The EngD is a doctoral level degree similar to a PhD in so far as both must contribute to knowledge, but differ in that an EngD has an additional requirement of demonstrating *impact*. Industry-driven research is at the core of the EngD, which was set up to directly meet the research and development needs of UK businesses.

> *The EngD qualification was initiated in the UK in 1992 by the EPSRC in response to the Parnaby Report as a* ***'…radical alternative to the traditional PhD, better suited to the needs of industry, and providing a more vocationally oriented doctorate … by applying new knowledge to industrially relevant doctoral research.'***
>
> *Parnaby Report SERC 1991*

Publications are the well-established measure for contributing to knowledge. Impact is less well defined, because the form it takes depends on the external partner. The needs of the charitable sector are not those of the commercially led sector or of the educational sector, and there is considerable diversity too within sectors.

2.1 Taught component

Typically, about 75% of each Research Engineer's time is spent in the company. The remaining time is spent in Masters-level or doctoral-level training. This is usually concentrated in year 1, with the company placement in years 2-4. The modules, units and courses taken by each student are tailored to the student's skills base and the needs of the project.

2.2 Finance

Travel and equipment

The CDE gives each students a Training Support Fund (TSF) of up to £10,000 for conference

attendance, equipment, and other activities supporting their research. The academic supervisor must approve any expenditure and it is essential that the University's procurement policies and procedures are followed.

International visits
The CDE can provide up to an additional £5,000 per student for an international visit of one month or longer, such as visiting another division of a host company or a university overseas. Further details are available at http://www.digital-entertainment.org/cde-documents/cde-documents-copy/.

3 Roles and responsibilities

The CDE has four main parts: management, partners, academics, and students. Best practice sees these components working as a single team, which requires clear communication between the parts.

3.1 Management

The management team runs the CDE, academically, financially, socially. They are the main point of contact for partners (exclusively so in early stages of contact) and they are the interface to the respective university internal management.

There are two **Directors**, one at each university. They provide academic direction to the CDE and are responsible for determining the breadth of the areas that CDE students study. They should therefore be aware of current developments in the state of the art and the interests external partners might have. They interact with the EPSRC so that CDE can respond appropriately to a variable funding landscape. The Directors represent the CDE at externally organised events.

A **Centre Manager** is responsible for running the CDE administration. That includes budget control, inter-site (Bath, Bournemouth) relationships and intra-site communications, organising management meetings, and people management. The manager also represents the CDE at meetings and events, liaises with industry, and writes reports on CDE progress for the EPSRC.

Two **Research Project Managers** are responsible for recruiting students into the CDE programme, facilitating partner placements for them, and negotiating placement contracts. Contracts are based on a standard agreement model that is determined by the needs of the EPSRC and the programme.

Two **Events Coordinators** are responsible for marketing, day-to-day office duties, and arranging events and travel. There is at least one large scale event every year

that all CDE students are expected to attend. In addition, there are a myriad of other smaller events that promote the CDE and its partners.

3.2 Partners

The CDE works with partners from many sectors of the UK economy. Some partners come from the charitable sector, others from education, most are commercially led companies that depend on Visual Computing in some way. The partners benefit from the CDE through the impact it generates, and they contribute by providing sector experience, R&D problems, a working environment, and staff time.

A partner is responsible for hosting EngD student(s). As such they are responsible for the "impact development" aspect of the student's doctoral studies, but must be aware too of the academic development that is required. A partner is expected to appoint a member of its staff to be the student's industrial supervisor.

The industrial supervisor works closely with the student and the academic supervisor to make sure the aim of the CDE (a contribution with impact) is met. This includes writing a project plan (see below) and attending regular meetings; remote meetings are acceptable but face-to-face meetings should be held at least four times per year, and exceptionally should events demand it.

The industrial supervisor should not only assist the student to integrate their work into the company (or otherwise express impact), but also encourage the student to write academic papers, to attend CDE events, and to write their final dissertation. Industrial supervisors are encouraged to attend CDE events.

3.3 Academics

The primary role of academics is use their expertise to ensure the IP produced is of the highest quality.

The academic should aim to produce work of a standard that could be published in tier one journals and conferences; an ambition that calls for coherence between project parts whether or not the student plans to submit a portfolio or a thesis for examination. The academic must advise on the literature gap under pursuit, the state of the art that surrounds the gap, relevant approaches and experiments.

Supervision of EngD students takes as much work as for PhD students. The activities are similar, but is not identical. In particular, the academic must (a) be

aware of the difficulties that remote supervision brings, and how to address those difficulties; and (b) be aware that the student is studying for an EngD, not a PhD.

The academic supervisor will collaborate with the industrial supervisor and the student to write a plan for the project (see below). The plan must conform to the aims of the CDE, and it is the academic's responsibility to make sure the plan can feasibly yield work that contributes to the state of the art. The plan is "live" in the sense that it may change in response to what is learned, new innovations, publications of others *etc*, but a plan is essential.

The academic supervisor will meet regularly with the industrial supervisor and student. Remote meetings are acceptable but face-to-face meetings should be held at least four times per year, and exceptionally should events demand it.

3.4 Students

The first duty of any student is to complete the programme such that they can be awarded an Engineering Doctorate. This means planning work and submitting a dissertation, within four years from their start date. Students are not employees of their host company, and therefore do not have associated employee rights; their stipend and leave entitlement is determined by their home university. Periods of leave should be agreed between the student and both the industrial and academic supervisors. The industrial partner can keep a record of the leave days taken.

Students should work with their supervisors to agree a project plan (see below) in an area that will hold their attention for the period of study, and advance their career plans beyond the project period.

The CDE is a community, and students are expected to attend and actively participate in that community. EPSRC requires students to attend training events as a condition of the funding. Best practice is to attend several events per year, so as to maintain the community spirit, learn from student colleagues, and ensure ongoing personal development. Some students may also opt to take on additional roles, such as becoming student representatives.

4 Developing and Managing a Project

Research projects are at the heart of CDE activity. A suitable project takes time to develop.

4.1 First Steps

The first steps in developing a project are the responsibility of the directors (or an appointee of one of the directors) in conjunction with one or more partner representatives. It is quite possible that none of the staff that become supervisors on the project are present at these initial meetings. The partner will normally describe one of more set of interests / aims / problems which can be both diverse and ambitious. Indeed, ambition is positively encouraged.

During these initial steps the aim is to identify one or more feasible project areas, not to fully define a project. Rather, the project should be *just sufficiently well described*, such that identified supervisors can be appointed and, simultaneously, the project proposal will be known to the student cohort for their consideration.

The project proposal will be a component (Schedule A) of the company agreement between the University and the CDE partner. The company agreement sets out the specific commercial requirements of the project, including arrangements for IP, confidentiality, and the publications approval process.

The partner will interview interested students (ideally but not necessarily with the supervisor) and, if all is well, move to the next step of producing a written plan.

4.2 A Written Plan

A written plan for the project is a document that is intended to mitigate problems of remote supervision. The plan must be intended to last three years. It must include aims and objectives, deadlines and deliverables. The literature gap must be described. There must be a pathway to impact.

The plan must include a diary of meetings, both remotely and face-to-face. It must include provision for the student to attend CDE events. The plan must include provision to write-up both a transfer report and a final dissertation. A skeletal template is found in Appendix A.

Written plans must be submitted to the CDE management team, who reserve the right to request amendments.

4.3 Monitoring Progress

As mentioned, the written plan must include a diary of meetings. This is the primary

way to monitor progress. It is essential that the agreed schedule is adhered to. It is best practice to keep a record of each meeting and to take notes at these meetings as they occur. The student and academic supervisor are expected to report progress on a bi-annual basis to the appropriate university authorities, in line with the university policy where the student is registered.

EngD Programme	Component	Deliverables
Year 1	Taught Masters Level Modules	Completion of required credits from specified modules.
	Research project at the home university	Initial Review Report or Dissertation
	Secure 3-year Industrial Placement, with support from the CDE team	Completed Company Agreement between University & Industrial Partner.
Years 2-4	Research project(s) at the industrial partner	Progress Reports every six months. Journal or conference papers, patents, leveraged further funding, new products or processes, etc.
Start of Year 2		Written Research Plan
End of Year 2		Transfer/Confirmation Report and successful outcome at the progression board oral examination
End of Year 4		EngD thesis / portfolio

5 IP, Publishing and Writing Up

All parties should be aware that unless the contract has a statement to the contrary, it should be assumed that all IP generated by the project is fully owned by the partners, not by the CDE, either university, or any student. This does not prevent publication, rather it means developing a publication strategy, possibly as part of a marketing exercise.

The CDE expects publishable research to be produced. We strongly encourage publication in the very best possible forums. A written plan should include publication ambitions. All publications must acknowledge the CDE as a sponsor of

the research, and in particular cite the EPSRC grant code: EP/L016540/1.

Students must write a transfer report, typically after one year of research for examination. The transfer process must be completed by the end of year 2. This is a mandatory requirement for progression to EngD, before then acceptance onto the programme is provisional. Failure to progress will lead to the award of a Masters level degree (MRes at Bournemouth, MPhil or MSc at Bath).

Writing up a final thesis or portfolio for EngD examination will typically take about 4 to 6 months, and must be examined by the end of the fourth year. It is the responsibility of the academic supervisor to make sure it is doctoral level standard.

5.1 Examining an EngD

The general form for examining an EngD is similar to that of a PhD. The student submits a portfolio or thesis, which is examined by at least two examiners, one internal to the student's university, the other external to that university and usually appointed at the suggestion of the supervisor. The external examiner does not need to be employed by an academic institution, but must be approved as a competent to examine a doctorate. All examiners must be aware of the requirements needed to fulfil the award of a doctorate.

The examiners read the submission and conduct a viva-voce, arranged by the University where the student is registered. In the case of an EngD the document submitted is allowed to take the form of a portfolio. A typical portfolio comprises several chapters that describe the contribution to knowledge, and at least one chapter that describes impact. The contribution to knowledge must be deemed publishable by the examiners. Impact is less well defined, but the examiners must be satisfied that impact has been made.

Unlike a PhD dissertation, a portfolio does not require a single thesis statement to defend. Instead, the dissertation could, in principle, comprise *N* chapters, each describing a quite distinct project. This is a direct consequence of impact: in fact, one can consider that the impact requirement replaces that of a defendable thesis. Even so, the chapters of an EngD portfolio must be logically related.

There is an important caveat. The variation in the understanding of what "impact" is can mean that an EngD echoes a PhD very closely. In these circumstances, the student may submit a thesis rather than a portfolio, and the examination can be conducted similar to a PhD. However, a successful outcome nonetheless leads to an EngD award.

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6 Trouble Shooting

When things go wrong, it is important to know who to turn to. Problems are often grounded on miscommunication or differing assumptions, and can often be resolved with a little good will.

In the first instance, the majority of problems can be sorted out between student and the pair of supervisors. If that fails – should a problem escalate, or if confidentiality is an issue – then the management team, including the directors, are open for contact.

If there is a complaint regarding the management team, including the directors, then the same general path should be followed. That is, local resolution is preferred. If that does not happen then the complaint can be taken to the relevant head of department who will offer further advice on what to do next.

Key Points

The EngD scheme 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 academics and companies
- contribute to the body of knowledge on a particular technical discipline, industrial sector or multidisciplinary theme

The Industrial Supervisor:

- Guides the RE's research agenda
- Advises on strategic importance and industrial relevance of work
- Ensures the RE has had relevant company induction
- Ensures the RE is aware of the company's expectations regarding conduct and what material is suitable for disclosure to the public sphere
- Ensures company colleagues fully understand the nature of the RE's role as a research student embedded in a company who is not an employee
- Clears the RE's presentations to external audiences
- Guides the RE on choice of taught units and professional development to fill skills gaps
- Regularly meets with the RE and academic supervisor to monitor and record progress*
- Allows the RE time to attend conferences and do coursework. Time spent on these are an integral part of the programme and do not count as leave.
- Approves leave in consultation with the academic supervisor

The Academic Supervisor:

- Guides the RE's research agenda
- Advises on the doctoral worth of research agenda (regarding novelty and literature)
- Advises on depth of understanding and analysis
- Ensures the RE has had relevant university inductions
- Guides the RE on choice of taught units and relevant professional training
- Approves spend on the RE's Training Support Fund
- Regularly meets with RE and industrial supervisor to monitor and record progress*
- Guides the RE on the production of the thesis/portfolio including suitability of evidence

*REs are recommended to make contact with each supervisor at least weekly, be this separately or in a joint session (which can be via remote means). The entire supervisory team and the RE should meet together at least quarterly.

A Project Plan

This section contains a template for a written project plan in the form of headings and explanatory text. It is based largely on the case for support documents as required by EPSRC for grant applications.

A.1 Project Title

List the team too.

A.2 Synopsis

Explain the project in very broad terms, including what motivates the partner and why CDE should have an interest.

A.3 Aims and Objectives

Clearly state the aim of the project, and the objectives that act as constraints.

A.4 Prior art and Planned Contributions

Explain the background to the project. Identify the contributions to the literature that the work should yield. It is not always possible to be precise, but the general form of the contribution should be described.

A.5 Method

Here the broad working methods are described. Does the project comprise a sequence of related steps, or is it to be a collection of more loosely related projects?

A.6 Work Plan

In as much detail as possible, specify a set of milestones, deliverables, and time frames. Allow for writing up and for a transfer report. Be sure to include references to publication ambitions, and to describe a mechanism for transferring IP from the research into the partner's working environment, as appropriate.

Include an outline of the responsibilities of team members and a diary of meetings.

REs are recommended to make contact with each supervisor at least weekly, be this separately or in a joint session (which can be via remote means). The entire supervisory team and the RE should meet together at least quarterly to review progress and next steps.

A.7 Resources Required

Say what computer, cameras *etc* will be required. Include a reference to visits by the student to conferences and CDE events.

A.8 Pathways to Impact

Describe, at least in general terms, how the integration of IP is to be audited, and its impact measured. Potential impacts are sales, intellectual property, patents and publications.

A.9 Other

Here include any additional information of relevance. For example, CDE encourages and has funds to support international visits. If that has been discussed and an agreement reached, include it here.