REVIEW OF THE ENGINEERING DOCTORATE SCHEME: STAKEHOLDERS SURVEY

Management Report
Prepared for
EPSRC

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1. INTRODUCTION

1.1 Terms of Reference

This Report contains the findings of a Survey conducted among EPSRC stakeholders involved in the Engineering Doctorate (EngD) Scheme.

Following the original “Parnaby” Pilot Scheme in 1992 and the 1997 Review, the EngD Scheme has grown to 18 EngD Centres throughout the UK with Programmes as diverse as bioprocess leadership, transport systems, and environmental technology. In order to ensure that the EngD continues to be relevant to its key stakeholders in academia and industry, EPSRC required an up to date review of the Scheme by seeking to gain high-level views among Current and Past Research Engineers (REs), Academics and Industry. The research was carried out by Strategic Marketing Associates (SMA) on behalf of EPSRC.

1.2 Objectives

In brief, the overall objective of the research project, as stated by EPSRC, is to provide an assessment of the impact and appropriateness of the EngD Scheme on academia and industry, including:

- **The Views of Current and Past REs**: the training received by REs (formal teaching and during placement); the subsequent career experiences of Past REs (progression, application of training)

- **The Views of Industry**: benefits received by participating/sponsoring companies and companies REs have since moved to (transfer of knowledge, improved performance)

- **The Views of Academics**: benefits received by participating Universities / EngD Centres; the quality of research undertaken: academic output and industrial impact both during and after the EngD course

- **The Operation of the Scheme**: feedback on the effectiveness of the delivery of the Scheme by EPSRC; and

- **Future Developments**: stakeholders views on where improvements can be made to the Scheme in order to define and inform EPSRC’s policy towards future EngDs

1.3 Methodology

Introduction

Since the information gathered relates specifically to attitudes and perceptions, the optimal method to do this was through **qualitative research**. The core of SMA’s approach consisted of in depth interviews via **personal and telephone contacts**, supported by a self complete postal and email questionnaire to invite participation by all stakeholders and to provide a quantitative background to the research project.

The research methodology ensured that SMA got a representative cross section of views and provided an opportunity for all EngD stakeholders to participate in the consultation process.
The Research Project

The research project was undertaken between November 2005 and March 2006. The component parts of the research programme included:

1) Interviews with EPSRC’s Project Manager(s) and APMs

Preliminary discussions were held with Senior staff at EPSRC, in November 2005, to kick start the project, to obtain briefings prior to developing the various questionnaires, to discuss topics and issues to be addressed in the interview programme and to define the sample to be contacted. The sample was provided by EPSRC and drawn from contacts provided by all the EngD Centres, broken down as follows:

- Present REs (~410)
- Past REs (~383)
- Academic supervisors (~410)
- Industrial supervisors (~573)

Before proceeding with the main field work, in depth interviews were also conducted with Assistant Project Managers (APMs) at EPSRC, in order to place the findings of the research in the context of their perceptions and expectations. This exercise ensured that aspects of significance from their experience of the EngD Scheme to date were taken into account in subsequent discussions with stakeholders.

2) Questionnaire Design and Piloting

During November 2005 a pilot exercise was conducted involving interviews with Academics, REs and industry, which helped shape and finalise the questionnaire design.

3) Personal and Telephone Interviews

A programme of personal and telephone interviews was initiated among stakeholders in November 2005. The personal, face to face, interviews were completed by February 2006, while the telephone programme was completed by March 2006.

- **Personal interviews at EngD Centres: 44 Academics and 90 Current REs.** All 18 EngD Centres were visited and in-depth interviews conducted with the EngD Centre Directors (18). The remainder 26 Academics consisted of a mix of EngD Programme Managers and Co-ordinators (who are also Supervisors), as well Academic Supervisors. 90 Current REs were interviewed at the EngD Centres in small focus groups, varying in size from two/three REs to groups of 8 REs. The focus groups consisted of a mix of years 1 to 4; REs placed by the universities as well as industry sponsored REs; and REs with and without previous industry experience.

- **10 Personal interviews with Industry.** These consisted of in-depth face to face interviews with Industry Supervisors, with the focus on the larger company sponsors. Respondents were drawn from those whose supervision included both Current and Past REs.

- **82 Telephone interviews with Industry.** A telephone interviewing programme was carried out with Industry Supervisors based on a semi-structured questionnaire among a cross section of the target audience (to represent differing size of companies and EngD Centres).

- **30 Telephone interviews with Past REs.** A cross section of Past REs were interviewed, utilising a semi-structured questionnaire, with each EngD Centre being represented in the sample.

Interim findings were presented to EPSRC on 9th February 2006.
4) Self Complete Questionnaire

At about the same time as the telephone interview programme was taking place, work was started on the self complete questionnaires to be sent to Academics, REs and to industry. The questionnaires were posted to the whole sample at the end of February / beginning of March 2006 with a cut off date of 4 April 2006 when returns were data processed.

- **Self Complete Questionnaire (540).** To supplement the above in-depth interview programme and to ensure that the consultation reached the maximum possible audience, a self-complete postal survey was conducted among those within the database of EPSRC / EngD Centres. The self complete questionnaires were sent out by EPSRC to 1,776 stakeholders (Academics, Current REs, Past REs and Industry) held on the database. By the time the self complete questionnaires went into data processing 485 had been received by post or electronically as emails (a pleasing 27% return). With the addition of 55 industry telephone questionnaires, 540 questionnaires in total (i.e. some 30% of all stakeholders) were analysed to generate a comprehensive set of Tabulations.

The 540 self complete questionnaire responses analysed break down as follows:

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>No. of Respondents</th>
<th>Per Cent</th>
<th>No. in Sample</th>
<th>Per cent Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academics</td>
<td>150</td>
<td>28</td>
<td>410</td>
<td>37</td>
</tr>
<tr>
<td>Current REs</td>
<td>125</td>
<td>23</td>
<td>410</td>
<td>30</td>
</tr>
<tr>
<td>Past REs</td>
<td>100</td>
<td>19</td>
<td>383</td>
<td>26</td>
</tr>
<tr>
<td>Industry (incl. 55 by telephone)</td>
<td>165</td>
<td>30</td>
<td>573</td>
<td>29</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>540</strong></td>
<td><strong>100</strong></td>
<td><strong>1,776</strong></td>
<td><strong>30</strong></td>
</tr>
</tbody>
</table>

Further breakdowns of the 540 sample illustrate the representative cross section of views achieved amongst Academics, REs and Industry by the self complete questionnaires and are included in Appendix 1 of the Management Report.

This report is supplemented by a separate and more detailed Supporting Report which provides much of the commentary and additional evidence for the key findings that follow in this Management Report.
1.4 Acknowledgements

SMA would like to express their thanks to Dr. Alicia Greated and Dr. Richard Bailey at EPSRC, who co-ordinated and managed this project. We would also like to extend our thanks to their many colleagues at EPSRC for their comments, guidance and assistance in the various phases of the study.

The authors are also indebted to the many individuals in Universities (Academics and REs), companies and organisations who gave so generously of their time and whose views made a significant contribution to the study. There was an extremely high level of co-operation with SMA throughout the research project, during the personal interviews, the telephone and postal questionnaire stages, reflecting the appreciation and esteem in which stakeholders hold EPSRC. Many respondents also made it known that they welcomed their opinion being sought in this way and were happy to contribute their views.

The views expressed during the fieldwork have been treated in confidence by SMA and EPSRC so individuals are not identified. Where quotations are used in the Report for illustrative purposes they are treated anonymously. The research report was produced by:

Vivian Falzon and Jean Sutton
Strategic Marketing Associates
2. KEY FINDINGS AND RECOMMENDATIONS

2.1 Key Findings

Overall Findings

The overall perception of the EngD from Academics, REs and from Industry is clearly positive - often described as a ‘win-win’ for all. There is definite agreement among Academics, REs and Industry, that the EngD meets their respective needs.

Involvement in the EngD does help cement (and sometimes extend) relationships between industry and academics.

Many of the Centres are still at an early stage of development and so the number of REs that have graduated may be small or non-existent. Thus it is for many, too early to judge the long-term benefit to RE, to industry or to the academic department.

The number one reservation to the very positive picture is the extremely low profile of the EngD qualification among potential applicants and within industry in general. A majority of respondents in academia and industry believe the profile of the EngD needs to be raised.

Not surprisingly, there is a widely held view that there is not a “EngD” brand. REs have to explain what an Eng D is – it has no profile or identity (e.g. employers application forms will not have a tick box for an EngD, but will have one for a PhD).

The EngD is highly regarded by those who know.

REs benefit from the industrial experience and the taught elements (MBA). Past REs speak highly of their experience and subsequent impact on their career.

The quality of output of REs is perceived to match and/or exceed that of a PhD.

In addition to lack of awareness, one of the main limiting factors to growth or possibly maintaining momentum in the numbers of REs is the increasingly limited numbers of suitably qualified UK undergraduates coming through the system.

Although most respondents, when asked to rate EPSRC’s level of involvement, suggested that it is “about right” - the view was often expressed that EPSRC could play a useful role in helping to raise the profile of the EngD.

Centres do not anticipate any changes in future funding arrangements, looking to the status quo to prevail.

The scope for more Centres and future EngDs will be dependent on continued EPSRC core funding.

There is scope to increase EPSRC role (steering, guidance, promotion, CTA)

Although the research has identified very few, fundamental, shortcomings to the qualification there are a few suggestions regarding specifics of the running of the programme.

Most respondents expect that demand for EngDs from industry will continue to grow as the awareness and experience of the qualification spreads.
Overall Attitudes towards the EngD

Respondents were asked to sum up their views on the EngD by indicating the extent to which they agree with a number of specific statements. The positive answers reflected the tone of the discussions, reaffirming the enthusiasm for the EngD concept while indicating that it is not a panacea but is best suited to specific situations.

The EngD develops innovative thinking while tackling industry problems

In relation to the statement

“The EngD develops innovative thinking while tackling industry problems”

there was general agreement, with almost 80% in all respondent groups saying they agree with the statement. However, fewer from industry said they ‘Fully’ agree and were more likely to ‘Partly agree’ than other stakeholders.

The Quality of output from an EngD matches or exceeds that of a PhD in Engineering

Some concern was expressed in the light of the ignorance surrounding what an EngD really is, that it might be perceived to be ‘second-best’ when compared with a PhD. RESs are frustrated to have to explain to potential employers and friends alike that it is actually a ‘PhD Plus’. All stakeholders are in agreement, however, that the quality of output compared favourably with fewer than one in ten disagreeing with the statement that:

“The Quality of output from an EngD matches or exceeds that of a PhD in Engineering”

Some 11% of respondents from industry were not quite convinced - or at least not sure enough to reply either way which highlights the need to communicate the essence of the EngD more forcibly from the outset.

The EngD helps to foster communication between academia and industry

Both Industry and academics acknowledged that even where they had existing links and collaboration in place, involvement in the EngD helps to cement and to broaden those links. Thus 70% of Academics and 80% of Industry Supervisors agreed with the statement that:

“The EngD helps to foster communication between academia and industry”

Only 2 or 3 from industry and fewer than a dozen Academics disagreed while both Current and Past RESs were likewise very much in agreement.

The EngD strengthens the links between the university research base and industry

In similar vein when Academics and Industry Supervisors were asked whether they agreed with the statement

“The EngD strengthens the links between the university research base and industry.”

there was widespread agreement from 94% of those in industry and 82% of Academics.
Job applicants with an EngD are more attractive to the engineering industry than those with a PhD in engineering

When they were asked to compare the relative attractiveness and/or performance of an EngD with that of a PhD, respondents typically stressed that this is not a direct comparison and it depends very much on the circumstances, on the company needs and/or on the individual. Thus when asked to what extent they agree with the statement:

“Job applicants with an EngD are more attractive to the engineering industry than those with a PhD in engineering”
	here was mild agreement - from about half of the respondents but many said they neither agreed nor disagreed or preferred not to commit. Among each of the stakeholder categories, about one in 6 disagreed with the statement.

An EngD recruit gets paid more than a PhD recruit

Since many stakeholders believe there is an added value in an EngD recruit - given their additional training and their time spent in industry, REs were asked whether in fact they are paid more. It is clear that this is not necessarily the case, even though REs often qualified their comments by saying it is possible the recruit with an EngD would progress faster. Thus when asked to what extent they agree that:

“An EngD recruit gets paid more than a PhD recruit”

only about one in three agreed and almost half either preferred not to answer or would neither agree nor disagree. About one in five did disagree with the statement.

The mean scores from a 1 to 5 scale are summarised in the Table below, with 5 indicating full agreement.

<table>
<thead>
<tr>
<th>The EngD…..</th>
<th>All</th>
<th>Current RE</th>
<th>Past RE</th>
<th>Industry</th>
<th>Academics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develops Innovative thinking while tackling industry problems</td>
<td>4.18</td>
<td>4.30</td>
<td>4.15</td>
<td>4.05</td>
<td>4.21</td>
</tr>
<tr>
<td>Quality of output matches or exceeds PhD</td>
<td>4.15</td>
<td>4.39</td>
<td>4.45</td>
<td>3.85</td>
<td>4.02</td>
</tr>
<tr>
<td>Helps foster communication between academia and industry</td>
<td>4.20</td>
<td>4.15</td>
<td>4.33</td>
<td>4.25</td>
<td>4.08</td>
</tr>
<tr>
<td>EngD strengthens research links between university research base &amp; industry</td>
<td>4.23</td>
<td>n.a</td>
<td>n.a</td>
<td>4.20</td>
<td>4.27</td>
</tr>
<tr>
<td>EngD applicants are more attractive to engineering industry than PhD</td>
<td>3.65</td>
<td>3.87</td>
<td>3.68</td>
<td>3.49</td>
<td>3.60</td>
</tr>
<tr>
<td>EngD Recruit gets paid more than PhD recruit</td>
<td>3.29</td>
<td>3.34</td>
<td>3.23</td>
<td>n.a</td>
<td>n.a</td>
</tr>
</tbody>
</table>
2.2 The RE Experience

2.2.1 REs: the Context

Since 1992 some 550 REs have graduated out of a total intake, up to 2005, of 1,280 students.

The vast majority of Past REs (74%) had spent some time in industry prior to applying for the EngD – 54% had spent between 1 and 5 years and 20% more than 6 years in industry. Amongst Current REs, fewer (just under 60%) have previous industry experience: 38% have between 1 and 5 years and 20% over 6 years experience.

A quarter of Past REs had past links with the company that sponsored them through the EngD – usually continuing a sponsorship that had originated with their first degree and/or Masters. Amongst Current REs the proportion with past links with their sponsoring company, at 41%, is higher. For the rest, with no previous links, the sponsor and project were lined up by the University.

2.2.2 How REs Find Out About the EngD Scheme

Most REs report that personal contacts made them aware of the qualification, particularly word of mouth (other students, colleagues at work or their tutors). Other sources of information on the EngD include internet searches (university web sites, www.jobs.ac.uk) articles, ads and advertorials in professional and science journals and newspapers.

2.2.3 Attraction of Doing the EngD to an RE

The EngD has encouraged post graduate participation – a third of all REs had not considered doing a PhD but were attracted to the EngD because of the chance to work in a real industry environment.

The industrial connection is one of the main reasons for choosing to do an EngD. RE’s greatly appreciate the combination of research and commercial skills offered by the EngD. There is also a financial attraction in doing an EngD.

2.2.4 RE Expectations

Nearly two-thirds of Past REs and three-quarters of Current REs feel that the EngD meets their expectations – both during the course and since. They recall getting good support from their departments, while for Past REs, post EngD they feel the qualification has enhanced and accelerated their career prospects.

To REs the Centre Director sets the tone – with views varying from those who think Directors can be energetic with clear ideas on the delivery and objectives of the EngD to those who are seen as more relaxed. On balance those Directors with considerable experience of industry appear to have the clearer vision.

Some REs feel their Industry Supervisors lacked a clear understanding on what is expected of them – (this can be particularly so in circumstances where there is a change of Industry Supervisor within a company.) The less enthusiastic also made references to aspects such as duration (4 years is too long), having less industry contact than expected and the writing up element being harder than envisaged.

2.2.5 How Easily an RE Gets Sponsorship

As previously mentioned some 25% of Past REs and as many as 41% of Current REs have past links with the company that sponsored them through the EngD programme.
Some REs have encountered problems with their sponsoring company pulling out halfway through their EngD. Most have been fortunate that a new employer was found by the University and agreed to take on their EngD sponsorship. REs also make the point that the Scheme, in their view, often works best when the REs have had some industrial experience.

2.2.6 RE Attitudes Towards the EngD

Mixed messages come from REs when asked to rate the overall image of the EngD as a qualification. The EngD is “Highly regarded” or “Very well regarded” by 55% of Past REs and 67% of Current REs. But REs are not sure how widely known and understood the qualification is to have a real identity.

The ‘essence’ of the EngD is seen as its practicality, the industry-bias, the applied nature (and thus relevance) of the research and practical tuition to back this up and prepare for it. Three elements of the EngD came on top being scored as “Very important” by all stakeholders:

1. Time spent in sponsor company: 65% of Past REs and 78% of Current REs - (73% of all respondents)
2. Funding by EPSRC with top up by company: 67% of both Past REs and Current REs - (72% all)
3. Applied Focus: 61% of Past REs and 59% of Current REs - (62% all)

Three other key components of the EngD were given a slightly lower rating of “Very important” by all respondents:

4. Teamwork element: Past REs (35%) and Current REs (27%) - (34% all)
5. Taught component: a slightly higher proportion of Past REs (36%) rated the taught component as “Very important” compared to 29% of Current REs and 34% of all other respondents
6. Managerial Training: This is the one element were Past REs disagreed with all other respondents – with 54% rating it as “Very important” compared with 36% of Current REs and 43% of all respondents

Amongst all stakeholders the only components of the EngD that had an appreciable low rating of “Not very important” were ‘Managerial Training’ (17%), ‘Taught component’ (14%) and ‘Teamwork element’ (13%); while only 1% or 2% of all respondents typically gave the lowest rating of “Not at all important” to all components.

2.2.7 Strengths of the EngD

The strengths of the EngD, over a PhD, are seen as higher funding levels, real work (a job), flexibility where to work (at university or company), the MBA teaching, the industrial experience and the community feel, social and networking aspects of it. The EngD can be a fast track to CEng status. Other strengths mentioned by REs include the increase in attractiveness to an employer, access to specialised /high value equipment only found in industry, the guidance and training received from the sponsor company.

2.2.8 Drawbacks of the EngD

Lack of recognition and relationship with industry sponsor (maintaining a balance between the needs of academia and industry) are the main drawbacks of the EngD according to REs. A further drawback relates to their project if it is not fully conceived before starting. The lack of understanding among sponsoring companies can be difficult for REs to handle. The uncertainty of outlook in industry can be unnerving for REs who need to have a certain amount of stability over a 4 year period. Some REs made reference to the constraint and frustration of having to deliver research that is focused to the sponsor's needs. Finally, some REs feel very vulnerable if there is a problem with the sponsor company, since apart from any financial difficulties, the qualification is put in jeopardy, and feel there is insufficient support if they have problems at the company.
2.2.9 Would REs Recommend the EngD

As a group, REs would definitely recommend the EngD to a friend (some **70%** of both Past and Current REs), despite admitting to having to be prepared to give up a lot over the 4 year duration.

2.2.10 Benefits of the EngD to REs

The main benefit of the EngD to REs is that it enables the implementation of innovation. Other benefits include industrial experience and exposure; the level of financial sponsorship; a well designed programme; confidence gained in the field of research undertaken; and the qualification itself.

In terms of employment, the EngD is perceived to enable REs to hit the ground running, eventually achieving more rapid salary increments and career progression. Just **over half** Past REs believe that they have made faster progress because of having the EngD. Most Past REs are unanimous in believing that colleagues in their cohorts had found first employment easily.

But there is generally little networking amongst (past) REs, while Current REs would welcome more opportunity to interact with other EngD students. Sometimes this can depend on how the modules are organised and run but the discussions would indicate that much is left up to the students themselves to arrange social events to get together.

2.2.11 Comparison of an EngD with a PhD

REs differentiate themselves from PhDs in not wanting to sit in ivory towers – preferring to get their hands dirty. The practical nature of the EngD is its main distinction compared to doing an EngD. Other distinctions include the focus on the application of innovation, the grounding in industry, being less isolated than a PhD and the money too.

Nine out 10 Past and Current REs believe having an EngD gives added value to a job applicant (although recognition of the qualification is an underlying problem). However, there remains great concern about the misunderstanding of how an EngD compares, with some REs feeling that an EngD is seen as inferior to a PhD- due to ignorance of what it entails.

2.2.12 Perceived Benefits to Industry of the EngD Scheme

According to **75%** of Past REs, the EngD meets “Very well” or “Extremely well” the needs of industry today – in particular by providing graduates with strong engineering background and excellent business skills.

Industry needs people who are able to conduct research rigorously, and yet understand the environment in which the research could be applied / diffused. Some Past REs see recruitment as the only purpose behind some employers’ motivation in sponsoring the EngD. Current REs are a little less convinced with **two-thirds** saying the EngD meets the needs of industry “Very well” (54%) or “Extremely Well” (12%).

REs believe that industry gets value added when employing REs, in the form of cost effective funding of research; links with university / academia; status and kudos in the development of the future leaders of their industry; and innovative thinking. A common view is that it’s very well geared to the needs of industry – they benefit from dedicated research now, when often they would not be able to do afford (or have time) to do it themselves at a much lower cost than hiring someone to do it.
2.2.13 Future Demand

The majority of Past REs (57%) feel that demand for EngDs by industry will grow over the next 3 to 5 years as awareness of the qualification grows. Current REs are more optimistic than the Past REs with 70% anticipating some growth in demand for EngDs and a further 24% expecting a stable outlook. Only 2% envisage a possible reduction.

Other demand drivers mentioned by REs include increased competition (especially from overseas) leading industry to seek innovation and that the basis of UK competition will increasingly be in the effective generation, management and exploitation of IPR.

Those few REs who saw demand contracting were strongly influenced by factors such as the state of the economy, the short-termism of UK industry in general and the state of health in their own particular industry sector.
2.3 Industry Experience

2.3.1 Industry Involvement in the EngD: the Context

In addition to CASE studentships, and sponsoring of MScs, many of the organisations contacted have also sponsored PhD students and often have experience of summer placement students. The largest R&D organisations have many points of collaboration with universities as well as with funded projects.

Those with supervision responsibility for the RE typically have job titles such as Principal Research Scientist, R&D Manager, and Technical Research Manager.

There can be half a dozen or more people involved in the supervision of EngDs at larger companies while others may have just a main supervisor.

The research encountered a number of situations in which the industry supervisor had moved roles, necessitating a change of supervisor for the RE. The point was made many times that 4 years is a long time in industry today. With that in mind some organisations allocate 2 industry supervisors in order to provide some continuity to the RE in terms of supervision.

Where companies are sponsoring existing employees, it is suggested that it is slightly less onerous in terms of supervision since they are already well integrated with the organisation.

Some companies have been involved with the EngD programme since its inception. About one in 10 of the companies contacted have more than 10 years experience of involvement in the EngD scheme. About 60% have first been involved in the last 4 years and so have not yet had the experience of having an RE complete.

The largest companies may have 5 or more EngD students under supervision at any one time and may have sponsored 10 to 20 by this point in time. The majority of companies however have experience of fewer than 4 and small companies in particular stressed that for them having one RE at a time is as much as they can cope with in terms of time allocation.

Unlike 90% of Academics who suggested that their department’s current collaboration with industry is “Very high” or “High”, only 46% of companies thought their involvement in funding of research was “High” or “Very high”. In fact one in three companies indicated that the company funding is “Low” or “Very low” and gave it a 1 or 2 rating out of 5. (Only 5% of Academics gave their departmental collaboration a 1 or 2 rating).

Almost two-thirds of companies (61%) indicated that there has been an increase in the level of collaboration with universities since their involvement in the EngD scheme. (Again Academics have a rosier picture with 85% suggesting some increase and only 2% suggesting it had remained the same compared with one in 4 of the companies contacted).

2.3.2 How Industry Finds Out About the EngD

Industry Supervisors also report that personal contacts made them aware of the qualification. Most industry sponsors are already collaborating with the university and the EngD is put forward as part of a package of services offered by the institution. There were a number of cases where the industry supervisor had himself been an EngD student in the early days and so brought the scheme to the attention of the sponsor company.

2.3.4 The RE Selection Process

The research suggests that the majority of companies involved in the EngD have had existing relationships with the University with whom they are collaborating. It is often on the suggestion of their academic contact that they agree to sponsor an EngD. The R&D manager together with the supervising manager typically decide between them about the selection of the RE.
There were many concerns expressed regarding the growing difficulty of finding high calibre applicants, with the perception that the general degree standard has decreased in the UK.

Companies prefer where possible to have a project in mind before taking on an EngD student since it is more likely that the work is closely tailored to their requirements. Often this means matching projects with the university suggested applicants to the EngD, interviewing a number of students and picking one.

With projects for students based in the University, the project mainly comes first. With those already employed they may be doing the job anyway and want to gain a higher degree / qualification, so the project can be selected as a secondary element.

There are some examples of where companies have to adapt their topic to fit with the focus of the university. The project can be out of alignment with their specific interest which presents a less attractive proposition and in some cases can lead to problems as the student moves further from the company interests.

2.3.5 Attraction of Sponsoring the EngD to Industry

Among the reasons given for getting involved in the EngD were:

- A way of having involvement with Universities
- Cost effective means of getting a project done
- Commercial slant of recruit
- Opportunity to ‘grow your own’ in light of recruitment difficulties
- A 4 year job interview

Industry values the opportunity to get research projects done as well as the communication line to academic research. Access to university research groups is a plus for Industry, a cost effective way of getting projects done. For some companies that have a strong research tradition, the EngD involvement may be valued as an opportunity to work with academics that they respect or to recruit in fields where there has been difficulty in finding suitable candidates in the past.

2.3.6 Industry Expectations

For some companies the main expectation is of having a resource that will be available on a full time basis when they do not have someone internally they can put onto a project.

Given the time scale for an EngD and the pace of progress, it is seen as best suited to a project that embodies an underlying problem rather than addressing an immediate need.

A major distinction perceived when agreeing to sponsor an EngD compared with a PhD is the expectation that the student will be based for most of the time at the company and therefore be easier to oversee and control.

For the most part industry respondents (65%) declared themselves satisfied in terms of how well their expectations have been met. A significant minority however (31%) said “Not very well” or “Not at all well”. A recurring issue that was raised related to the interruptions experienced as a result of the need to attend taught courses.

Companies also typically have shorter time horizons than the EngD project time scale and thus experience frustration at the pace of progress.

Respondents are often surprised to discover how much of the time is in fact spent away from the company and where a company employee is involved there is disappointment at the loss of availability of that member of staff.
2.3.7 Industry Attitudes Towards the EngD

Respondents from industry are slightly less positive than Academics in the overall rating they give to the image of the EngD but 61% rate the overall image of the EngD as a qualification as being “Very highly regarded” (26%) and “Quite well regarded” (35%).

For many respondents the perception is of a PhD with industry experience or as many described the EngD - a PhD with an MBA. Most consider it to be at least as good if not better than a PhD. It is more practically oriented than a PhD and is seen as postgraduate recognition of an engineering subject to quite a high level.

Some say it’s basically like a PhD in terms of the degree of commitment and time, but with extra taught components and with a business management element as well. And without the constraint of a single topic in the PhD thesis, although it’s theme is around a common subject area.

Many described the EngD in terms of someone with a scientific background who is trained to work in a company.

When companies were asked how important they felt selected components were as part of the ‘essence’ of an EngD, like other stakeholders they gave higher ratings to:

1. “Time spent in sponsor company” - 80 % said “very important” (73% all respondents)
2. “Funding by EPSRC with top up by company” – 74% said “very important” (72% all)
3. “Applied Focus” – 67% of industry said “very important” - (62% all)

The time spent with the sponsor company is the very reason that most companies agree to be involved in the EngD – being perceived as a mechanism to get work done.

The funding by EPSRC is an important element in enabling companies to commit to the top up amount. In some cases the EPSRC support enables approval at middle-management level, without the need of authorisation at Senior level.

Like other stakeholders, fewer companies rated as “Very important” the “Teamwork element” (46%) the “Taught component” (29%) and “Managerial training” (24%).

2.3.8 Industry Perception of the RE

‘Much the same as a PhD but better’ is how industry compares the EngD. Generally industry recruit on the basis of the person not the qualification and so they could not express a preference for employing or choosing one over the other in terms of a PhD or an EngD. Some would consider that a recruit with an EngD is a more ‘rounded’ individual based on their time spent in industry.

Four out of ten industry respondents were of the opinion that there is little difference in terms of quality, capability, commitment, age and number of years industry experience in comparing an EngD with a PhD while a further 20% acknowledged that there may be in some cases. The major distinction is likely to be in terms of the number of years industry experience of the RE.

The main distinction is that the PhD is essentially based at the University, and thus does not acquire the same appreciation of industry and research in an industrial environment as an EngD. One element highlighted as being of value in the EngD is the perceived flexibility in allowing a change of direction according to needs as a project may progress (easier to resolve with an EngD than with a PhD).

There is no distinction in the quality of work from an EngD or a PhD - the differential is more likely to be in the individual than in the qualification. In some cases it may be different, due to access to equipment within a company for example and so the work output might be regarded as better quality than if the same person were based at a university.
There are some in industry however who do not really understand whether the EngD is an extended MSc or a PhD except in name.

Typically REs come in to a company at exactly the same level as a PhD, but the advantages of the EngDs experience would allow them to settle into the company more quickly and to deliver more quickly - to ‘hit the ground running’ as was suggested many times. The EngD might therefore progress more quickly once in the company and so over a period of time the pay might be higher.

### 2.3.9 Strengths of the EngD

Key strengths of the EngD identified were:

- Suitable for an underlying problem
- Flexibility to adapt to changing situation
- Taught component
- Funding from EPSRC

### 2.3.10 Drawbacks of the EngD

The key weaknesses of the EngD programme identified by industry respondents were:

- not suitable for a quick fix problem that requires an immediate solution
- interruption of time with the company due to coursework

### 2.3.11 Perceived Benefits to Industry of the EngD

Industry Sponsors are slightly less enthusiastic than Academics regarding the benefits gained by involvement in the EngD scheme. Although some 64% believe it to be the case – this compares with 84% of Academics who believe the university has benefited.

Among Industry Supervisors 47% think the company gets “Substantial benefit” (score of 5 on a scale of 5) and 17% that they benefit “Greatly” (score of 4). Some 10% think their company gets little or no benefit. There is no discernible difference in attitude between small and large companies.

The benefits cited include

- Having the RE on site
- Access to equipment
- Tacking a problem in a new way
- Can tackle a long term issue
- Time/Resource
- Expertise

The EngD benefits industry also in that they are getting something commercially viable at the end/that will make money for them. They have someone who is cheaper than a graduate doing a long term project that otherwise one of their own employees would have to do. The company also has an input into the project.

Most companies involved with the EngD already have existing relationships with the University and so from that point of view the EngD has brought no significant change. Likewise many of the companies involved would consider themselves to be fairly research oriented and so involvement in the EngD does not necessarily serve to raise the profile of research generally. However, in some cases companies acknowledge that their involvement has made them more aware of the availability of the resources that can be made available through the University.
The research identified some examples of where the involvement has fostered closer relations between a company or individual and the university. In one case the Industry Supervisor developed a good relationship with the academic who was co-supervising, and he now has input on the MSc course, and they are both going to be involved with a spin-out company.

Having an EngD student within a company can bring positive benefits in encouraging existing staff to consider improving their qualifications.

Respondents tend to have low awareness of other companies that may be sponsoring EngDs and the research identified no feeling of community or ‘belonging’ among the companies interviewed. At the annual conference in the Spring where the REs present their papers, there are opportunities to meet people from other companies but it was suggested that it is unlikely that any more substantial relationships develop.

Respondents had difficulty in envisaging in what way their involvement might foster relations with the Regional Development Authorities and had very little knowledge of any possible role.

### 2.3.12 Extent to Which EngD Meets Industry Needs

When asked how well the EngD meets the needs of industry today, only 56% of industry (compared with 69% of academics) replied that it does so “Extremely well” (20%) or “Very well” (36%), an additional 1 in 5 think it does so “Quite well”. About one in 5 (double that of Academics) believe that the EngD does not meet the needs of industry.

Frustration at the interrupted time on site is where the EngD is weak in matching company needs. The reservations raised most often were Interruptions associated with taught courses; time scale of deliverables; and the fact that the specific focus of the project does not always match needs.

While 51% of those from industry do not think that the needs of UK industry have changed in the last 5 years, some 39% believe they have done so (10 said don’t know). The key changes identified by industry respondents include:

- A need for business acumen
- A need for speedier response
- A greater practical focus

Respondents suggested that one of the main ways in which their needs are now different compared with 5 years ago is the need for more rapid turnaround. For some companies there is a need for more short term solutions (research) compared with a longer term focus to which an EngD project might be suited.

It was also suggested that no longer can one expect to be researching the same thing for 5 years – and thus it’s by no means as sure as it was that one will be able to continue in what was first embarked upon. There is more focus on product and process development and less on early research/discovery. There are more frequent changes of direction than in the past.

Companies stressed that their requirement first and foremost is for someone who is technically competent and in that respect their needs have not changed. It was acknowledged that today there may be more value placed on also having a wider business or industry perspective.

It is difficult to recruit today compared with 5 years ago as there are fewer engineering graduates, forcing some companies to look to employ EU nationals.
2.3.13 Future Demand

Many companies are only now reaching completion with their first sponsored RE and so they feel it is too early to evaluate their likely future involvement.

Only 31% of companies expect the demand for EngDs by industry will grow in the next 3 to 5 years (compared with 61% of Academics who replied in the affirmative). Almost half (48%) expect their needs to “Remain the same” and 15% anticipate a fall.

Companies suggested that there is a natural limit to the number they will sponsor at any one time- typically at a level of one a year.

Some major industry supporters said that there is substantially more demand within their companies but the main constraint is the pressure on overheads (mainly staff time) to become involved.

Others who expected a fall pointed to budget constraints and the continued undermining of UK manufacturing by low cost countries.

For many companies their needs in the future will be driven by the nature of the projects that arise.

Companies mainly declared themselves very satisfied with their experience to date. Some 89% of Industry Supervisors said they would recommend to others in their sector to sponsor an EngD although some were cautious - mainly dependent on having an appropriate project and willingness/ability to make the time to supervise. It is recognised that not all companies have the time or resource to provide the supervision required and so much depends on the company situation.
2.4 Views of Academics

2.4.1 EngD Centres: the Context

According to the research some 33% of Academics say they first became involved in the programme over the 1992 to 1998 period, 25% over the 1999 to 2001 period, and a further 37% have become involved since 2002. Typically over the 14 years, 1992 to 2005, across all Centres, between 5% and 10% of Academics become involved in the EngD programme every year (8 to 15 Academics in total).

Across all Academics and all Centres, 39% have supervised at least one RE since they have been involved with the programme (up to and including 2005). Some 19% of Academics have supervised two REs and a further 14% three REs. Nearly a third of Academics have supervised 4 or more REs over the years.

A majority of Academics (58%) currently supervise fewer than two REs, while 20% of the Academics who participated in the survey are not currently supervising any REs (but have done so in years past). Some 7% of Academics are currently supervising three REs, 8% four REs and 6% five or more REs (one in 10 supervises 10 REs). Many Centres run a system of Lead Supervisor and Co-Supervisors, which accounts in some cases for the large numbers of REs under their supervision. Centre Directors and Co-ordinators often taken on the task of acting as Co-supervisors.

Academics feel that the EngD dovetails well with other current industry collaborative programmes offered by their departments - 83% rate the current level of collaboration between their department and industry as “Very high” (60%) and “High” (23%).

2.4.2 Attraction of Setting Up the EngD Scheme

The main reasons for setting up the EngD programme in the first instance include the belief that the EngD “is an excellent programme” and that it often reflected the strength of their department in the UK. In addition, many Academics had previous positive experience of EngDs and recognise the benefits to REs, to industry and to the university. Finally, the EngD is seen as reinforcing or increasing their collaboration with industry, while also helping with the RAE.

2.4.3 Ease of Attracting REs

Centres actively recruit companies as well as students throughout the year. Typically Centres match the student to the sponsor but sometimes the sponsor will come to the Centres with a student. Centres whittle down three-quarter of applicants, aiming for a ratio of 2:1 or 3:1 short list to accepted REs.

Despite the numbers applying, nearly half of the Academics report recruiting suitable / high quality students for the EngD a difficult task, with 35% saying “Not very easy” and 13% “Not at all easy”. Part of the difficulty lies in the fact that the EngD requires the University, supervisor, project, sponsor and student all to be aligned (a PhD requires much less commitment), lack of awareness of the benefits among prospective candidates and a reluctance to commit to a 4 year period. More broadly they believe that many graduate engineers do not consider doing a PhD, although at times the difficulty can be project-specific or related to the time of year when they advertise. A dearth of applicants can also be caused by the buoyancy in a particular industry sector.

More worryingly student recruitment is becoming increasingly difficult - especially within the UK – because there is a squeeze on students mainly due to debt levels.

But some 39% of Academics found recruiting REs relatively straight forward (33% saying “Quite easy” and 6% “Very easy”) partly because the breadth of the programme has increased over time and more students have become aware of the qualification.
On the more positive side, some Academics felt that the EngD attracted the best engineering students because of its obvious benefits: the pay; the extra skills gained; the link to industry; combined with the University’s research reputation.

2.4.4 Ease of Attracting Industry Sponsorship

The key to success in attracting industry sponsorship in many Centres appears to be academics who already collaborate with companies, are interested in doing so and drive the process forward (it is not always possible to suddenly collaborate with a company that they have not worked with before). Another key to success is that there has to be a project either with intermediate goals and outputs that companies can latch on to, or that they will be happy to wait for the four years for the results.

However, attracting industrial partners requires considerable effort over an extended period of time to convert interest into actual sponsorship, this, combined with uncertainty as to the level of contribution expected from industry means that half of the Academics do not find recruiting sponsors easy. Identifying potential sponsors is tricky, especially with the SMEs. General low awareness in industry of the potential benefits of the EngD, uncertainty about commitment over 4 year time span or uncertainty about mergers / take-overs are some of the key reasons holding industry back.

Just over a third of Academics, however, find recruiting sponsors “Quite easy” (29%) or “Very easy” (3%), a process typically facilitated by extensive industry networks within their departments. Those Academics who are more positive think that companies that come on board do so because they want links with universities, see RESs as a low cost option and believe that they can recruit good graduates (with the EngD acting as a good way of recruiting staff).

2.4.5 Attitudes Towards the EngD

Unlike Past RESs who expressed some reservations, 74% of Academics believe the EngD, as a qualification, is “Very highly” (27%) and “Very well” (47%) regarded. Despite this positive perception, overall Academics feel the qualification is not well known and as a result has a patchy image - with large chunks of industry who do not know about the EngD and others who know it well and value it.

Academics like the EngD because it keeps them in touch with industry and involvement can be particularly good in keeping them abreast of where their own research might focus.

An industry friendly PhD is how Academics would describe the EngD to industry - a strategic four-year research programme, training someone with the research skills and expertise, but also providing the industrial, financial and managerial knowledge, to apply that expertise. The EngD is widely seen as a “PhD Plus”. The time spent in the company gives the EngD its distinguishing characteristic – putting them ahead of PhD candidates. Academics would emphasise to industry that the EngD provides an opportunity to groom a potential employee in a way that is not possible with a PhD. Companies choose the RE from a shortlist and 75% of the funding comes via EPSRC (RESs have access to a substantial training and travel grant.)

To students, Academics would actually sell the EngD as a challenge. They make it a feature to the RESs that they have to do taught courses for real to acquire the technical / managerial transferable skills, and then apply them to a research project and the fact that they have to work with the industrial sponsor to consider the real issues.

Three key elements of the EngD ranked by Academics as “Very important” are in line with what they described, unprompted, was the ‘essence’ of the EngD:

- “Funding by EPSRC with top up by company” – 78% of Academics - (72% all respondents)
- “Time spent in sponsor company” - 67% of Academics - (73% all)
- “Applied Focus” – 59% of Academics - (62% all)
2.4.6 Strengths and weaknesses of the EngD

Strengths of the EngD mirror the key elements of its ‘essence’ combined with level of support that the REs get during the course: the resources, facilities and training and the day-to-day support.

Completion rates are seen as one of the unspoken strengths of the EngD. At some Centres these rates compare favourably with PhDs (7/8 out of 10 REs finishing), in other Centres they better PhD rates (with 93% successful RE completion rates).

Weaknesses of the EngD are mainly confined to its delivery and include:

(a) Multiple supervision leading to possible conflicts of interest. Industry and Academic Supervisors can have competing goals: academics look to publishing work, while for industry this is a lesser priority (more generally Academics believe industry has lower intellectual standards). There can be clashes in deadlines/priorities between a report for the company and a different one for the university.

(b) The 4 year span before getting results can be hard for industry who are used to quicker results. Industry needs can change over the 4 year period.

(c) Some, in academia and industry, frown on the portfolio approach, preferring the more classic “PhD” style thesis and single project approach

(d) Not enough discussion about what is expected of the EngD between the Academic and Industry supervisor (especially true of a new sponsoring company)

(e) RE’s limited choice of research (which is often largely driven by company needs)

(f) In the first 18 months REs can have a “wobble” as a result of a lack of confidence. While universities are used to this happening – REs often feel industry as being more remote.

(g) There are some issues re the length of time required to organise the contracts between industry and the companies, especially to do with Intellectual Property Rights (IPRs) which can tie up legal departments.

(h) It can be hard work matching REs, research projects and industry sponsors. Like much of the EngD, the flexible approach and interpretation of “best guidance” means that Centres approach this in a variety of ways. In some centres the REs come first (and a project is found), in others the project is there (and the RE is matched).

(i) The drop out rate among sponsors

(j) The lack of international currency of the qualification

2.4.7 Perceived Benefits of the EngD to REs

The range of benefits to the REs, according to Academics, include better remuneration, more rapid progress in their careers and the fact that they adapt more quickly to work in the industrial environment.
Other benefits to the REs mentioned by Academics include the opportunity to carry out high quality research whilst also being treated as a company employee. ‘Business literacy’ (REs learn how to manage research activity); the fact that the EngD gives REs more industrial relevance therefore increases their chance of employment; continuing industrial/academic links; a good stipend; and the ability to work with a cohort of other REs.

REs become business savvy during the course of their training, and although a very challenging programme, most REs rise to the challenge and become very sharp both academically and commercially.

The research picked up evidence that those graduating with EngDs get paid more (eventually) than a PhD. For example, Cranfield and Manchester, in their Annual Reports, provide salary surveys of Past REs. The implication from the data is that the average salary is higher and the differential can be as high as £5,000 to £10,000.

The first destination and subsequent employment of EngD graduates in the Annual Reports made available for this review by some centres show that the majority of graduates gain employment easily and that a number make early moves to better jobs.

2.4.8 Comparison of an EngD with a PhD

Academics report that while the type of student suited to the EngD may differ from those suited to do a PhD - there certainly is no essential difference in calibre. Academics know the type of candidate who will make the best EngD or PhD student often feeding own students in, on the basis not so much of academic ability but on the student's own industry orientation. Companies tend to look for slightly different people. They want and prefer students who have certain interpersonal skills – not just scientific ability.

Over 40% of Academics do not think there is any difference between PhD and EngD students where quality, capability and age are concerned; although a third of Academic respondents feel that some times there is a difference. The key differences between the two types of students are their commitment and number of years of industry experience.

The academic output of an EngD RE (in terms of papers etc) differs from other (postgraduate) students according to 55% of Academics, although 38% say there is no difference. Differences arise in that EngD outputs tend to focus on one highly involved company, the research is more diverse and much more applied and based on real solutions to business while contributing to knowledge. The research elements of the EngD are not seen as different as those for PhDs, in quality terms, though they might be different in terms of topics. The EngD is a “Level D” qualification – thus, as far as academics are concerned, the quality of the REs output is considered as rigorous as a PhD, with many believing the EngD exceeds a PhD.

In most Centres REs will publish on average 2 to 3 conference or journal papers in the latter years, including presentations to conferences. More often the result of the research project feeds straight through to the company’s benefit. IPR and confidentiality issues means that REs can be limited in terms of what may be published.

Academics frequently expressed the view that a successful EngD/RE needs constant supervision and that they have to keep a tight rein on the Industry Supervisors – both to meet the requirements of the EngD and to avoid the use of the RE as “cheap labour”.

2.4.9 Perceived Benefits of the EngD to the University

Academia benefits from industry involvement with 82% of Academics believing that their university gets “Substantial” or “Great” benefits through involvement with and their ability to offer the EngD as part of a package of services to postgraduates and to industry.

Closer connections with industry; a useful tool in collaborative projects to build upon or to start fostering links; the ability to offer a broader range of post graduate options/programmes; the fact that the EngD enhances research grant aspirations are some of the more direct benefits experienced by universities.
Nearly 60% of Academics, since running the EngD programme, have seen the number of collaborating companies grow (while 33% said they had remained the same).

Additional direct and indirect benefits of the EngD mentioned include the fact that:

(a) it is a huge resource and well funded scheme
(b) it boosts post graduate numbers reinforcing their graduate school
(c) it enables universities to offer another /alternative qualification as a postgraduate opportunity
(d) it strengthens their research portfolio / expertise and helping them achieve a good research rating (RAE)
(e) it gives the potential for recruiting overseas REs, e.g. Warwick has EngD Centres in Hong Kong and South Africa, while Cranfield have REs from the Singapore Institute of Manufacturing Technology. Universities are keen to recruit from overseas
(f) it fits with existing or new MSc programmes (with often many taught courses in common) – which means that the EngD funding goes in part to support these MSc programmes

2.4.10 Perceived Benefits of the EngD to Industry

The majority of Academics believe that one of the key benefits of the EngD to companies is the added value in the RE compared with a PhD student. This value added comes from the RE having done the research in an industrial setting rather than at University. Having done the taught courses and having developed their communication skills, REs are also equipped theoretically / academically for their practical experience, helping them to engage more quickly within a company and better able to cope with the demands of industry.

Academics also believe that the EngDocs:

(a) play a role in cementing the relationship between industry and academia
(b) help the understanding in academia of what the industry problems are (and vice versa). In some Centres, they have found that some of their new lecturers, in particular, with no previous industry experience, supervising EngDs had been beneficial
(c) help in leading to stronger collaboration - Centres report making more contacts now through the REs themselves
(d) help in the REs being advocates of collaboration - most Centres believe that REs are good ambassadors, fairly enthusiastic about the Scheme who will enthuse with their sponsor companies and as a result of this networking they are getting new companies on board

2.4.11 Extent to Which EngD Meets the Needs of Industry

Nearly 9 out of 10 Academics think that the EngD meet the needs of industry today - over two-thirds think the EngD does so “Extremely well” or “Very well”, an additional 1 in 5 think it does so “Quite well”. The reasons given behind the success of the EngD are that it generally produces graduates with the correct level of industrial awareness and academic skills. Industry gets a RE relatively cheaply – and they can actually make a positive contribution whilst employed as REs.

Proof that the EngD successfully satisfies industry needs comes from repeat business with companies and the employment record of EngD graduates (in many cases, the sponsoring company being out bid by others).
Over a third of Academics think that industry needs have changed in the last 5 years, with four key changes identified. Firstly, the need for the RE of the future (one who is both more highly specialised as well as multi-disciplinary). There is now more recognition of the need for top quality, managerially trained, engineering graduates, with UK industry needing more emphasis on entrepreneurship. Secondly, a RE capable of adapting to rapidly changing industry environments, e.g. away from manufacturing. A substantial fraction of the EngD output now goes into the service sector. Thirdly, with the level of competition and time to market pressures having increased dramatically in last 5 years, so acceptance of the time factor is changing. Finally, R&D has to face more globalised competition which requires high quality technical and managerial ability in recruited staff.

2.4.12 Changes to Future Funding Arrangements

Most Centres assume that future funding of the EngD will carry on with a similar combination of EPSRC / CTA money and industry support. They assume at some stage, when the EPSRC funding reaches a ceiling, that the level of industry contribution will need to increase. Centres are aware that they need to establish more and deeper industry links to secure sufficient finance for growth in the future.

Centres do not anticipate any changes in future funding arrangements, looking to the status quo to prevail. Some are not quite clear on the funding principles at present. There is one fundamental aspect on which all Academics agree, and that is that the EngD will continue to need EPSRC core funding.

Academics think that if there was a sudden change in funding from EPSRC or the companies, it would have a big impact on the way they operate the Scheme – they believe that it would be hard to get companies to input more than they do at present. Without the core EPSRC funding they believe they would probably survive a few years and then the EngD would go down to a very small marginal operation which might carry on, but Centres essentially would disappear.

Most Centres agree that there is a limit to the number of companies who would be interested in this sort of research, and who carry on sufficient research in their own companies to support viable projects. The possibility of responsive mode applications for additional Centres is suggested, while most Centres also believe that funding for EU / overseas students could be an option.

2.4.13 Future Demand

Some 61% of Academics expect the demand for EngDs by industry will grow in the next 3 to 5 years. A further 28% believe demand will “Remain the same” and 6% that there will be a fall (5% don’t know/ no answer)

Most Centres feel that as more EngDs graduate and show their mettle, the profile and benefit of the Scheme will be more appreciated, increasing the demand for the qualification. Similarly, because of the success of the brand, the EngD is expected to become more and more relevant to industry. A lot depends on how the EngD is interpreted by institutions and how EPSRC see that and how flexible the Council want to be.

Some Centres believe that demand from their particular industry sector is only in its very early stages, while others worry that they may have reached their limit within their sector, both in terms of industry demand and ability to provide qualified staff internally.
2.5. Operation of the Scheme

2.5.1 Awareness of the EngD Scheme

Respondents believe that there is limited awareness of the EngD qualification among students and industry beyond the narrow confines of those university departments and companies that are involved. While 66% of Past REs and over half of Industry respondents rate the awareness level in their industry and among students as “Low”, the perception among both Academics and Current REs is slightly more positive with fewer (less than half) saying it is “Low” among both industry and students.

Company respondents are less positive than Academics and only 17% suggest that awareness is “High” (15%) or “Very high” (2%). The majority of industry respondents said they had no idea what the EngD was until they actually got involved and suggested that there was a low level of awareness and understanding of an EngD even within their own company. Industry Supervisors, in general, are familiar only with the university/EngD programme at which they are sponsoring an RE and this is likely to be because the focus is in some way related to their area of interest.

Both REs and Academics believe awareness is likely to be higher amongst students who are looking to do a postgraduate qualification (Masters). Academics tend to target the EngD and rely on the pool of potential students from their own in-house Masters programmes in Engineering or from Masters programmes in other Universities.

Most respondents feel that it will take time for increasing numbers of students to work through the system and spread the word more widely and that the younger generation in industry is likely to be more aware, while older people are more familiar with the PhD. Where it becomes known or where it is in use – then the EngD tends to be highly regarded.

2.5.2 Future Promotion of the Scheme

There is scope for greater promotion of the EngD Scheme to potential REs and to industry. When promoting the qualification to students, the emphasis should be placed on the fact that the EngD is a PhD with industrial experience, the management (MBA) training, the career/career advancement aspects and the fact that EngDs are capable of Chartered status. A little more focus should be placed on the academic qualities of the EngD as it often seems to be portrayed as totally industry based.

According to REs and Academics, the EngD Scheme should be publicised to industry as the most efficient formula between academia and industry to develop the skills of business leaders, a way of developing existing staff whilst undertaking work of direct importance to the company (with the emphasis on the level of, EPSRC, funding being critical).

Vehicles for promoting the EngD by Universities and EPSRC mentioned by REs and Academics include:

- Direct approach to undergraduates (through emails / tutors / lectures) and to industry, via direct marketing, e.g. mail shots to SMEs. (However, there is a belief among Academics that advertising to industry does not generally work nor does cold calling).
- Encourage companies to present to other companies in the field about their experience of the EngD
- Marketing the qualification at relevant industry trade exhibitions and conferences (e.g. Recovery of Biological Products Conference, Embedded Systems at Birmingham etc.)
- Build on personal contacts / existing connections with industry, e.g. dedicated events every year, university enterprise type activities, presentations and information packs sent out to companies.
- Implementing an EngD roadshow visiting universities across the UK
• EPSRC to organise dedicated open days, promoting at the University’s “milk round” and at recruitment/careers fairs, in Prospects magazine and in other (non Centre) chemical engineering departments on their notice boards, plus other departments as well.

• Job search websites, a better / dedicated EPSRC website, jobs.ac.uk

• EPSRC to use specialist PR/media consultants to get articles in broad-sheets, not just TES, and in the local press of partner firms highlighting key successes, particularly in the run up to undergraduate graduations. Articles and advertorials need to be published in magazines read by potential REs and those people in industry who recruit EngDs (particularly HR people).

• EngD Centres to record and disseminate data on e.g. exit salaries compared to PhD and MSc graduates, current salary levels, first employment destinations, completion rates and successful RE case studies

In addition Academics believe that:

• EPSRC should be more closely involved in promoting the Scheme

Academics would welcome more EPSRC involvement in promoting the EngD, with the Council finding ways of embedding it in the consciousness of companies throughout the UK. The message, that the EngD is prestigious and that EPSRC is behind it, needs to be co-ordinated at a national level. It is not viable (a waste of resources) if done by individual Centres, as the message would be much more effective coming from EPSRC than from them. At a local level they think that universities need more assistance with marketing in general.

• National events/pressure is needed

Despite the problem in deciding who the audience should be, as the Centres are all in different aspects of engineering, Academics feel that national events would help raise the profile of the qualification. For example, an annual event could be held at the House of Commons with DTI/OST attending, as well as top industrialist and the press, to publicise the scheme’s successes. At a national level the involvement of the DTI/OST is suggested, helping, for example to make it a rule that employers include in their application forms the EngD qualification (de facto, HR people would become aware of the EngD).

EPSRC could put pressure on the Engineering Institutions (as it is an engineering doctorate) to encourage them to promote the EngD as a way of getting Chartered Engineer status.

• Partnership with other organisations should be encouraged

Seeking partnerships with other organisations that might be able to contribute funding is a possibility put forward suggested by Centre Directors. This would centre on groups in particular industry sectors, either because they are based in the region or because they represent particular industries, e.g. the chemicals industry or the aerospace sector.

According to Industry Supervisors, there is scope to improve the awareness of the EngD scheme both within industry generally but also even within sponsoring companies. Industry Supervisors had numerous suggestions for raising the profile, many mirroring those made by REs and Academics, including word of mouth, direct to undergraduates, conferences and the use of successful students/REs as champions. The natural places for the Scheme to be advertised is seen by industry to be in professional journals of the Institutions, e.g. IEE, Civil Engineering, IMechE, Royal Academy of Engineering, the Institute of Measurement and control, the British Computer Society. Industry called for a systematic and concerted direct marketing campaign targeted at relevant companies and HR departments who could then disseminate the information to the correct people.
For different motives, some EngD Centres and Current REs are reluctant to promote the qualification more. Although it is becoming increasingly difficult to recruit suitable UK participants (because of accumulated first degree/Masters debts) there are at present sufficient numbers coming through to fill their nominal quotas (10 REs or in some cases fewer numbers). However this involves a lot of work in matching up students, research projects and industry sponsors. This pressure tends to limit in some departments the number of EngDs that they can supervise. Those Current REs reluctant to raise the awareness of the qualification fear a dilution in its ‘premium / exclusive’ image.

2.5.3 EPSRC Involvement in the EngD Scheme

REs report little or no contact with EPSRC and have no knowledge of its role, except that EPSRC provides their money. Past REs just see the Council as the core administrator of the Scheme.

Academics report that they usually have few/regular contacts a year with EPSRC, with the annual EngD presentation and the EngD Directors’ meeting probably the main events. Much of this contact tends to relate to the administration of their programmes. Although generally satisfied with the links and contacts they have, Academics fear that the level of contact is changing and that most of the direct contact in future will be through the CTA.

Companies contacted in the main indicated that their contact with EPSRC has been minimal and so their knowledge of the role of the Council is limited to the funding of the Scheme.

Although some two thirds of REs and Academics rate EPSRC’s involvement in the EngD as “About right”, about one in five of the REs and 14% of all Academics think it is too “Low”. However, those Academics more closely involved, such as the Centre Directors, Co-ordinators and Managers, think that EPSRC’s involvement has got too light touch. Even among all other Academics the feeling is that EPSRC’s involvement has changed and is less now as a result of the introduction of CTAs.

The general view among companies contacted is that the level of involvement by EPSRC is “About right” (76%). Few believe it is too “Low” (16%). However, respondents often were unsure what they should expect of EPSRC, typically believing EPSRC’s role to be the source of funding.

2.5.4 EPSRC’s role

REs who rated EPSRC’s involvement as too low would welcome more guidance, networking support and more EPSRC EngD workshops to enable students from across the institutions to come together and benefit from shared experiences.

Among all Academics there is a belief that there is scope for EPSRC to play a greater role, including:

- A promotional/advertising role

EPSRC should do more on the marketing side to increase awareness of the EngD:

- As a monitor of the quality of the programme

Via rolling visits to EngD centres, EPSRC would thus not lose the strategic overview and eliminate the risk that all EngDs become more uniform in approach, rather than distinct Centres of excellence for specific topics.

- Raising the overall level of involvement

EPSRC should be represented at all EngD Directors'/ Management Committee meetings. EPSRC might like to encourage EngD Centre Directors to sit on other EngD Centre Management Committees, thus fostering the sharing of best practice. A better network of EngD Centre Directors might be the way forward.

- Enable overseas students to come onto the EngD programme
Industry Supervisors generally indicated that they are not aware of EPSRC playing any co-ordinating role or any role in bringing parties together but this is something they could help with. They also believe that EPSRC should be promoting the EngD to the trade and professional bodies.

Industry expressed the wish that EPSRC might play a role in terms of more creative and imaginative lobbying on what science does, certainly promoting the EngD more widely but also industrial research in particular.

Some companies assume and expect that EPSRC plays a role in monitoring the universities running the scheme. There is some expectation that EPSRC will ensure that they maintain the quality that was expected in terms of research output and in terms of development of students. Respondents from industry consider that it is very important to ensure that the quality of candidate is maintained to protect the ‘Brand’ in the longer term.

2.5.5 Impact of the CTA on the delivery of the EngD Scheme

Strong views were expressed by both Centre Directors and some Academic Supervisors specifically on the CTAs’ impact on the delivery of the EngD. EngD Centre Directors believe that EPSRC has given universities, through the CTAs, the freedom to manage collaborative funds and balance different activities. However, although EPSRC may wish to be more closely associated with the EngD, in their view, it no longer has the power to do so. It was widely perceived that in many universities the money would be stripped out and used for other purposes. They believe what they predicted has happened in some cases.

Positive aspects of the CTA, mentioned by Centre Directors, include:

- **The timing of RE recruitment and future new Centres**

  The scheme has had the positive effect of allowing Centres to wait for and seek the best students rather than having to take them on some kind of arbitrary time scale. Flexibility of funding from EPSRC is a good thing in principle. Through the CTA system each University can decide what they want the money for, making it easier to set up Centres than before.

- **The CTA budget allows for creativity in increasing funding sources**

  Centre Directors are looking to get best value out of the CTA since it gives them the flexibility to develop a business model which can seek support from other areas they want to explore including public/private arrangements, best contribution from companies and increased sources of funding. As Centres try and increase the amount they get from industry, some spend the EPSRC funding more thinly, in order to get more students (paralleling the way they try and generate PhD students/funding).

  However, Centre Directors believe that the CTA scheme has affected the delivery of the EngD, not least by putting a distance between them and EPSRC, which in turn has meant an erosion of a number of fundamental precepts which have underpinned the success of the EngD Scheme, including:

- **The loss of strategic role by EPSRC**

  Centre Directors believe that EPSRC has now lost that grip which they had on the EngD and as a result it is not strategically looking at what the national need is, effectively telling universities that they can do what they like. At a strategic level EPSRC need to be steering in areas of need they see – using mechanisms such as TOP and UP and the committee structure, as well as the fact that EPSRC is plugged into government.
• The need to ring fence EngD funds within CTAs

While flexibility is good, if left completely open, like EPSRC have done, then Centre Directors find themselves having to bid every year for placements. In addition there is a clash between taught courses, like the MSc on the one hand, and a research degree like the EngD; that funding coming to them through the CTA has been pared back; and that they are having to provide their own resources to run the Centres. EPSRC should convey that general sense of what it sees is the proper delivery of the EngD. The Council could suggest that when it comes to assess the CTAs/EngD Centres, it would be worried if EngD Directors point to problems in the area of funding being diverted away from EngDs.

• EPSRC needs to clear up a number of creeping inconsistencies

(a) Centre Directors feel quite strongly that the EngD should not be based on campus but is a qualification that is with industry and it is based on transferring knowledge to industry. The agreed best practice guidelines came up with the 50-75 (time in industry) as a compromise. However, 50 per cent is considered an absolute minimum and they believe that EPSRC ought to get involved in raising that to a much higher level. If a company does not have the facilities they should not be running an EngD, but should be doing a PhD.

(b) The concept of what is meant by “Collaborative” also needs clarification, Centre Directors believing that at present it is open to interpretation and does not have much meaning.

(c) Centre Directors are looking for guidance on what industry’s contribution should be – e.g. their understanding is that some students, in some Centres, do not receive any industrial contribution.

(d) Another area of inconsistency between the way EngD Centres operate is in the requirement that is made for REs to write a thesis. The reason Centres originally envisaged the single thesis approach is because they wanted no argument that the EngD is a better qualification than a PhD.

To achieve these changes, a number of suggestions have been made that would help raise EPSRC’s profile and protect the status of the EngD qualification:

• EPSRC need to appoint a dedicated Manager for the EngD Scheme to drive the strategy, provide consistency, advice and guidance

Centre Directors think the key change would be to have a dedicated EngD Programme Manager - an identified champion at EPSRC who can influence what is going on. There should also be actual and active EPSRC representation on each Management Committee

• EPSRC ought to reaffirm the original aims of the best practice guidelines

The best practice guidelines are seen as a very good touchstone. Academics stress that these guidelines should be reaffirmed by EPSRC as being at the core of the EngD.

• EPSRC should encourage revision of the original ethos of the Centres

Some EngD Directors would like EPSRC to encourage Centres to undertake the serious re-visiting of the ethos of the programme itself and its structure on at least a 5 year basis, in order to justify their reinvention.

• Protect the EngD brand

Centre Directors are concerned that efforts to build up a perception of a product – particularly amongst industry – is being undermined. They believe that EPSRC is best placed in having the overview of the programme, which the Centres do not have. There is concern that the Centres may not all be sending out the same message and even possibly sending out different messages. EPSRC can best mediate these messages. EPSRC should also “discourage” those universities offering an Engineering Doctorate (EngD) which is not based on the guidelines agreed by all Centres and EPSRC.
2.5.6 Extent to Which the EngD Scheme Delivers on Aims

62% of Past REs, 74% of Current REs and nearly two-thirds of Academics believe the EngD scheme helps to deliver on Government aims of encouraging innovation and making Britain more high tech. Overall 58% of companies think the EngD delivers on Government aims.

To REs the EngD does so since it steers Doctorate level research more in an applied direction with more practical outcomes (including published papers and patents), it prepares industrial researchers more appropriately and companies to engage more with fundamental research in Universities.

Academics feel the EngD is hugely significant in underpinning the scientific base within industry. The EngD helps companies, in terms of training, but also in the ability to do long term research, transfer knowledge and innovation to an industrial environment. Academics believe that EngDocs are beginning to play a role in leading to interaction with Regional Development Authorities (RDAs).

Industry respondents believe that the EngD meets the Government aim insofar as the research is likely to be focused on an industry specific issue rather than being more academic or ‘blue sky’.

2.5.7 Future Outlook

As reported, most respondents expect demand for EngDs by industry to increase.

The majority of Centre Directors and Academics think that the EngD model could be transferred to other sciences, like Physics and Chemistry, and would like to see this happen. Due to the industrial element they think the Centres should be kept within engineering departments.

Although early days, there are signs that the EngD is beginning to successfully establish itself internationally. Most Centres are not aware of anything else equivalent to the EngD qualification, apart from the US and Germany models.

Warwick runs two programmes overseas – in Hong Kong and South Africa – which are not EPSRC funded. As of 2005, 13 REs from Hong Kong and 2 REs from South Africa have completed the EngD; while the programme currently has 12 REs in Hong Kong spread over the 4 years and 15 in South Africa. Cranfield have been running an EngD Scheme in conjunction with SIMTEC (the Singapore Institute of Management & Technology) attracting 5 Singapore REs in the UK (and a 6th next year). In addition, the Thai Chamber of Commerce, sponsor a Thai RE to stay at Cranfield for the 4 years. At Cranfield, these foreign students are charged £52,000.

The picture across the other EngD Centres shows that in a typical year they may have one or two ‘foreign’ students, usually from the EU. All Centres report significant interest from EU candidates and would like to take on more if they could.

A number of possible key constraints to the future growth of EngD Centres have been identified by REs, including the lack of awareness of what is involved, of the benefits to all parties involved and appreciation of the potential for significant progress.

Other, industry, constraints mentioned by REs include:

- the further decline of British industry and thus possible decline in sponsor companies
- the debate surrounding IP
- the need to minimise industry drop-out by ensuring real buy-in to the programme in the first place
- access to suitable candidates
- tight financial budgets among potential industry sponsors
- the need for rapid research turnaround in industry, versus slower turnaround in academia
- funding available to REs and higher cost to the sponsoring company
Academics see as the main challenge to the future of EngD Centres not so much the intellectual side of things, but the need to define exactly what the top level goal is and how universities can deliver it in a way that is cost effective. So to Academics the key constraint for future growth is:

- **Financing the Scheme**

The EngD is expensive to deliver - it costs some £80,000 per student to EPSRC and industry – making it hard to achieve Parnaby’s goal to create a new engineering degree fit for industry. Academics believe that EPSRC could not envisage quadrupling the number of EngDs places they support without destroying responsive mode research for large areas of engineering.

Other future constraining factors singled out by Academics relate to:

- **Industry funding**

Industry appears to be quite happy to pay their relatively small contribution, but when it comes to serious money they are, often, unable to deliver. Future funding from companies may become an issue. Centres are actively raising the share contributed by companies but there is a feeling that they are reaching the limit of what they can squeeze out of sponsors. Without EPSRC providing the core funding most Centres would have great difficulties delivering the EngD.

- **Finding suitable sponsor companies**

There is a limited number of relevant companies that can be brought in the Scheme - large companies are more likely to be undertaking ongoing research and thus provide repeat projects. SMEs are more likely to be one off (adding to the admin and efforts of Centres)

- **Managing the conflict between research and taught courses**

A balance between research and taught course appears to be quite difficult to manage, with industry and REs not always seeing the benefit that they are getting from taught courses until later on during the course.

- **The CTA in some ways is an opportunity**

There needs to be a healthy mix of PhDs, Masters and EngDs in a department/university and the CTA sees to this (for Masters and EngDs). To some there is a risk that there are just too many EngDs.

- **Qualified staff**

The size of some Departments and the limited number of specialist academics (in some areas) act as potential constraints on the growth of EngDs. Some Departments are already working close to capacity in terms of being able to provide supervision. As a response, a number of Centres envisage future growth in the links between institutions – to form “consortia” or “partnerships” – providing the benefit of economies of scale, the filling in of academic gaps, the sharing of courses and widening the choice of taught modules to REs.

- **A huge challenge for the REs**

The EngD challenges REs both intellectually and physically.

- **Difficulties of recruitment good students**

According to Academics, it is generally more difficult to recruit good students than companies.

- **Rising student debt burden and the future supply of graduates**

Some Academics believe that, as a result of student debt, the supply of good UK graduates will drop by 80% to 90% and that EPSRC will need to think seriously about this issue.
Companies are generally positive about the future potential for them to be involved in the EngD but much depends on their having a suitable project and of course on budget constraints. Industry Supervisors regard as potential barriers to future growth, the following:

- Companies with time and money to get involved
- The number of suitable problems available
- Budgets within industry
- Increasing emphasis on short-term objectives

Most industry respondents indicated that there is a natural limit to the number of students they might wish to have at any one time, depending on the issues or projects which might be of longer duration. One of the limitations is the need to take a longer term view of projects than they might otherwise wish to. It is not only the project which has a long term outlook but the 4 years is perceived to be a long terms cost commitment also.

Industry views of constraints for future students include the logistics problem of the base university not always being located close to the company location and the difficulties encountered in travelling between the two. It was also suggested by industry that the RE needs to have a long term perspective and need to consider very carefully whether they want to be in the same place for 4+ years, and are prepared to put in an enormous amount of additional personal time. Companies frequently made reference to the intense demands on the student when trying to meet the needs of the ‘day job’ and to progress the academic research.

2.5.8 Success of the EngD Scheme

Around 90% of Past and Current REs, Academics and Industry Supervisors give a resounding thumbs up when asked the extent of the success of the scheme, saying that it was “Very successful” / “Quite successful”.

This strong endorsement of the EngD was coloured by the REs own past experience and the assumption that it had been equally successful for other students at other Centres. Overwhelmingly, Past REs felt the success of the scheme centred on a number of elements, in particular the scope of finding a permanent job. Past REs feel that others who graduated from their cohort went into employment in the field they wanted. The success of the EngD is also measured in personal terms: their pay, job progression, the advantage of the EngD experience in normal working life and the development of managerial skills.

Other indicators of success mentioned by REs include the opportunity for networking, the academic endorsement of research and the raising of the profile of their sponsor company. Finally, the articles, conference presentations and papers that they had to publish and the opportunity to develop patents all point to the success of the qualification.

Academics similarly believe that there are a number of ways in which the scheme’s success should be judged, including:

- Statistics of what the REs go on to achieve after the EngD

Over a longer period of time and by tracking career paths of graduating students (employment statistics and career progression) the data would clearly show the success of the Scheme.
Other statistics pointing to the success of the EngD scheme include:

- a) The number of companies. Increased participation of industrial sponsors in the scheme, repeat business from companies.
- b) The number of REs involved in the scheme and whether it has attracted more UK students to study at advanced level.
- c) Success rates on completion – degrees awarded.
- d) Number of good applicants compared to number of offers from companies.
- e) First appointments in industry / destination of REs and subsequent promotion. Employment levels achieved in companies with other higher degrees.
- f) Published output, papers, international conference presentations, articles, patents.
- g) Development of long term industry - university collaborative research.
- h) Changes in industrial practice and whether the EngD has encouraged industry R & D and the industrial development of ideas and by the number of successful projects where technology has been transferred and is used in industry.
- i) Further research development (by university or sponsoring company) based on EngD projects.
- j) Feedback from REs and companies / employers (e.g. peer assessment from industry leaders).

Academics point, as evidence of the success, to the fact that the EngD is still working and they are in discussions with companies for projects starting in the future. Ultimately, they believe that if Parnaby had got it right, in 20 or 30 years time we should see people in engineering doing EngDs instead of PhDs.

Industry Supervisors mention the fact that the benefits gained from projects have been incorporated into the fabric of ongoing work and have had lasting benefit; as well as positive internal feedback on the work carried out by the REs.

Success, according to industry, should be judged by the number and quality of researchers recruited into industry. Products and patents were frequently cited as useful indicators. Companies themselves may judge by whether they get the necessary R&D completed. In addition the fact that they have taken on the RE as an employee or the fact that they have chosen to sponsor another EngD is an indicator of the success of the scheme. They also welcome publications or participation at conferences in raising the profile of the company.
2.6 Recommendations

Overall Conclusions

REs believe that EPSRC could do more in terms of

- promotion of the EngD
- raising the profile of the Scheme
- open days
- organise an EngD student of the year event
- have thematic conferences to bring EngDs together from all other centres that share a similar theme
- making companies aware. Canvas among EPSRC industry contacts / referees etc

The lack of qualified engineering graduates is the core problem perceived by industry; while to Universities attracting the right number of graduate students is becoming increasingly an issue. This often means that ability to fill places is variable from year to year. This gap could be filled by overseas applicants.

Raise the “esprit de corps” of the “EngD” among REs and Industry. While REs do mix with other post graduates in some Centres they only see other REs when doing modules.

EPSRC should be more involved, e.g. by attending the Annual Showcase put up by the Centres. There is perceived to be possible scope for more steering. There is potential for sharing from experience - best practice.

Guidelines to be brought up to date to reflect 13 years of EngD experience. For example:

- some uncertainty exists on the awarding of the MRes (some did and no longer do so, some use the MRes as an exit qualification)
- whether there is scope to award an MBA as some REs feel that they are short of a few modules to complete.
- The exact requirement in providing taught modules, as some Centres and REs see some modules as not being relevant

Improvements to the EngD Scheme

A significant number of respondents do not think there is anything they would (fundamentally) change in the current EngD Scheme.

Suggested improvements from REs (Past and Current) include:

- **Raise the profile across the board!**

Raise the academic profile of the EngD, more publicity, higher government and industry profile. An annual promotional event would be a good thing - an EngD Conference where the “best papers” (selected from a review process) would be presented to an industry and academic audience are suggested examples.

- **More networking among REs**

A network between the students (and Alumni) of the various Centres (with an annual meet up) would be of benefit to the REs
• **Strong views on the courses & when they should be taken**

This topic attracted a significant number of comments from REs including the view that some modules are seen as not being relevant; the need to standardise the number of taught modules that are required to be attended and a possible reduction in the taught element.

• **Incorporate an MBA**

Many REs wonder whether there could be scope to get the qualification – an option to upgrade the Management aspects to a full MBA, as often they are only a few modules short of an MBA.

• **More interaction with Professional Institutions**

REs would like to see better links with Professional Institutions and recognition of the qualification for continued professional development and acquiring CEng status.

• **Provide a broader range of course options**

Provide the option of doing courses in other Centres, allowing REs to select courses more relevant to their long term career aims.

• **Provide guidelines / framework on what is expected**

There is a need to set up guidelines/uniformity from EPSRC for the process (and outputs) involved towards getting the qualification; a framework which would make it is easier to see over the course of the EngD whereabouts the RE should be; and more solid guidelines surrounding the IP issue.

• **Make the EngD conference national instead of University based**

It was suggested that one way to encourage networking and to raise the profile of the EngD in Industry would be to run EngD conference on a country-wide basis.

Amongst Academics the more frequently made suggestions include:

• **Better marketing / promotion of the scheme**

Higher profile to help recruit students and sponsors.

• **More networking for REs**

A professional networking club for EngD Alumni – to keep in touch and be able to contact others from elsewhere.

• **Encourage foreign students**

The (future) shortage of prospective British students to take up the Scheme could be addressed by opening it up to international students. It is suggested that EPSRC might want to think about the rules regarding who is eligible to qualify for certain types of funding. This will assist in ensuring that the quality of EngD remains high or improves and gives UK engineering science greater visibility within the EU.

• **Revisit elements of the taught component**

Academic Supervisors, like REs, are also looking at the possibility of reducing the taught component or introduce more flexibility in the taught elements and extend the research project by the corresponding amount.
• **Protect the brand**

Different practices in the different EngDs on aspect as fundamental as time to complete and so on, means that best practice guidelines should be re-stated and adopted.

A significant number of Academics are concerned that universities are able to offer an EngD (a three year degree) which is not funded by EPSRC. Although this is seen to a large degree as a positive – the negative is that the Universities in question do not play by the same rules that all other Centres have to abide by.

• **Better guidelines**

Some Academics are looking for greater understanding of what is required in the final thesis.

• **Look at time scales**

Some Academics want the adoption of less rigorous time scales. Others are looking to ensure flexibility in timing of taught parts of the programme, so industrial partners can play a role in phasing the project and management elements to match their needs. Others still would like to reduce the length of the course to 3 years, to make it more industry friendly.

• **Maintain the distinctive strategic subject areas**

Those Academics who have sat on various committees in recent years, that have been looking at separate EngD calls, think the way EPSRC have gone about it is very sensible. There is the need, they believe, to tell the community occasionally that being invited to bid is not a done deal.

• **Encourage and ensure greater inter-University collaboration among the Centres**

Industrial partners (and UK plc) could profit from pockets of academic excellence around the country. Encouraging greater collaboration should be formally built into the Scheme and in the way that Collaborative Training Account grant applications are actually made.

• **Look at all funding aspects**

What Academics suggest is that universities should be prevented from exercising cuts over EngDs now that they are part of CTAs. Some would like to see the funding of innovative work at higher percentage from EPSRC, others would like to see a reduction of EPSRC contribution if industry control / aims remain a major driver or increase EPSRC contribution and ensure more academic control directed towards blue sky research.

Industry sponsors also point to many inconsistencies in the administration of the EngD scheme, such that some improvements that were called for are in fact standard practice in some places. Companies themselves have an impression that the structures and planning seem to be too ad hoc. There is clearly room for clearer guidelines and sharing of best practice while allowing for some tailoring by the individual Centres.

Key suggestions for improvements made by industry include:

• **Timing of courses**

Industry finds difficult to match the timing of the courses with company needs. It was suggested that these would be better taken upfront so that the RE has all the tools that he needs from the onset (and the interruption element would be reduced)
• **Review Course options**

EPSRC should publish a list of all taught modules available (in all Centres), then REs can choose and tailor their courses

• **Make courses voluntary**

There were many comments from industry about the course requirements and the need to take exams.

• **Reduce conflicts of interest**

There is tension between the formal academic objectives of doing a good thesis and the fire-fighting environment in industry.

• **Better Communications**

Respondents in industry suggested that there is scope to improve understanding of expectations and communications generally between the university and the company.

• **Sort out the IP**

The time and effort incurred in coming to agreement on IP issues is of great concern to companies and in some cases took 18 months or longer to sort out.

• **Clarity from the beginning**

It was suggested that a handbook setting out the ‘rules of the game’ as it were, would be useful to have.

• **Travel Time**

Companies are acutely aware of how much management time is absorbed in supervising the EngD and so it would be appreciated if the academics could visit them at the company more often than they going to the university. It appears there are constraints on this at present since the academics do not always have travel budget.

• **Time spent at sponsor company**

The area in which expectations are least well fulfilled for companies is in terms of how much time the RE spends at the company. Companies expressed disappointment at how much time the RE was away/

• **Scrutinise the sponsor company thoroughly**

Industry respondents repeatedly stressed that 4 years can be a long time in industry and the financial viability of the sponsoring company must be determined over the entire period of the doctorate. Some contingencies need to be in place if company circumstances change.

• **Ensure quality of new recruits**

The majority of companies have had a good experience in sponsoring EngDs but some that have had a number of REs have experienced variable quality. This can be down to a number of factors including the project, the company itself, the supervision or the RE but many respondents expressed concern that the quality of RE must be maintained.
APPENDIX 1: SAMPLE BREAKDOWN

Four key stakeholder groups were identified and interviewed for the Survey:

1) Current REs 90 Current REs were interviewed at EngD Centres
2) Past REs 30 Past REs were telephone interviewed
3) Industry 10 personal interviews were conducted with industry, as well as 82 telephone interviews
4) Academics 44 Academics, including all Centre Directors and selected Academic Supervisors were interviewed at the EngD Centres

Self-complete questionnaires were returned by 485 respondents from across all four groups of stakeholders. With the addition of 55 industry telephone questionnaires, 540 questionnaires in total were data processed and analysed for the Survey. The 540 respondents break down as follows:

(1) Academics by EngD Centres (University)

The original 1992 pilot EngD Centres and those Centres with a longer pedigree each accounts for some 10% of Academic responses analysed from the total of 150 received – the overall breakdown of Academics by University, EngD Centre and the Centre’s first year of intake was as follows:

<table>
<thead>
<tr>
<th>University/EngD Centre / Year</th>
<th>No. of Respondents</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birmingham University – Materials / Formulation – 2001/02</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>Cranfield University – Aerospace, Manufacturing – 1993</td>
<td>19</td>
<td>13</td>
</tr>
<tr>
<td>Heriot-Watt/Strathclyde/St Andrews Universities – Photonics – 2001/02</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>ISLI – Edinburgh/Glasgow/Heriot-Watt/Strathclyde - Electronic System – 1999</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Loughborough University – Construction – 1999</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>University of Manchester - Manufacture, Process &amp; Product – 1992</td>
<td>14</td>
<td>9</td>
</tr>
<tr>
<td>Newcastle University - Power Electronics-2001/02</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Southampton University – Transport - 1999</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>Surrey / Brunel Universities – Environmental – 1993</td>
<td>9</td>
<td>6</td>
</tr>
<tr>
<td>University College London – Communications- 1999 / Bioprocess – 1999/ VEIV – 2001/02 / Environmental – 2004/05 / Molecular Modelling – 2004/05</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>University of Wales Swansea/Cardiff/ Bangor- Steel Technology – 1992</td>
<td>19</td>
<td>13</td>
</tr>
<tr>
<td>Warwick University – Manufacturing Systems – 1992</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>Not Stated</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>TOTAL</td>
<td>150</td>
<td>100</td>
</tr>
</tbody>
</table>
(2) Academics by year of involvement of the respondent with the EngD

Over a third of Academics who participated in the self complete survey say they became involved in the EngD over the 1992 to 1998 period – the overall Academics breakdown is shown below:

<table>
<thead>
<tr>
<th>Academics</th>
<th>No. of Respondents</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992 – 1998</td>
<td>50</td>
<td>33</td>
</tr>
<tr>
<td>1999 – 2001</td>
<td>38</td>
<td>25</td>
</tr>
<tr>
<td>2002 – 2005</td>
<td>55</td>
<td>37</td>
</tr>
<tr>
<td>Not stated</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>TOTAL</td>
<td>150</td>
<td>100</td>
</tr>
</tbody>
</table>

(3) Current REs and Past REs

Around one-third of the 125 Current REs who returned the questionnaires, are in their second or third year of their EngD. The overall profile of these respondents is as follows:

<table>
<thead>
<tr>
<th>Current REs</th>
<th>No. of Respondents</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>Year 2</td>
<td>41</td>
<td>33</td>
</tr>
<tr>
<td>Year 3</td>
<td>36</td>
<td>29</td>
</tr>
<tr>
<td>Year 4</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Not stated</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>125</td>
<td>100</td>
</tr>
</tbody>
</table>

Of the 130 Past REs who participated in the survey, 18% had graduated from the first two cohorts of 1992 and 1993, 20% had completed their EngD over the 1999 to 2001 period, 64% between 2002 and 2005.

<table>
<thead>
<tr>
<th>Past REs</th>
<th>No. of Respondents</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997 – 1998</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>1999 – 2001</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>2002 – 2005</td>
<td>64</td>
<td>49</td>
</tr>
<tr>
<td>Not stated</td>
<td>28</td>
<td>22</td>
</tr>
<tr>
<td>TOTAL</td>
<td>130</td>
<td>100</td>
</tr>
</tbody>
</table>
(4) All Current and Past REs with / without previous industry experience

Nearly two-thirds of Current and Past REs had previous industry experience before starting their EngD.

<table>
<thead>
<tr>
<th>No. of Respondents</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>REs with no industry experience</td>
<td>72</td>
</tr>
<tr>
<td>REs with industry experience</td>
<td>147</td>
</tr>
<tr>
<td>Not stated</td>
<td>6</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>225</strong></td>
</tr>
</tbody>
</table>

Amongst Past REs fewer (23%) had no industry experience prior to applying for the EngD compared to Current REs (39%). Over half of the Past REs had between 1 and 5 years industry experience compared to 38% among Current REs.

<table>
<thead>
<tr>
<th>No. of years industry experience</th>
<th>Current REs (%)</th>
<th>Past REs (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>39</td>
<td>23</td>
</tr>
<tr>
<td>1 to 5</td>
<td>38</td>
<td>54</td>
</tr>
<tr>
<td>6 to 10</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>Over 10</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Not stated</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

(5) All Current REs and Past REs by age group

Nearly half of all the 225 REs (Current and Past) who responded to the survey are aged 31 and over. The breakdown of all REs by age group was as follows:

<table>
<thead>
<tr>
<th>Age group</th>
<th>No. of All REs Respondents</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 – 25</td>
<td>52</td>
<td>28</td>
</tr>
<tr>
<td>26 – 30</td>
<td>48</td>
<td>26</td>
</tr>
<tr>
<td>31 – 40</td>
<td>74</td>
<td>40</td>
</tr>
<tr>
<td>41+</td>
<td>11</td>
<td>6</td>
</tr>
<tr>
<td><strong>Sub-total</strong></td>
<td><strong>185</strong></td>
<td><strong>100</strong></td>
</tr>
<tr>
<td>Not stated</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>225</strong></td>
<td></td>
</tr>
</tbody>
</table>
(6) Industry

Industry Supervisors were classified by the size of their company according to the DTI definition (Companies Act 1985 as amended by Statutory Instrument 2004/16). According to this a small company is one that has a turnover of not more than £5.6 million and not more than 50 employees. A medium-sized company has a turnover of not more than £22.8 million and not more than 250 employees.

XXX Check with latest TABS xxxx
Just over two-thirds of the 165 Industry Supervisors who took part in the survey work for large companies. However, nearly one in five work for small sponsoring companies.

XXXXXXXXXXXXXXXXX – numbers to be checked with latest TABS from John (3rd & final run)

<table>
<thead>
<tr>
<th>Industry</th>
<th>No. of Respondents</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Large</td>
<td>68</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>165</td>
<td>100</td>
</tr>
</tbody>
</table>

(7) Industry by year of involvement with the EngD

Nearly one in five of the Industry Supervisors became involved with the EngD over the 1992 to 1998 period, and an equal number became involved over the 1999 to 2001 period. The breakdown of Industry Supervisors xxxxxxxxxx (check numbers) was as follows:

<table>
<thead>
<tr>
<th>Industry</th>
<th>No. of Respondents</th>
<th>Per cent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992 – 1998</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>1999 – 2001</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>2002 – 2005</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>Not stated</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>165</td>
<td>100</td>
</tr>
</tbody>
</table>