National HE STEM Programme
Regional Action Plan

Unemployment of Engineering Graduates: the Key Issues

Final Report

This regional project is funded through the National HE STEM Programme under the *Employer Engagement, Workforce Development and Higher Level Skills* strand.

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Project findings

The findings in this report are based upon three distinct areas of fieldwork (see *Methodology* for more details):

1. Interviews with 66 graduates (2010 and 2011) from the above institutions who indicated that they were unemployed at the *Destinations of Leavers from HE* census point (six months after graduation).

2. Interviews with 12 graduates (2010 and 2011) from the above institutions who indicated that they were employed at the *Destinations of Leavers from HE* census point (six months after graduation).

3. Interviews with 19 engineering graduate employers drawn from both large companies and small/medium sized enterprises.

Overall, it is clear there is strong demand for engineering graduates in the UK with many employers expressing frustration at their inability to meet recruitment needs. At the same time, there appears to be great enthusiasm for an engineering career amongst recent graduates and, most interestingly, no major differences between the characteristics and behaviours of those graduates who are unemployed and those in graduate jobs six months after graduation except that the latter would seem to be better motivated and keener whilst at university to take the necessary action to move on successfully.

What is clear from this study is that there is no single reason for engineering graduates' being unemployed, there are steps that they can take, with the support of their university, to improve their chances of securing a graduate level engineering job soon after graduation. The project aims to draw out the actions for students (one unintended outcome of the research was a short guide aimed at students summarising the research findings from employers – see Appendix 3) and universities and to identify potential mechanisms for further improving interactions with employers.

More specifically, the following conclusions have been drawn:

1. Employers, particularly larger ones, express a clear preference for graduates with either an MEng (the four year course which generally requires upper second class performance) or a BEng plus MSc, regarding these qualifications as a fast route to chartered status. In some cases, employers have linked this requirement to the expansion of their apprenticeship intakes and want to see graduates as distinctively 'high fliers'. Graduates with these qualifications give themselves a distinct advantage therefore over those with the three-year BEng. Our findings, however, indicate that, whilst several unemployed graduates referred to their lack of an MEng as being responsible for some of their difficulties in the job market, over a third of this cohort nevertheless possessed this qualification.

2. There is sometimes an assumption that it is the graduates with the lower class degrees who tend to be unemployed. We did not find this in our study, with the unemployed having the full range of potential degree classes suggesting that the reasons for graduate unemployment are more complex than solely, or even mainly, academic attainment.

3. When unemployed graduates are asked what they wish they had done differently, many stress the need for students to begin their career planning and job seeking early, well before graduating. Employers reinforce this. Key skills in this context include time management, as many of the unemployed appear to have prioritised academic study over career activities

such as applying for jobs. Of those who were unemployed, nearly half made no applications during their final year, in contrast with the employed graduates, the vast majority of whom had done so.

4. There appears to be a strong correlation between graduates' work experience, particularly in engineering, and their employability. Employers rate the former highly and about two-thirds of the unemployed graduates either had unrelated experience or, in the case of about a quarter, none at all; all of the employed graduates had some work experience. All groups made this a major recommendation to current students.

5. Location of employment and mobility is a key issue for both unemployed graduates and employers. Whilst many employers, especially larger ones, stressed the need for mobility, about half of the unemployed graduates preferred to work in a more specific location, mainly in order to be closer to family and/or friends.

6. Most employers reported recruitment difficulties in certain disciplines. Smaller employers felt that they were competing not just with the larger employers (who put considerable resources into recruitment) but also with other sectors such as financial services. There is a case for considering the type of support structures available to smaller employers to help them develop positive relationships with universities for recruitment.

7. Students and graduates require effective communication skills, including the ability to articulate their attributes and competences in both applications and at interview, in order to be successful in the application process (and certainly to get through the 'initial sift'). These skills need to be inculcated at an early age and further developed within higher education with particular attention paid to the different skills required at different stages of the recruitment process.

8. Careers services are key players in any institutional strategy to improve engineering graduates' employability. Whilst the survey found much evidence of positive collaboration between careers services and both engineering departments and employers, and of overall graduate satisfaction with their services, there remains scope for earlier input into the curriculum targeted specifically at engineering students, and better publicity for the range of provision offered by careers services.

9. The research identified evidence of excellent practice within particular institutions, as evidenced by the recall and comments of graduates. The Add+Vantage and Respect programmes at Coventry and Birmingham respectively seem worthy of investigation as possible models for other institutions to consider developing.

10. Employers have identified the main reasons why they reject applicants during the recruitment process (see pages 38-45), and both unemployed and employed graduates have indicated both the areas where they most struggle and the areas that they felt universities could provide more help with. These findings have many implications for student support, advice and guidance that universities need to acknowledge and act on.

The main body of this report is in the following sections:

A. Project Background

Engineering employers say publicly at national level that they need more engineering graduates. Surveys by, for example, the Engineering Employers Federation, prove there is demand. So why is there an almost 13% unemployment rate for engineering (HESA data July 2010) with, in addition, a proportion of graduates employed in non-graduate level jobs? Whilst some disciplines have a higher unemployment rate (e.g. Computer Science 16.5%; Media/Communications 15.1 %), others, including STEM subjects, have a lower rate (e.g. Chemistry 9.2%; Maths 10.4%; Physics/Astronomy 11.8%). Employability has received a huge amount of attention but there is a distinct issue here about why some engineers do not get graduate level work within a short time of graduation.

To the best of our knowledge there has been no previous research focussed on interviewing unemployed engineering graduates. This study (which is based in Midlands Universities) goes beyond issues of employability (but includes them); for example, a graduate can be highly employable but want to live in a part of the country where few jobs are available. Each of the universities involved has identified the engineering graduates who graduated in the last three years and who were unemployed (or in a non-graduate level job) at the *Destinations of Leavers from HE* census date (about six months after graduation). A selection of these graduates has been interviewed to try to identify the key issues that may have impeded their employment at graduate level. Questions range from whether the graduate decided to put off looking for a graduate level job until after graduation (and therefore 'missed the boat'), through to academic and personal skills attributes, motivation and regional location.

In addition, employers have been interviewed to cross-validate the findings with graduates and interviews have taken place with graduates in graduate level employment to seek their views and identify why they felt they were successful. The findings have been reviewed to identify how universities can further improve what they do to help engineering students gain graduate level employment shortly after graduation.

B. Project Methodology

The project's uniqueness rested upon the intention to gather evidence directly from graduates themselves rather than to rely either on quantitative data or on the testimony of employers alone.

Each institution thus agreed to identify a cohort of graduates from amongst their 2010 graduating engineers who had indicated, at the *Destinations of Leavers from Higher Education* (DLHE) census point in January 2011, that they were unemployed. This census date was adopted as it was a common point of reference for all institutions and graduates' contact details would be reasonably current, although there were some concerns about its being too close to graduation. The total target number of unemployed graduates for the project was set at 80 with Aston, Birmingham, Coventry and Loughborough contributing 19 graduates each and Leicester (with a much smaller graduating cohort than its partners) making up the balance with four.

To provide a contrasting group, it was also decided to interview a smaller group of 2010 graduates (15 in total) who had identified themselves as being employed at the same DLHE census point. Each institution agreed to find three such graduates.

In the event, it proved very difficult to identify enough 2010 graduates willing to participate in the project (contact details quickly become outdated meaning graduates are hard to locate) so it was agreed that the survey would be extended to 2011 graduates who had responded to the DLHE survey in January 2012. The final numbers of graduates in the survey were 66 unemployed and 12 employed. All graduates in the survey were assured of their anonymity under data protection regulations and were given a £20 gift voucher in recognition of their time and contribution.

A Graduate Interview topic guide (see Appendix 1) was constructed and agreed by the partner institutions and used as the basis for the Graduate Interview Record (GIR) to record the interview outcomes and to ensure consistency in the data collected. Graduate interview guidelines were also produced, again to ensure consistency and to help interviewers deal with issues they might encounter. Graduates from both unemployed and employed cohorts were recruited through various appropriate channels including careers services and alumni relations offices. All graduates were contacted and interviewed, in most cases by telephone, between July 2011 and April 2012 and most of the interviews took between 30 and 45 minutes to complete. All the GIRs were then entered onto a central database for analysis.

The project partners agreed also to collect new data from engineering employers because existing employer data was either not specific to the engineering industry or did not address the particular questions we had identified. The intention was to interview 20 engineering companies, both large and small enterprises, which recruited graduates. Leicester agreed to conduct the majority of these (16), through the project consultant, with Aston, Birmingham, Coventry and Loughborough taking one each. In the event, only 19 employer interviews were completed although it was felt that this number was sufficient for the purposes of the study.

An Employer Interview topic guide (see Appendix 2) was constructed and agreed by the partner institutions and this was used as the basis for the Employer Interview Record (EIR) to record the interview outcomes. The employer interviews were conducted between July 2011 and February 2012; in the majority of cases the interviews were face-to-face but this was not always possible, owing to distance for example, so a small number were done over the telephone.

The project consultant also carried out a literature review covering a range of published material relating to the engineering industry and, in particular, the engineering graduate employment market and the views of employers and professional bodies.

In addition to the fieldwork, five meetings of the Project Steering Group took place in May 2011, September 2011, December 2011, February 2012, and April 2012 to keep the project on track and share emerging findings.

C. Executive Summary

1. Graduates' difficulties in the job market

Well over half the unemployed graduates cited external factors referring to one or a combination of the following: the state of the economy; lack of graduate opportunities; competition for jobs; and the number of graduates. A small group felt that employers' lengthy recruitment processes resulted in the inevitably delayed entry of graduates into employment.

Other graduates cited factors more within their control including: degree class or level (MEng/BEng); lateness in starting to apply for jobs; difficulties with the application process including applications, interviews and aptitude tests; and limitations on job choice or location. The biggest single reason cited by unemployed graduates in this respect, however, was their general lack of experience or work experience specifically. Nearly a third of unemployed graduates identified this as the main or a contributory reason for their difficulties, with many expressing regret that they had not taken up the option of a placement during their degree course.

A small number, by contrast, mentioned that they had found it easier than they anticipated or that there were plenty of jobs and they were confident about their ability to secure one before too long.

2. Academic Requirements

Of the unemployed graduates in the survey, 64% had a BEng degree, 35% an MEng (one graduate had a BSc). About 67% had a 1st or 2:1 degree with the vast majority of the remainder having gained a 2:2; only a handful had a 3rd. In comparison, a third of the employed graduates interviewed had an MEng, all but two had a 1st or 2:1, and none had below a 2:2.

In general, academic requirements were the key entry criteria with most employers seeking a 2:1; only a minority would accept below this level. Many also expressed a preference for the MEng, or BEng plus MSc, rather than the BEng level linked to the requirements of chartered status. For one employer this was partly due to a need to demonstrate the greater achievement of graduates relative to those recruited onto its apprenticeship programme. Some employers also filtered candidates on 'A' level scores (at about the 300 points level) with Maths, Physics and Chemistry commonly sought.

The proportions of unemployed graduates with MEng degrees and 1st/2:1s suggest that degree level and class alone cannot explain graduates' lack of success in the job market, although about a tenth of the unemployed graduates referred to their academic background as a factor hindering their employment prospects. There is a perception amongst University staff that it is those students with weaker degrees who are unemployed but the data here suggests this is not the case.

3. Work experience

A third of the unemployed graduates had been on a year's work placement as part of their courses. Whilst just under a half had had an unrelated part-time or vacation job, nearly a quarter had had no work experience at all, thus reducing their attractiveness to employers. When asked, just under a third blamed their difficulties in the job market partly on their lack of work experience. All the employed graduates had gained some work experience, three-quarters in a related field.

Employers valued graduates with work experience as this demonstrated their motivation, interest, understanding and commercial awareness. Some employers insisted on applicants having work experience in engineering whilst others felt that any type of work experience was useful as it provided graduates with an insight into work place values and practices.

4. Extra-curricular activities
Whilst just under a half of unemployed graduates had become involved in Students' Union activities, only about a third had participated in other voluntary activities, and many had not been involved in either. A small number had taken on responsible roles with clubs and societies but many maintained that concentration on their academic work prevented this. Slightly higher proportions of employed graduates had taken part in such activities and a couple referred to the value of this in job/placement interviews.

Generally, employers regarded extra-curricular activities, such as students' union activities and volunteering, as valuable evidence of graduates' wider *'perspective'*, '*get up and go'* or *'something extra'*, linked to their overall motivation. Such experience also provided the chance for graduates to learn new skills such as *'leadership'* and *'teamwork'*. Whilst most employers agreed that these did not carry the same weight as either academic qualifications or work experience, some gave more credit for other activities based on an interest in engineering such as car mechanics.

5. Location and mobility
About half of the unemployed graduates expressed a strong desire to remain within a particular location with the remainder considering any locations (albeit with some preferences). Employed graduates were slightly more willing to consider any location, although many still had preferences.

For larger employers, either on several sites or operating internationally, graduates' mobility was important, especially for those selected for more explicit leadership roles. A few larger employers were willing to be more accommodating, however, whilst, for smaller employers typically based in one location, mobility was less important.

6. Skills shortages
There was a fair degree of consensus amongst employers about the kind of skills that they sought from new graduates. In general, these included: leadership; teamworking; communication and interpersonal skills; analysis/problem-solving; creativity/innovation; planning and organising; business understanding/commercial awareness; and performance.

Whilst most employers were satisfied with the quantity of applicants, they would have preferred better quality from which to select. Vacancies often remained unfilled owing to a lack of suitable candidates. This was particularly the case with electronic and electrical engineering graduates, although some employers had identified other shortfalls and many referred to the perennial problem of recruiting women engineers. Many employers also felt that good graduates were attracted to better paid jobs elsewhere, for example in the financial services sector.

Many employers stated that often graduates lacked the ability to apply their technical skills and knowledge in a business or workplace context, describing this as, not just the ability to recall engineering principles and techniques, important though this was, but also an almost innate feel for how these could be applied to a particular problem. This factor was regarded as being related to whether or not graduates had significant work experience, and not particularly connected to degree class.

7. Application process
Nearly half the unemployed graduates had made no applications whilst at university, with those that had making typically fewer than 10 applications. After graduation, their application activity increased hugely. Just under a third of graduates had had at least one interview before graduating and over two-thirds since, whilst only a few had reached an assessment centre before graduation and just

under a third since. Almost all of the employed graduates had made applications before or during their final year, although not huge numbers of these (up to 30), and two-thirds had attended assessment centres before graduating.

The majority of employers started their recruitment process in September/October with closing dates in December/January; many felt that this enabled them to catch good graduates applying early. Most placed vacancies on university websites usually via careers services but occasionally directly with departments. In general most (and, in particular, the larger employers) used a three-stage process: first stage - application form (usually online); second stage - telephone interview and psychometric tests; third stage - assessment centre/final interview. Smaller employers departed from this model when it suited their needs to shorten the process. The majority of candidates were rejected at the first stage with those applicants getting to the third stage having a strong chance of being selected.

8. Graduates' difficulties with application process

Over half the unemployed graduates reported that their biggest areas of difficulty in the application process were:

- completing application forms especially the competence-based questions; and
- handling interviews (again, particularly competence-based interviews).

Small numbers also referred to aptitude tests, finding out about vacancies, and selling themselves. Several found the whole online application process repetitive, making it difficult to give fresh responses, whilst others commented that it was very cold and impersonal and complained of the lack of response from employers. Whilst over half of employed graduates reported encountering no difficulties in the application process, the comments from some reinforced those of their unemployed counterparts.

To place the above into context, at the first stage (when most are rejected) the commonest reasons cited by employers for rejecting applicants were as follows:

- Poor spelling, grammar and punctuation
- Poor responses to 'competence' based questions
- Cutting and pasting material from companies' own websites
- Graduates not selling themselves on the application form
- Not showing enough knowledge or understanding of the post or company.

At the second stage, reasons included:

- Failure to live up to the impression created by the application form, or not being able to substantiate this with evidence
- Graduates' inability to sell themselves through lack of enthusiasm or brevity of responses.

At the final stage, reasons included:

- *Group discussions*: poor or inappropriate contributions, for example being either too quiet or too dominant
- *Presentations*: inadequate preparation; ignoring evidence or failure to grasp the key issues; confusing content with clarity; or running over time
- *Interviews*: poor interview technique or presentation; lack of research into company; low confidence leading to an inability to sell themselves effectively; lack of commercial awareness; limited grasp of the importance of teamwork and communication skills in a business environment; an inability to apply basic engineering principles and techniques to everyday work situations and problems.

9. Careers input into courses and employers' links with institutions

Nearly a third of the unemployed graduates recalled no or little specific careers input within their courses, although many referred to the importance of understanding employers and the graduate job market and felt that this, along with placement advice and CV/application/interview support, were the main areas in which universities could improve their provision for students. A minority also felt that making careers elements compulsory within the curriculum, and possibly assessed, would ensure that more students took them seriously. Some also commented that placing the majority of this input into the final year was a case of 'too little, too late' and conflicted with the pressure of academic work. Slightly more employed graduates were able to recall careers inputs whilst some echoed the call for more at an earlier stage.

Most of the large employers in the survey had links with a small number of institutions, normally through the careers service, and some maintained a presence at a considerable number. Employers' choice of institution was often based on a combination of geography and a judgement of where they might find the best graduates, linked to course discipline, ratings of departments, and past success in recruiting graduates. Careers fairs were the commonest activity on campus with presentations and workshops also prevalent.

Significantly, many employers were trying to link more closely with engineering departments in order to reach students directly, and to do this from an early stage in students' university careers rather than towards the end. Similarly, they were interested in working more closely with both careers services and students unions in providing skills sessions to students in order to improve their employability. Although several of the employers interviewed said that they were also involved with institutions in other ways, through research agreements or curriculum development, in general it was rare that such relationships had any bearing on, or connection with, the company's recruitment needs.

10. Use of institutional careers services

Most of the unemployed graduates had used their careers services whilst studying although it is not clear that all completely understood the full range of services available to them; about a quarter had not used the service at all. Most of these users had found the service helpful, although, echoing employers, a few expressed concerns about its generic nature and the lack of specialised advice. Many now expressed some regret that they had not used the careers service more whilst at university whilst some were continuing to take advantage of their provision for graduates and alumni. The experience of employed graduates was similar where the opportunity to meet employers and CV advice were highlighted as key elements of provision.

Employers generally used careers services as their main contact point within institutions and this relationship worked well, particularly where careers services had a dedicated employer liaison team. Employers gave examples of effective and proactive collaborations with careers services in the interests of students and employers alike and it was clear that a true partnership approach worked well for all parties. Some employers pointed to possible weaknesses in some careers services, however, owing to their lack of resources or a limited understanding of the engineering industry.

11. Advice for institutions

Both unemployed and employed graduates felt that they would have benefited from:

- Better placement advice (why these were useful and how to secure them)
- CV/application/interview/assessment centre guidance tailored to engineering students
- Employer contacts and networks and advice on vacancy sources
- More careers activities provided on a timetabled basis within the curriculum

- More publicity about, and resources for, the careers service.

Employers' views on this fell into the following main categories:

- Developing curricula to better reflect the realities of an engineering career
- Helping students understand the practical application of engineering theory in solving the types of problems that engineers in industry often faced
- Increasing students' understanding of careers and the major employers in engineering through talks, visits etc.
- Developing students' understanding of the recruitment process and how to negotiate this successfully and sell themselves effectively.

12. Advice for students

There was considerable commonality between the advice from employers and graduates to current students. Unemployed graduates suggested that current students should:

- Get some relevant work experience for both its intrinsic benefits and the employer contacts
- Start thinking early about careers and making applications in the final year
- Use all the support provided by the institution especially the careers service
- Develop skills through volunteering, the Students' Union and other extra-curricular activities and ensure that applications and CVs are tailored to employers and sell skills and experience effectively
- Get as good a degree as possible and an MEng if possible
- Be persistent, resilient and flexible within the current economic climate and graduate job market.

Employed graduates, in addition to many of the above, suggested that students:

- Apply widely to employers without being restricted as to location
- Practise application form questions and research employers before interviews
- Attend all lectures, take proper notes and revise effectively.

Employers advised current students to:

- Get some relevant work experience
- Stand out from the crowd by participating in extra-curricular activities
- Take advantage of all opportunities offered by institutions especially those provided through the careers service
- Research employers properly before applying and be positive about their achievements and skills.

D. Report on Unemployed Graduate Interviews

1. Demographic breakdown of unemployed graduates surveyed

Total: 66 graduates in total (46 graduated in 2010; 18 graduated in 2011; 2 unknown)

Degree discipline:

Discipline	BSc	B Eng	M Eng	Total
Aerospace	0	4	0	4
Automotive	0	5	0	5
Biomedical	0	0	1	1
Chemical	0	5	7	12
Civil	0	7	9	16
Computer Systems	0	1	0	1
Electronic/ electrical	0	4	2	6
Manufacturing	0	2	0	2
Materials	0	2	0	2
Mechanical	0	8	3	11
Motor Sport	0	4	0	4
Product Design	0	0	1	1
Sports Technology	1	0	0	1
Total	**1**	**42**	**23**	**66**

The research was not intended to be representative of UK engineering higher education, so the sample of unemployed graduates interviewed was not weighted in line with the proportions of graduates from different disciplines amongst the UK graduate population generally. Data from the Engineering UK report *Engineering UK 2011: the state of engineering,* based on the 2008-09 graduating cohort (divided into seven sub-disciplines), however, suggests that the above sample is over-representative of the proportion of chemical engineering graduates (18% in the study sample compared with 4% generally) and under-representative of that of electronic/electrical engineering graduates (9% compared with 19%), with civil engineering (24% compared with 18%) and mechanical engineering (17% compared with 20%) more evenly balanced.

Degree class:

1st	2:1	2:2	3rd	Unknown
11 (17%)	33 (50%)	18 (27%)	3 (5%)	1

Data from the Higher Education Statistics Agency (HESA) based on 2010-11 graduates indicate that 22% of first degree engineering graduates obtained a 1st class degree, 39% a 2:1, 25% a 2:2 and 8% a 3rd. Amongst the unemployed graduates in the study, a slightly smaller proportion had a 1st class degree but a larger proportion graduated with a 2:1. Proportions of those with 2:2s and 3rds were very similar to the national data.

Gender:

Male	Female	Unknown
52 (78%)	12 (18%)	2

The Engineering UK report *Engineering UK 2011: the state of engineering* indicates that about 9.7% of 2008-09 engineering graduates were female. The unemployed graduates in the study, therefore,

included a higher proportion of female graduates than might be expected although further research would be required before deducing from this that female engineering graduates encounter more hurdles in their job seeking; it is possible, for example, that female graduates were more disposed to participate in the study.

Ethnicity (self-reported):

Asian	1	British Asian	4	Mixed race	1
Black African	7	British Indian	1	Nigerian	1
Black British	1	British Pakistani	1	White	2
Black British/Caribbean	1	Chinese	3	White British	31
British	1	Indian	1	White Irish	1
British African	1	Iranian	1	Unknown	7

The above data were self-reported so it is difficult to compare this picture with the proportions recorded across the UK generally. The Engineering UK report *Engineering UK 2011: the state of engineering*, however, indicates that in 2008-09, 76% of first degree graduates across all disciplines were White, compared with 53% (combining the British, White, White British and White Irish categories) of the unemployed graduates in the study. Again, it would be unwise to draw hard and fast conclusions from this difference without conducting further research.

Current age:

20-21	2
22-24	44
25-30	11
Over 30	5
Unknown	4

2. Current employment circumstances

Whilst all the graduates were unemployed at the time of the DLHE survey (about six months after graduation), 15 had moved into graduate engineering posts by the time of the survey of various kinds including solutions engineering, consultancy, civil engineering, software engineering, production engineering, process engineering, metallurgy, and test engineering. Employers included Aecom, Laing O'Rourke, MOD, Jaguar Land Rover, Severn Trent and Turbine Controls. Four had decided to move into graduate roles outside engineering (secondary teaching, software, engineering recruitment and IT) and seven had moved onto further study (four at MSc level to improve their employment chances, two on PhDs and one on a PGCE chemistry teaching course). A further ten were employed in temporary or administrative posts (e.g. bar work, building society, travel money advice) or working in the family business, two were working on a voluntary basis, and one was travelling. Overall, 22 still appeared to be unemployed although this had not necessarily been continuously the case since graduation.

The unemployed graduates' current circumstances did not always do justice to the range of activities many had engaged in since graduating including: travelling; teaching English abroad; other voluntary work overseas; overseas and UK engineering internships; and helping to build the family home.

3. Main career aspirations including non-engineering and non-graduate jobs

Most of the unemployed graduates (48 including those now working in engineering) still aspired primarily to work in engineering, the majority in fields where their degree background would be relevant. Whilst most expressed a clear or exclusive preference for remaining within their subject

specialism, a small minority would consider any engineering post for which they felt they were qualified and had widened their job search accordingly. At the same time, about half of the graduates had, at some stage after leaving university, considered non-engineering employment but only about a fifth were actively pursuing such employment in, for example teaching, laboratory work, finance, investment banking, IT, administration, accountancy, retail/marketing, logistics, recruitment and the Civil Service, or, in some cases, anything at all. In most cases this was because they were having difficulty securing an engineering post and had decided that, in the interests of getting a job at all, they needed to extend their job choice. Only a small number had concluded that engineering was not a suitable career for them either for reasons to do with personal suitability or, in at least one case, because it was felt that engineers were not valued and worked long hours for poor salaries.

Two graduates (both female) mentioned the impact of their personal relationships on their career planning explaining that, in order to stay with their partners, they were going to have to take jobs outside engineering as such jobs were difficult to find in their local area.
About two-thirds of the unemployed graduates had considered applying for non-graduate employment or had done so. In most cases, this was seen as a forced choice owing to the competitive graduate job market and their need to earn money or get some experience (a 'stepping stone' to a graduate job). Those unemployed graduates who now aspired to non-engineering careers particularly felt that lower-level experience would be valuable to them. About a third of the graduates were adamant, however, that only graduate-level engineering employment would be appropriate to their graduate status and that, if they persevered, they would be successful.

4. Location preferred

Overall, nearly half the unemployed graduates would consider taking a job anywhere, including abroad, although this did not exclude their having specific preferences. About half expressed a strong desire to remain within a particular location (e.g. West and East Midlands, London and the south-east, Yorkshire) with the main reasons given for this choice being the desire to be close to family or friends. A small number indicated that they appreciated that this decision placed restrictions on their opportunities but were nevertheless happy to make this choice.

5. Starting salary preferred

Up to £15K	2
£16-19K	11
£20-24K	22
£25-29K	10
Above £30K	2
Flexible	19

It is possible that the difficulties encountered by the unemployed graduates in securing employment resulted in the significant number feeling that they needed to be flexible about salary; in fact, many of those citing a preferred salary level also indicated that they appreciated that they were in a 'buyers' market'. In the light of the average graduate salaries in the engineering industry, and those for the graduate job market as a whole, however, most of these preferences, with the possible exception of those holding out for more than £30K, do not appear over-ambitious. The starting salaries disclosed by the employers surveyed by the project revealed a range from £22K to £28.8K with a median of about £25K.

6. Size of employer preferred

Small	4
Large	25
Any	36

Well over a third of the unemployed graduates preferred to work for a larger company, in most cases because of their perceived wider opportunities, the potential for training, progression and travel, and their greater visibility in the graduate job market. Very few unemployed graduates wanted particularly to work for smaller employers, although some were attracted by the greater variety of the work or felt that the competition for entry might be less intense. Many indicated that they started by applying unsuccessfully to larger employers with well-publicised graduate schemes, and then turned to smaller employers. The clear majority, however, would consider employment with either regarding each as having different benefits and drawbacks.

7. Start of active job seeking

Before final year	3
During final year	31
After graduation	32

There was a fairly even split between those unemployed graduates who started job applications before they left university (the vast majority in their final year) and those who left this until after they graduated. The main reason cited for deferral was the pressure of academic work in the final year; indeed, even many of those who began job seeking in their final year indicated that their efforts were compromised by the need to balance this with academic pressures.

Of those who made applications in their final year, over half made fewer than 10 supporting the view expressed by some that academic pressures affected their job seeking activities. After graduating, the level of job seeking activity increased, understandably, with two-thirds of graduates indicating that they had made over 10 applications, of whom just under half had made over 50. Several reported that they had made 'hundreds' of applications, an admission that might be construed as either hyperbole or an indication of a rather panicky approach to job seeking.

8. Job seeking methods

Unemployed graduates were asked to indicate which job seeking methods they had found to be most successful. Just under a third mentioned websites as being their primary focus of attention with a high proportion of these referring in particular to job vacancy and advice websites such as Gradcracker (the most frequently named site), Jobsite, Targetjobs, CV Library, Quality Engineer, LinkedIn and GradCentral. Interestingly, the websites of professional bodies were not mentioned except by a couple of respondents who found them disappointing and aimed at more experienced engineers. The other main strategies cited by unemployed graduates as useful included applying to smaller employers, using job agencies, and networking (seeking out personal recommendations and contacts). Contacting larger employers, using departmental tutors, attending fairs and open days, and using the Connexions service also received mentions. Just under a third of graduates found no particular method to be helpful, perhaps reflecting the broadly negative experience of these graduates in the job market.

Roughly half the unemployed graduates had applied to employers speculatively with many of these indicating that this strategy had been adopted after graduation when more formal application avenues had proven less rewarding. This approach was often tried at the suggestion of others, for example friends in employment, job agencies, and the Job Centre, and in several cases seems to

have been successful in securing either interviews or, in a few cases, a job. Several of those who had not applied speculatively commented that they regarded such approaches as 'hit and miss' or felt that the state of the job market was not bad enough to warrant this strategy.

Nearly two-thirds of the unemployed graduates had adapted or changed their job seeking strategy in the light of their experiences. In many of these cases, this involved broadening their search in terms of the type of jobs being sought, including in some cases, to include non-engineering or non-graduate jobs, or to consider jobs in other locations. On the other hand, a very small number indicated that they had narrowed down their job search in order to make fewer, more targeted applications. Others had now widened the range of support that they sought to include job agencies, the Job Centre or networks of friends, whilst others had decided to apply to smaller employers, to alter their CV style and approach, or to study for a Masters in order to increase their attractiveness to employers.

A very small number of unemployed graduates had been forced to make changes to their job seeking strategy at an early stage when their career aspirations had been affected by illness or similar misfortune. As a result, they had had to rethink their plans including, in at least one case, completely changing their career direction.

9. First interviews

Whilst slightly fewer than one-third of the unemployed graduates had obtained at least one job interview before graduating, the remainder had attended none. After graduation, perhaps unsurprisingly given the increase in job seeking activity generally amongst the cohort, over two-thirds of graduates had attended between one and 10 job interviews and a small number had attended over 10. Of more concern is the significant proportion of graduates (about a fifth) who had not managed to secure even one interview since graduating.

10. Assessment centres

Unsurprisingly, the vast majority of unemployed graduates had not attended an assessment centre before graduating with only 11 of the cohort having reached this stage of the recruitment process at least once (and, in two cases, twice). Following graduation, the success rate was higher, with nearly twice as many graduates having attended at least one assessment centre (with the majority of these attending just one). Two-thirds of the unemployed graduates, however, had still not reached this stage of the recruitment process after graduation suggesting that their performance at the application or first interview stages was capable of some improvement.

11. Careers input into course/curriculum

Nearly a third of unemployed graduates recalled no or little specific careers input into their courses. For the majority who did, the main elements recalled were either one-off talks from the careers service about services provided, CVs, interviews etc., or pre-placement preparatory talks in the second year. Small numbers of graduates also cited presentations, PDP modules, careers fairs and talks from employers. The majority of these careers inputs were not assessed and the general impression is that these were sporadic and, apart from the pre-placement activities, timetabled towards the end of degree courses.

More positively, a significant number of unemployed Coventry graduates referred to Add+Vantage modules in each year of their programme whilst several Aston graduates recalled a careers module forming part of a larger 2nd year design project. Unlike the activities described above, elements of these programmes were assessed. A few graduates also mentioned that particular members of academic staff had been helpful in providing them with employer contacts to pursue in obtaining placements.

The overwhelming majority of unemployed graduates who expressed an opinion considered that these inputs were useful, either directly at the time or later. The general feedback was that they were most useful when linked to securing a placement for the third year or when centred on practical CV/applications/interview advice with some indicating that they were still benefiting from this knowledge and advice. Others referred to the importance of being invited to start thinking about careers or to assess and articulate their skills development. Where the elements were assessed, graduates felt that they were valuable as they were obliged to do them whereas discretionary elements could often be ignored.

A minority did not find them useful as they were felt to be too general and therefore not relevant to them or their degree course. Some unemployed graduates also stated that they were too busy in their final year to pay enough attention to them, or that it was a case of 'too little, too late', whilst one graduate did not think that assessing CVs etc. was the right approach to adopt.

12. Unemployed graduates' use of careers services whilst at university

About three-quarters of the unemployed graduates had used their university's careers service whilst studying, although there was evidence that some did not understand nor use the full range of services available to them (this was also the case with some of those who did not use it). For those who did make use of it, the main services accessed were the very practical advice offered relating to job vacancies, CVs, applications, interviews and job seeking. Others indicated that they had attended workshops, presentations, and employer events especially careers fairs. Some graduates were clearly still using their careers service, in particular for information about job vacancies and employers who were recruiting.

About four-fifths of those who had used their careers service found this helpful, most commonly for the support with job vacancies, CVs, applications and interviews. Other graduates also mentioned the way in which careers staff were able to point out broader options and to help them better to understand the nature and structure of the graduate job market and how to negotiate this. A few graduates also praised the way in which services were provided and, in particular, the helpful and attentive staff.

A small number did not find their service helpful, however, with concerns expressed being about its perceived generic nature and the lack of specialised advice for engineers. In addition individual graduates pointed out the long wait for an individual appointment at busy times and the lack of campus publicity for the range of services provided.

13. Unemployed graduates' extra-curricular experience whilst at university

Work experience:

Over a third of the unemployed graduates had had a year's engineering placement as part of their course, with some having also worked in engineering during their vacations. Just under half had had an unrelated part-time job either during their studies or in the vacations, typically in catering, retail or care work, whilst one had worked full-time and another had set up their own business whilst studying. One graduate had studied abroad (Korea) in their penultimate year and felt the language skills and adaptability they acquired were very useful. Other graduates valued their work experience as it had helped them to adapt better to the work culture. Only a minority (just under a quarter) had had no work experience at all.

Voluntary work:

About a third of unemployed graduates had become involved in volunteering at university including: mentoring; religious activities; cycling/running to raise funds; right to read; St John's Ambulance;

working in a charity shop and teaching. A small number had volunteered in areas related to engineering, for example with the charity Engineering Without Borders, and motorcycle maintenance.

About two-thirds of the unemployed graduates had done no voluntary work whilst at university.

Students' Union:

Slightly under half of the unemployed graduates had become involved in SU activities whilst studying, particularly in sports clubs, but also staff-student committees, cultural societies, recreational societies, and community clubs. About a quarter of unemployed graduates had taken on responsibilities such as chair, president and treasurer whilst some activities took graduates into the community in teaching and mentoring roles. On rare occasions, graduates had been actively involved in societies related to their degree discipline such as the Chemical Engineering Society.

Just over half the unemployed graduates had not become involved in SU activities at all or had joined societies but never or rarely participated.

Overall, nearly half of the unemployed graduates had only participated in one of the above activities (work experience, volunteering or Students' Union) whilst eight had not taken part in any at all. It is difficult to quantify the impact of such activities on unemployed graduates' chances of employment but it is clear that employers are looking for evidence of experience and skills development outside the degree course. Some graduates may, therefore, be denying themselves the benefits that such extra-curricular involvement can bring.

14. Help sought by graduates after graduation

Friends and family were by far the most common source of help and advice after graduation (mentioned by about half of the unemployed graduates) with smaller but significant numbers citing the university careers service. Websites and agencies were also seen as helpful by about a third of graduates with some also receiving support from course tutors, ex-placement providers, the Jobcentre Plus, and professional bodies.

The vast majority of these sources were regarded as helpful, particularly where family members had inside knowledge from their own experience of, for example, engineering or HR, and might also be able to suggest contacts. The support provided by friends appears to have been particularly useful in terms of keeping up morale and being able to talk to others in a similar situation and feel less isolated. Several graduates commented that they had not expected to be able to still receive support from their careers services after graduation and were very grateful that this was the case. Conversely, the main negative comments were about Jobcentre Plus described by a couple of graduates as having little to offer engineering graduates apart from generalised advice.

15. Unemployed graduates' difficulties in the job market

Many unemployed graduates put forward a range of reasons for their difficulties in getting a job with no single consensus emerging. Overall, however, responses seemed to fall into two main categories. Many (well over half) cited external factors referring to one or a combination of the following: the state of the economy; the lack of graduate opportunities; the competition for jobs; and the number of graduates. One graduate provided a slight twist on this theme by suggesting that economic factors made it difficult for older engineers to retire meaning that fewer opportunities were available for new graduates. A small group felt that employers' lengthy recruitment processes resulted in the inevitably delayed entry of graduates into employment.

The other category included factors more within graduates' own control including: their degree class or level (MEng/BEng); their lateness in starting to apply for jobs; difficulties with the application process including writing effective applications, and coping with interviews and aptitude tests; and limitations (self-imposed or otherwise) on their job choice or location. The biggest single reason cited by unemployed graduates in this respect, however, was their general lack of experience or work experience specifically. Nearly a third of unemployed graduates identified this as the main or a contributory reason for their difficulties, with many expressing regret that they had not taken up the option of a sandwich or vacation placement during their degree course.

A small number, by contrast, mentioned that they had found it easier than they anticipated or that there were plenty of jobs and they were confident about their ability to secure one before too long.

16. Unemployed graduates' difficulties in the recruitment process

The two biggest areas of difficulty encountered by unemployed graduates were the written application process (either using a CV or application form) and interviews; over half the graduates mentioned one or both of these. In particular, competence-based questions (in both application forms and interviews) posed great challenges to many. Some graduates were frustrated at the necessity for such detailed questions in the first place but also felt that the repetitive nature of the process, particularly online applications, made it hard to ensure that their responses to such questions were fresh and tailored to the specific employer. Finally, one graduate found the entire online application experience cold and impersonal with little room for interaction between applicants and employers, whilst for at least one graduate with dyslexia, written applications of any kind were very daunting.

A small but significant group mentioned the difficulty of finding appropriate vacancies to apply for in the first place whilst a few had difficulty with aptitude tests, especially those online. The lack of response and feedback from employers, particularly smaller ones, was felt acutely by a small number of graduates, particularly in the context of the time and effort required to complete and submit an application.

By contrast, about a sixth of the unemployed graduates indicated that they were experiencing no particular difficulties in the recruitment process and that, if success had not already come their way, it would do so in time.

17. What unemployed graduates felt universities could provide more help with

Perhaps surprisingly, just over a third of unemployed graduates felt that universities provided enough help already, and that it was up to students to take advantage of it, with some graduates expressing regret that they had not used the careers service more whilst studying. There were five main areas, however, in which unemployed graduates felt that universities could improve their performance:

1. Encouraging, and even pushing, students to take up placements, and helping them to do so by providing better advice on strategy/tactics and more employer contacts.
2. More CV/application/psychometric tests/interview/assessment centre advice and guidance tailored specifically to the needs of engineering students.
3. Ensuring that careers and employability activities were provided within the curriculum (some expressed the view that engineers do not go to the careers service so activity must be at the department level) and preferably timetabled through specific modules, for example a final year module on effective job seeking.
4. Greater employer involvement in the curriculum and the provision of employer contacts and networks, plus advice on vacancy sources. One graduate even suggested that the university should act as a job agency for employers.

5. Ensuring that students know about the careers service (through mandatory sessions within the curriculum, for example) and that the latter is adequately resourced so that students do not have to wait for appointments.

Other suggestions included help with developing and understanding the importance of skills and competencies, and with choosing work-related projects.

18. What unemployed graduates felt they could have done to help themselves

Not surprisingly, the suggestions made by unemployed graduates tended to reflect the areas where they considered they were now having difficulty, with many of the graduates listing several ways in which they could have done more to help themselves. About a third of unemployed graduates felt that they could have begun applying for jobs earlier or made more applications and a similar proportion regretted not using the careers service more, in particular by attending the range of events provided (lack of time was cited as a key factor in this respect) and seeking advice on CVs and applications. Nearly a quarter wished that they had obtained a placement or, at least, some relevant work experience.

Others wished they had worked harder for a better degree class, developed their extra-curricular activities to boost their CVs, in particular through volunteering, practised aptitude tests, or networked more with employers.

A sizeable number (about a seventh of the total), however, were happy with their efforts whilst studying and were unable to identify any improvements they might have made.

19. Advice from unemployed graduates to current engineering students

As might be expected, this was hugely varied often depending on unemployed graduates' very individual experiences. The following key themes emerged, however:

- **Obtain work experience**: preferably within engineering on a yearlong placement, but, if not, then on a shorter engineering placement or any work experience that demonstrated skills development and commercial awareness. Several graduates pointed out that many employers recruited directly from their placement programmes.
- **Start early**: both the process of career planning and applying for jobs. Many unemployed graduates regretted not doing this in their final year, if not earlier, as they found that, after graduating, the same level of information and support was not available to them. They also discovered that building up employer contacts took time and that this process could have been started whilst at university.
- **Use the careers service**: in particular for the guidance, information, employer contacts and support that they provided. Many thought that students often took this for granted and only appreciated its value, in the form of advice, contacts and employability input within the curriculum, after graduating when such support was less readily available.
- **Get experience for the CV**: by taking advantage of opportunities to develop skills and build up the CV whilst at university, in particular through volunteering, SU activities, work placements etc. Linked to this, several unemployed graduates cited the importance of keeping the CV fresh, updated and targeted.
- **Get a good degree**: some unemployed graduates emphasised the value of strong academic qualifications at the right level (some regretted not being able to achieve an MEng rather than a BEng), often the bottom line for employers, together with making sure that the appropriate modules were studied for any preferred career direction.
- **'Don't give up'**: several unemployed graduates cited persistence, resilience and 'not giving up' as key requirements for graduates in the current economic climate, linking this with the

importance of flexibility of approach, for example being prepared to consider SMEs as well as big companies and not being too restrictive about location of work.

E. Report on Employed Graduate Interviews

The number of employed graduates in the survey was very small (12) and it would be dangerous to extrapolate from the data gathered. The main purpose behind the interviews with employed graduates was to discover if their experiences or activities were markedly different in any way from those who were unemployed rather than to compare them in terms of demographic background although such data are included for the sake of completeness.

1. Demographic background of employed graduates surveyed

Total: 12 graduates in total (7 graduated in 2010; 5 graduated in 2011)

Degree discipline

Discipline	BSc	B Eng	M Eng	Total
Aerospace	0	1	0	1
Civil	0	2	3	5
Electronic/ electrical	0	2	1	3
Engineering	1	0	0	1
Mechanical	0	1	0	1
Motor Sport	0	1	0	1
Total	**1**	**7**	**4**	**12**

Degree class:

1st	2:1	2:2
4	6	2

Gender:

Male	Female
10	2

Ethnicity (self-reported):

Black African	1
White British	11

Current age:

20-21	1
22-24	5
25-30	6

2. Current employment circumstances

Nine of the employed graduates were currently employed in graduate engineering roles of various kinds including design, CAD, consultancy, supportability, defence, and civil engineering. Employers included Jaguar Land Rover, Atkins, Cummins, BP, Qinetiq, Jacobs Engineering, and Geoffrey Osborne Ltd. One was working and studying for a PhD and another taking a year out prior to beginning deferred graduate engineering employment later in the year. One graduate was working in a non-graduate job although in the right field and for what he considered to be the appropriate type of employer and clearly regarded the job as being a stepping stone to graduate employment.

3. Main career aspirations including non-engineering and non-graduate jobs

Whilst eight of the employed graduates had never considered working outside engineering, four had done so (finance/oil; police; law; accountancy) although they now all worked in engineering. The main reason for considering non-engineering careers was the economic climate and a desire to widen their career choice. Only one had considered taking a role at non-graduate level in order to get a foot in the door of his chosen industry.

4. Location preferred

Eight employed graduates would consider working in any locations whilst the remainder preferred specific areas (south-east; Birmingham; London). Some of those with preferences were successful in meeting them whereas others had realised that they perhaps needed to be less prescriptive.

5. Starting salary preferred or achieved

£16-19K	3
£20-24K	1
£25-29K	4
Flexible	4

The main sentiment amongst those showing flexibility was a desire to get started in a career rather than being too concerned about the precise details of the package that they might secure.

6. Size of employer preferred

Small	1
Large	9
Any	2

Most of those preferring large companies pointed to the training on offer and the perceived greater progression opportunities as particular attractions, although one graduate had been looking for a job with a large employer but had eventually taken a job with an SME and was perfectly happy. Interestingly, only a small proportion was prepared to consider working for either type.

7. Job seeking and applications

Before final year	3
During final year	8
After graduation	1

Most of the employed graduates had begun applying for jobs before they graduated, with a few starting the process before their final year. Several graduates had been offered jobs by their sponsoring or placement employers but still chose to apply more widely in their final year in order to see what else was available. The one graduate who started applying after leaving university indicated that this was partly in order to think seriously about what he wanted to do, and partly owing to the pressure of academic work.

Half the employed graduates made fewer than 10 applications before graduating although four made between 10 and 30 and one made over 30. After graduation, most did not need to make any more applications although two made between one and 10 and one over 30 before securing a job.

8. Job seeking methods

Most employed graduates had used a range of job seeking methods with the use of websites (either specialist job search or employer's own websites) being the most common. Websites mentioned by name included Milkround, Gradcracker, Totaljobs and Graduate Prospects. Other graduates indicated the success of methods such as using the careers service, attending careers fairs and employer presentations, and signing up with agencies. Graduates from Birmingham University also viewed the Respect programme very positively in relation to job seeking and employer contacts.

Making speculative applications did not appear to be a major part of any graduate's strategy, with only a couple making any, and none had seen the need to alter their strategy at all in the light of circumstances that they encountered during their job seeking.

9. First interviews

Only one employed graduate failed to secure at least one interview before graduating, with most attending between one and 10 interviews and one more than 10. After graduation, the majority attended no more interviews apart from three who attended up to 10.

10. Assessment centres

Before graduation, four graduates had attended no assessment centres with the majority of the remainder attending fewer than five; one attended more than five. No graduates had attended any after graduation.

11. Careers input into course/curriculum

Nine employed graduates recalled some careers input into their courses (pre-placement; assessed module; final year module on ethics and debating; PDP) although this was not always compulsory (one graduate admitted that they had not attended any of the sessions) and appears to have been somewhat sporadic. Three employed Birmingham graduates mentioned the Respect programme favourably but three could recall no input at all. Most of those who had participated in careers activities regarded them as useful although there was a desire for more at an earlier stage.

12. Employed graduates' use of careers services

Nine employed graduates had used the careers service during their course, mainly for help with applications (CV/assessment centre/job vacancies. Most of those who had used the careers service found it helpful, in particular for meeting employers and CV advice.

13. Employed graduates' extra-curricular experience at university

Work experience:

Three of the employed graduates had done a year's placement as part of their course with one also having completed a summer placement. A further five had done summer placements only, one had

completed an apprenticeship, whilst three had unrelated work experience in catering, retail, administration, manufacturing and tailoring. None had no work experience at all.

Voluntary work:
Five employed graduates had volunteered whilst at university (Student Ambassador; JCR committee; hall representative; fundraising events) whilst the majority had not.

Students' Union:
Seven employed graduates had engaged with SU activities, in almost all cases in sports clubs, with two taking leading roles on committees or as captains. Two graduates indicated that this experience had been useful at job/placement interviews as evidence of skills development and being a 'more rounded applicant'. Five graduates had taken no part in SU activities.

14. Help sought after graduation
Unsurprisingly, as most of these graduates had jobs either before or soon after graduation, they had not sought help particularly. For those who had a few referred to help from agencies, tutors/lecturers, family and friends with all finding such help useful.

15. Employed graduates' difficulties in the job market
Again, given their relative success in the job market compared with those unemployed, it is not surprising that half the employed graduates felt that they had not really faced any difficulties. Of the remainder, several commented on the difficult economic circumstances and the impact this was having on the graduate job market, one indicated that they had been lucky in choosing to study a vocational subject, whilst another felt that their preparation had helped them through all difficulties.

16. Employed graduates' difficulties in the recruitment process
Over half the employed graduates had encountered no difficulties in the process with the remainder pointing to their struggles with applications (particularly competence-based questions), CVs, aptitude tests and interviews. One graduate specifically mentioned the extra challenges posed by their dyslexia when writing CVs and doing aptitude tests.

17. What employed graduates felt universities could provide more help with
Just over half felt that universities did enough with others pointing to a number of areas including: encouraging students to take up placements; help with CV writing and application forms (especially competence-based questions); publicising the careers service; and urging students to apply for jobs. Birmingham's Respect programme was again mentioned specifically in positive terms.

18. What employed graduates felt they could have done to help themselves
Half of the employed graduates felt that there was not anything more that they could have done. The others indicated that, in hindsight, they should have: used the careers service more; obtained more placements; attended careers seminars; and researched employers and applied for vacancies earlier.

19. Advice from employed graduates to current engineering students
The most common advice from over half the employed graduates was to obtain a placement or placements. Other suggestions included:

- Apply early for jobs and widely to employers, without being restricted as to location.
- Practise application form questions and research employers before interview.
- Use the careers service and attend careers fairs.
- Build up extracurricular experience.
- Attend all lectures, take proper notes and revise in time.
- Persevere with job seeking - this will pay off in time.

F. Report on Employer Interviews

Nineteen graduate employers have participated in the HE STEM project survey. The majority of these were interviewed face-to-face but a small minority only agreed to a telephone interview, either because they preferred this method of communication or because distance made it the most sensible approach.

a) Graduate recruitment in the engineering industry

1. Graduate opportunities

1.1 The number of engineering graduates recruited annually by the employers in the survey ranged from one or two a year to about 180. An exception to this was one small company that recruited only on an ad hoc basis, i.e. when the need arose. In general, the employers interviewed split into three groups: those recruiting between 70 and 180 graduates a year; those recruiting between 10 and 50; and those recruiting fewer than 10. For some employers, their recruitment needs in 2011 were markedly lower than in previous years, owing to the recession, although at least one employer was initiating a graduate programme as they felt it was important to maintain graduate recruitment to replace the large numbers of over-55 year-olds expected to be leaving the company in the next few years.

1.2 The range of degree disciplines sought by the employers also varied widely including:

Aerospace	Automotive	Chemical
Civil	Control	Design
Electrical	Electronics	Hardware
Manufacturing	Materials	Mechanical
Microelectronics	Process	Research
Software	Structural	Systems

This list should not be seen as exhaustive but indicative of the main disciplines commonly referred to by employers in interviews on or their websites.

1.3 The largest graduate recruiters tended to take their graduates into a structured graduate training programme often involving participation in placements of between two and six months across different areas of the company over a two to four year period, with a major emphasis on graduates' attaining chartered status within this timescale. Some employers recruited graduates into specific functions, often requiring applicants to make a choice at the application stage, whilst others recruited them into a more general programme with choices being left until later when they, and the company, felt able to make a better assessment of the options available based on their strengths, aptitudes, interests and performance. At least one employer, for example, asked applicants to choose between a technical excellence route and another focusing on more general business leadership. Smaller employers, recruiting few graduates, were more likely to take them into specific roles from the start.

2. Salaries and benefits

2.1 Not all employers interviewed would reveal the starting salary paid to new graduates and those disclosed varied from £22K up to £28.8K per annum (paid by one employer at the top end of a range beginning at £26.3K), with the median being about £25K. Within this range, there were some variations according to degree discipline sought; for example, one employer paid a £2K bonus to graduates with experience of microelectronics. Several paid a joining bonus of between £2K and £3K to overcome the problem of good candidates provisionally accepting several employment offers and

taking the most highly paid one. Others paid a bonus but only when graduates had achieved their professional qualifications.

2.2 Those not willing to reveal the salary paid claimed that this was competitive or the normal market rate whilst many stated that they benchmarked their salaries against industry comparators, within the AGR for example.

2.3 The range of non-salary benefits offered by employers varied considerably but, in general, larger companies were able to offer pension schemes (final salary or defined benefits), medical/health care and/or insurance, and profit sharing/share schemes.

2.4 Some also offered nursery and restaurant provision, sports facilities, and car purchase schemes and/or advances on travel season tickets. In addition, a minority pointed to opportunities to become involved in corporate social responsibility programmes, such as volunteering, as incentives to employment.

2.5 Smaller companies could not compete with these and, in response, stressed the intrinsic benefits of more interesting work, a greater sense of achievement from more integrated involvement in projects, and earlier management responsibility.

3. Career progression

3.1 The larger graduate recruiters in the survey tended to be explicitly recruiting the senior leaders of the future, although not all the graduates in any cohort were necessarily expected to reach these heights. Most emphasised that graduates were treated as a separate group within the organisation, in some ways a privileged one, that met regularly together, and shared a common experience typified by training events, a professional ethos engendered by the requirement to achieve professional accreditation, and experiences such as mentoring. The early career progression of such graduates was therefore closely moulded by the requirements of the engineering bodies responsible for accreditation.

3.2 Most of the larger employers placed an emphasis on their graduates learning about the organisation through placements within different parts of the company, possibly in different parts of the UK or even abroad. They would then be expected to progress through the company hierarchy, depending on their interests, skills and competences, into management positions. These might be either technical or project management positions, for those who preferred or were advised to work at this more practical level, or more business-related responsibilities for those demonstrating broader leadership potential.

3.3 The smaller employers in the survey, for whom such hierarchies were not possible, tended to emphasise the greater levels of responsibility given to their graduates and their more immediate involvement in the business at a strategic level, meaning that they needed to learn and demonstrate both technical and business competences within the organisation.

'The guys (sic) here are designing stuff that gets made in a few weeks: they're doing the testing themselves, it's all much quicker, much more complex; much harder, much more responsibility. It's not for everybody, people do resign and they'll go and work for a big company, because if you get something wrong here it really does stand out.'

b) Employers' requirements

1. Academic entry criteria

1.1 Most employers were looking for Masters level qualifications, preferably an MEng in a relevant discipline, although some would accept a BEng plus an MSc instead. It was stressed that this criterion was often linked to the requirements of professional bodies and the need to acquire chartered status, with the Masters degree shortening the time required to do this. In several cases, the requirement for a higher degree was also regarded as evidence of greater academic ability and one employer suggested that, as they were beginning to recruit at a sub-degree level for apprentices, they needed their graduate intake to show evidence of higher achievement and to be seen as '*high fliers'*.

'But talking to people who head up engineering, it's ''Mmm, maybe in future we need to be looking at MEng because we want our graduates to be high fliers'' because I think there's going to be a push towards apprentices'.

1.2 Whilst some employers were happy to recruit graduates with a 2:2, the majority preferred a 2:1 or above and, even in cases where a 2:2 would suffice, stressed that about 80% of recruits had a 2:1 anyway. Only a couple of employers seemed to dig down into the detail of an applicant's degree at the application stage, by inspecting module choices or looking for key words such as *'turbines'*, *'computational fluid dynamics'* and so on for evidence of their relevance; this aspect tended to be viewed as important in cases where niche engineering roles existed, more commonly with smaller employers.

1.3 For some employers, 'A' level results (or their equivalent) were a key filter with minimum UCAS points scores of 300 points being quoted. Occasionally this was translated into specific subject requirements with the most commonly sought subjects being Maths, Physics and Chemistry (at grades C or above). These requirements were sometimes lowered or even removed altogether for shortage areas such as electrical engineering. Although a couple of employers indicated that supply and demand occasionally affected the rigour with which these academic criteria were applied, employers generally agreed that they were reluctant to lower standards even when this meant that posts were left vacant.

1.4 Applicants with PhD qualifications were rarely mentioned, primarily as few of the employers had any experience of receiving applications from them. Those that mentioned such candidates indicated that, although they would be welcomed, they would receive no special treatment, or they might be invited to apply for specific posts rather than the graduate scheme.

2. Work experience

2.1 There was a general consensus amongst all employers that possessing work experience was desirable, for three main reasons:

a) If the experience was engineering-related, this was felt to demonstrate the candidate's motivation and interest in engineering as a career.

b) Work experience was regarded as conferring on graduates an understanding of the world of work and, possibly, some commercial awareness.

c) Several employers thought that work experience helped applicants to demonstrate the type of employability skills that they sought in new recruits and that it therefore gave them an edge at the interview and assessment stages, if not necessarily at the application stage. Even

those few employers who did not require candidates to provide evidence of their work experience conceded that this was the case, and that applicants with this would probably stand out.

2.2 More specifically, a couple of employers insisted on applicants having work experience in engineering and regarded other types of work experience, for example in catering or retail, with disdain, arguing that any candidate with a strong interest in engineering should have been able to find a summer placement if they had tried. A small minority, therefore, would not consider a candidate if they had no engineering experience, and were vehement in their defence of this practice, requiring, for example, at least two engineering internships or scoring engineering placements more highly when assessing applications.

'If someone spent their summer working in McDonald's, we're just not interested because that doesn't tell me it's someone who's keen on engineering……..So, ideally some relevant work experience, even if it's just the garage down the road.'

2.3 Others, however, regarded such experience as very important but not a crucial element; it might help to distinguish between candidates but the lack of it would not completely rule a particular applicant out. This group included those who, whilst regarding work experience as important, were more relaxed about the exact type of work experience that a candidate might have, feeling that, for example, any experience provided the graduate with an insight into work place values and practices.

2.4 The situation was made more complex by the fact that several of the employers ran their own student work placement programmes, typically sandwich year placements and shorter summer internships. For these employers, the fact that they ran such programmes meant that they had a ready source of graduates about whom they already knew a great deal. Indeed, one large employer gauged that about 70% of their placement students were taken onto the graduate programme providing about 50% of the new graduates taken on in this way. Employers in this group regarded these programmes as a crucial supply chain for their future graduate workforce and were anxious to make as much use of it as possible; some, in fact, felt that they did not exploit it as much as they might and were looking for ways in which they might do this.

2.5 Such programmes were not restricted to the larger employers either, although clearly they took students in larger numbers. At least two of the smaller employers interviewed had small work placement programmes from which they recruited graduate trainees. In some respects, they were even keener to retain these students as they knew them so well and had invested proportionately more resources in them; one such employer, for example, now offered small bursaries to placement students in their final year in order to retain their loyalty. Another employer recruited an intern through a local university's internship programme and was so impressed that they decided to take them on permanently.

3. Extra-curricular activities and interests

3.1 This question was intended to gauge the views of employers on the importance that they placed on extra-curricular activities, including interests and hobbies as well as more structured activities such as sports, volunteering and students' union involvement, in the recruitment process.

3.2 Most employers agreed that extra-curricular activities and interests, whilst valuable, did not carry the same weight as either academic qualifications or work experience, and, for some, they were not regarded as essential. Only one employer stated that they would score an application form more highly if the applicant were able to provide evidence of such engagement, whilst another

opined that evidence of interest in *'engineering-related'* hobbies such as car mechanics would reflect favourably on an applicant as demonstrating motivation and interest.

3.3 In general, however, employers cited three main related reasons why they felt extra-curricular activities to be valuable to graduates.

a) They were seen to demonstrate a wider *'perspective'* or *'engagement'* on the part of graduates providing them with a more *'holistic view'*. Graduates who had been involved in students' union activities or volunteering, for example, were seen as having a broader outlook and better able to get on with a wider range of people, than those without. One employer said, in this context, that such experience might balance out the lack of work experience if an applicant had been unable to secure the latter.

b) Such graduates were also thought to be demonstrating their '*get up and go'* or *'something extra'*, linked to their overall motivation, which helped to distinguish them from their counterparts who lacked this. Employers saw these character traits as being useful in the workplace.

c) Some employers described extra-curricular activities in terms of the skill set that they were felt to confer on graduates. Such employers pointed particularly to *'leadership'* and *'teamwork'* as traits that graduates, especially those involved in sports and activities such as the Duke of Edinburgh Award scheme, might develop through these. In this context, one employer turned the argument on its head by stating that they would be concerned about a graduate who had interests such as *'fishing'*, as this might indicate a solitary temperament, not conducive to the team working ethic prevailing within the organisation.

3.4 Two final points, expressed by several employers, help to place the importance of extra-curricular activities and interests into the wider recruitment context.

By themselves such activities would not be sufficient and applicants would need to be able to articulate the value that they had derived from them in terms of their personal and skills development, an area often probed through the use of competency-based questions in interviews.

Employers judged that those with such experiences to draw on were more likely to be able to deal with such questions with both confidence and supporting evidence.

4. Skills sought by employers

4.1 Not all employers were immediately able to describe the range of skills that their recruitment processes were designed to identify, although there was a degree of consensus about the main areas that they felt to be important as follows (with variations on the main theme in brackets):

- Leadership (role model; energising others; taking responsibility; credibility; confidence; challenging; courage; integrity; direction)
- Teamworking (relationship building)
- Communication and interpersonal skills
- Analysis/problem-solving (handing data; method; logic)
- Creativity/innovation (flexibility; adaptability; agility; challenging)
- Planning and organising (project management)
- Business understanding/commercial awareness (think the business; realism; judgement)
- Performance (execution; delivery; impact)

4.2 Several of the larger employers used personality questionnaires as part of the recruitment process in order to select for those skills and traits that they sought. Such instruments were never used on their own or as the final arbiter in assessing applicants but were felt to provide a different, more objective perspective to add to other selection methods, and to supply evidence that might then be probed or tested further at interview.

4.3 In addition to the above skills, several employers also referred to the ability of graduates to apply their technical skills and knowledge in a business or workplace context, and some tested for this at interview through the use of practical exercises. What was being sought here was not just the ability to recall engineering principles and techniques, important though this was, but also an almost innate feel for how these could be applied to a particular problem. One employer described this as *'challenging applicants to think on their feet'* and to remove themselves from the classroom into the real world, finding that this often distinguished those graduates with an instinct for engineering from those who perhaps knew the theory but no more. Interestingly, the employer thought that this quality was unrelated to degree class and that those with 1sts often struggled. Another smaller employer characterised this as the *'X factor'*, that outweighed all the other skills; these could be taught whereas this was intrinsic.

'We generally look for the elusive 'X factor' which can often be shown in CVs through people who have got an interest in different things like we have an engineer who….on his CV it talked about him taking apart and refurbishing CNC machines as a hobby. ……They work pretty long hours and the only way that you can put up with that sort of thing is if you've got an enthusiasm for the subject ……. a passion or whatever it is…….'

4.4 A supplementary question about institutional employability award programmes (such as the Leicester and Loughborough Awards) produced a fairly consistent response. These programmes accredit students' extra-curricular or work experience, help them to reflect on this in terms of their employability, and provide training and support in how to articulate this to employers. Most are delivered by the careers service, very often with employers providing insights and credibility, and have been in existence for about five to ten years. Most employers claimed that they had not heard of these programmes specifically and would only have done so if graduates highlighted them on applications or at interview, although no particular credit would be given solely on the basis that a graduate had been a participant.

4.5 Employers would expect graduates who had taken part in them, however, to demonstrate this through their enhanced ability to provide evidence for, and talk cogently and persuasively about, their employability skills. Moreover, all felt that such programmes were valuable and at least one employer expressed an interest in getting further involved and another mentioned Loughborough University's Insight programme as a similar type of activity that could add value to a student's skills portfolio.

c) Recruitment issues

1. Importance of location

1.1 Unsurprisingly, location and the importance of graduates' willingness to move varied from employer to employer. In general, again unsurprisingly, this was more of an issue for those employers with sites across the UK and, particularly for those operating internationally. For smaller employers, often based in one location, mobility was immaterial, and, indeed, some felt that graduate ambition in this respect might rule them out.

1.2 Several employers stressed the importance of graduates' willingness to demonstrate flexibility and to gain experience around various company sites and functions (including those abroad). For these employers, graduates needed to show that they were mobile. Indeed, several felt that the opportunity to move around locations was a selling point emphasised in recruitment literature in order to attract graduates.

1.3 Others were more accommodating saying that they allowed graduate recruits to specify a preferred location, although they could give no guarantees. One had even permitted a good graduate to defer starting for a year to allow them the option of their preferred location, but stressed that this was only done in exceptional circumstances.

1.4 Finally, for one global employer, the requirement to be mobile was not uniformly applied to all graduates in the cohort but might be used to distinguish those selected for a leadership programme, where flexibility was regarded as crucial, from those on a more technical programme, where it was easier to accommodate individual preferences.

2. New or recent graduates

2.1 The views of employers as to whether they preferred to take new graduates or would consider those more than a year from graduation provide some grounds for optimism for the latter. Most claimed that their programmes were designed for graduates within about 12-18 months of graduation with some, but not a huge amount of, work experience. The general feeling, however, was that they would look hard at those who had graduated longer ago and, depending on what they had been doing since graduation, consider them either for a graduate programme or, if they had been working in engineering for that period, for a specific post or different entry point more commensurate with their experience. Only one employer expressed a preference for graduates who had been out of university for over 18 months as they felt this gave them more experience of the world and, in particular, how to deal with people.

2.2 Some employers clearly felt that it was legitimate for graduates to make a false start in their career and therefore wish to change within a year or so, and were happy to consider them for their graduate programmes. Similarly, some said that they would consider unsuccessful applicants from the previous year who had been close to being recruited and who were able to provide fresh evidence of their suitability, perhaps through work experience. One employer stated that they would not be keen on taking on a graduate who had *'just been travelling'* for a year, whilst another had the opposite opinion: a year travelling was acceptable, whereas they would have to think hard about someone who had been working (presumably because they might have learnt bad habits!).

2.3 A couple of employers appeared unconcerned about when applicants had graduated and stated that they would consider anyone, as long as they were happy with the salary on offer (this could not be raised to acknowledge greater experience). At least one employer would be happy to defer entry for up to a year if a graduate wanted to take a year out but they would need to put forward a strong case for doing so.

3. Quantity and quality of applicants

3.1 When asked about the quantity and quality of graduates applying to them, most employers expressed satisfaction with the numbers but would have preferred better quality. Several maintained that they struggled to meet their annual targets for different disciplines, (in particular for electrical and electronic engineers. See below: 4. Specific recruitment shortages). This difficulty seemed to have two main effects:

a) Employers were finding the recruitment process very time-consuming with large numbers of applicants having to be reduced to a manageable quantity at the assessment centre and interview stages.

b) Some employers decided not to recruit graduates for functions for which they had not received the desired quality of applicants, and were not prepared to compromise on their entry criteria merely to fill their requirements. Indeed, one employer claimed not to have filled all their posts for the past four years for this reason.

3.2 When asked why they felt they were experiencing difficulties, there were several responses:

a) A couple of employers felt that their particular recruitment problems stemmed from the lateness of their entry into the graduate recruitment cycle (they had only opened their programmes after Christmas and found that many good graduates had already had offers).

b) Several laid the difficulties of the engineering industry generally at the door of other graduate employment sectors, in particular the financial services industry, which they felt took numerate and analytical graduates in large numbers and paid them higher salaries; there was a feeling that the engineering industry as a whole could not compete with this.

'A company like ours is….not just competing against other engineering companies, they're competing against consulting, the banks (who want)…… engineering graduates to work on the trading floor because they're analytical …… and they've got a high degree of Maths. And that kind of analytical, logical approach with this problem solving element fitted into (what is needed) from a banking perspective.'

c) One employer attributed its difficulties to its *'brand image problem'* as it was making redundancies in another part of the company and the ensuing publicity deterred graduates from applying.

3.3 A different gloss was put on this branding issue by a couple of smaller employers who felt that they suffered from having little brand name at all, being unable to compete with larger engineering companies that they felt rather hogged the graduate recruitment market. The latter could attend campus events and afford lavish advertising campaigns, making it almost impossible for smaller companies to attract graduates' attention.

4. Specific recruitment shortages

4.1 As noted in the previous section, the primary shortage reported by employers was that of electrical and electronic engineering graduates, with one employer specifically referring to difficulties in finding graduates with knowledge of microelectronics. Graduates from these disciplines were felt to have wider options than those from others, and, in particular, their blend of numerical ability and analytical/problem solving skills was seen to be attractive to the financial services industry offering higher salaries. One employer made the point, however, that they wouldn't want to take graduates interested primarily in financial rewards, preferring instead those with a keen interest in engineering and motivated by its particular challenges.

4.2 The net result of these shortages was three-fold:

a) Many employers, not wishing to reduce their recruitment criteria, accepted the fact that they could not recruit graduates from these disciplines and left posts unfilled, with, presumably, inevitable implications for their competitiveness.

b) Some employers decided to recruit more international graduates in order to meet their requirements. They expressed some regret at doing so, partly as they would have preferred to offer employment to home graduates and partly as securing work permits for such graduates was a time-consuming and arduous process, subject to frequent government policy changes.

c) A small minority of employers had decided to offer a salary premium to electrical and electronics engineering graduates to encourage them to accept their job offers.

4.3 A second issue raised by several employers was the difficulty of recruiting female engineers despite awareness of this problem at senior levels. At least one employer had even produced specific recruitment materials aimed at women. Although such employers accepted that the small numbers of female engineering graduates was a sign of a deeper malaise in schools, there was a view that the engineering industry itself needed to address its image problem amongst women.

4.4 Other employers mentioned more specific difficulties recruiting software engineering and mechanical engineering graduates, whilst another referred to a shortage of civil engineers willing to work outside London, although this was felt to be easing with the tightening of the job market caused by the recession. Another was concerned at the lack of graduates willing to get involved in the more *'physical'* side such as heavy engineering and site maintenance.

4.5 Finally, one small employer chose to interpret this question in terms of the lack of understanding of fundamental engineering principles and how to apply them amongst new graduates. Although they only recruited a small number of graduates annually, they had found this to be so widespread a deficit that they had accepted it as a fact and adapted their training methods so that new graduates spent considerable periods in their laboratories and machine shops or those of their partner companies to relearn techniques.

d) Recruitment strategies

1. Recruitment process and advertising vacancies

1.1 The majority of employers operated a recruitment process that started in September or early October with a closing date for applications of late-December or early January. Several employers mentioned that, in previous years, they had opened for applications later, typically after Christmas, and felt that they lost out on good applicants as result, and were therefore now bringing the timetable forward by several months. Sometimes, again for larger employers, it was not always easy to anticipate precise numbers required at the start of the year, and a second recruitment process was opened later in the year. For smaller employers, the picture was slightly different: one only started their recruitment in December, another operated year-round recruitment and held applications on file until they had a need to recruit, whilst a third recruited only when they had a specific vacancy to fill.

1.2 Most employers used a combination of publicity channels for advertising their vacancies and programmes. A small minority contracted out this part of the process to external specialist recruitment agencies who typically construct marketing and media packages for their clients. One employer indicated, however, that they would only use such an agency when they needed staff quickly and felt the outlay was therefore worth it.

1.3 The majority of employers used their own websites to promote their opportunities but drove interested students and graduates to these via external online agencies, the most popular of these

being Gradcracker (www.gradcracker.com), Milkround (www.milkround.com) and Graduate Prospects (www.prospects.ac.uk), with TARGETjobs (www.targetjobs.co.uk) and Gradjobs (www.gradjobs.co.uk) also being used.

1.4 Most employers also placed their vacancies on university vacancy websites, usually via institutional careers services but occasionally directly with departments. The strategy in these cases varied with some sending information to a considerable number of universities, regarding it as important to spread the message as widely as possible, whilst others targeted their efforts on a small number of chosen institutions that they felt better represented the graduates they were seeking.

2. Employer links with institutions and campus recruitment activity

2.1 All the larger employers interviewed maintained a high profile on university campuses although there was some variety in the number of institutions with which they had such links. For example, three employers visited over 25 careers fairs annually (the most was about 45) whilst others limited such activity to about four or five events at targeted institutions. Careers fairs seemed to be the most popular method of raising a company's profile amongst the student body although some employers questioned how effective this was since, at such events, they frequently saw many students who lacked direction and appeared to be ill-prepared. Financial considerations also were putting such activity under pressure and making recruiters think seriously about the impact of such endeavours.

2.2 As a consequence of these factors, some employers were seeking to concentrate their activities in two ways:

a) They were trying, with varying degrees of success, to become more involved within engineering departments, thus reaching their target students more directly, by providing, for example, lectures and presentations by staff on the graduate opportunities available within the company, or more generally within the industry, and skills-based sessions centred on CVs and application forms, assessment centres and interviews.

b) Many were working with careers services to help deliver the employability messages and activities that universities across the UK now regard as a central element of the student experience. These also centred around skills sessions and presentations but possibly to a wider audience than attending those run in departments. In both these arenas, employers mentioned increasingly using alumni to talk to students and act as mentors.

2.3 There was evidence also that some employers appreciated the importance of timetabling these early in the university careers of students in order to influence their long-term career aspirations and employability, rather than loading these into the final year when students were thought to be making applications. In the same vein, some employers indicated that they were trying to forge relationships with students' unions so that they might engage directly with student societies through, for example, sponsorship deals.

2.4 Not surprisingly, smaller employers found it more difficult to establish close relationships with institutions, largely as they had fewer staff available for this purpose. One such employer mentioned that they had attended a careers fair but would not return as it had proven so difficult to find staff with the time to spare. They felt their best approach was to contact the individual departments directly when they needed applicants. In contrast, another small company felt that its research links with local universities were adequate to ensure that its name was known to students and that it also maintained a high profile through magazine articles and Twitter.

2.5 When asked why they had links with certain universities and not others, it appeared that two factors particularly influenced this decision:

a) Geography played a part so that some employers maintained links with local universities either for convenience, or because it was deemed important to do so (even though, in at least one instance, the quality of graduates from this institution was not felt to be high), or because it was considered that local graduates were more likely to stay with the company.

b) More importantly, certain institutions were regarded highly because either they were considered to provide the right type of courses for the needs of the employer in terms of academic content, or their graduates had been successful over a number of years in securing employment with the company. Some of the employers using the second of these arguments were keen to point out that each year they reviewed their recruitment processes and would consider adding new institutions to their target list if their graduates had been successful applicants that year. Nevertheless, there seemed to be an element of sticking with the tried and tested, often based on managers' assessments of institutional quality, even when, by some employers' own admission, the quality of applications did not always meet the required standard.

'We have to target a certain number and like everyone else we'll target what we consider to be the best ones. Over a period of time you can normally tell which ones are going to send better quality graduates to interview and those are the ones we try and work with.'

2.6 At least one employer was more sophisticated in their approach and operated an A list of targeted institutions for recruitment purposes, based on engineering ranking tables, and a B list of those with whom they maintained links for other reasons, for example technical consultancy. The employer hoped in time that the B list would also provide them with a source of new graduates. The same employer also felt that, as it lacked a strong brand image, it was not worth targeting the top Russell Group institutions as their graduates would probably not consider them seriously.

2.7 Despite all the above, most employers were aware of the dangers of 'putting all their eggs in one basket', as one employer put it, particularly those maintaining links with only a small number of universities, and were at pains to make clear that all applicants would be judged against the same criteria regardless of their institution.

2.8 Many employers, including most of the larger and even some of the smaller employers, maintained links with institutions for reasons unrelated to recruitment; the majority of these were research and related agreements and relationships, often on a contract basis. In one case, such collaboration was formalised through a company's sponsoring technology centres or PhD students in selected universities. Other employers allowed staff to act as visiting professors who would give lectures or provide advice on curriculum development, often out of personal interest, as much as in order to derive any particular company benefit or as a result of a company policy or strategy. Although in one instance it was felt that such a relationship had been valuable in influencing the content of an institution's curriculum to reflect better the needs of the company, in general these links were not really exploited in connection with the company's recruitment needs.

'Quite a lot of our employees have links with their universities, e.g. they lecture there but to be honest we don't have a full picture of that; we know there's quite a few but we know there's more of it that we don't necessarily know about.'

2.9 A couple of employers, when asked, reflected that it would be useful if such overlap existed, particularly if a company was experiencing difficulties recruiting specific types of graduates. One employer, for example, agreed that, although their sponsorship of PhD students helped with brand awareness at a number of institutions, it would be helpful if they could have built on this collaboration to run specific events for students within the engineering department rather than having to rely on attendance at more generic careers fairs.

2.10 Most positively, a couple of employers had decided to exploit their research relationships with particular universities in order to forge links with the department/faculty at a different level and, more importantly, directly with students through the sponsorship of societies, for example.

3. Relationships with institutional careers services

3.1 There was a mixed response to questions about the relationships between employers and institutional careers services. In general, employers used careers services as their first port of call at an institution and found them to be very helpful in performing this role, either in terms of the range of services they provided directly to employers, or in referring them on to departments or particular individuals who might be better able to help them, or in some cases both of these. There were many examples given of effective collaboration including employers and careers staff jointly presenting to students about the engineering industry and how to enter and progress within it.

3.2 Some employers, however, perceived a wide variation in the resources of careers services meaning that, in some cases, they felt the response they received to requests was necessarily limited. Many careers services were felt to be extremely engaged in the business of meeting employers' needs, particularly those with a dedicated employer liaison function, and concerned to understand these and to put them in touch with the right people in situations where the careers service itself could not help. The best, in this respect, were those that anticipated these needs to some extent and offered specific services and provision accordingly. This was regarded as particularly valuable when an employer was late on the recruitment scene or needed to contact students outside the main recruitment schedule, and flexibility and innovation were required. One employer, for example, mentioned a situation where they were late booking for a fair and no spaces were available but the careers service was able to offer an acceptable alternative.

'So a lot of stuff was full but what was great was those universities that were saying ''This is full but you can do this, that etc.'' and want to engage with you; and it's easy to find out who you need to speak to.'

3.3 Other examples of good practice included being prepared to keep open channels of communication and offering employers constant reminders of forthcoming events and activities, rather than expecting employers to make all the running. The personal touch was seen as crucial in this respect, and several employers referred to the importance of having one point of contact for all communications, and careers staff taking time to understand an employer and how they operated.

3.4 On the other hand, a couple of employers expressed concern that some careers service staff did not fully comprehend the reality of working for an engineering company, and questioned how well-prepared they would therefore be to inform students. A further issue for some employers was the perception that some careers services viewed employers as a source of funding and charged for many of their services; such employers were at pains to point out that, contrary to expectations, their recruitment budgets were not always very large. Complex employer registration processes were also regarded as counterproductive.

3.5 Overall, employers pointed to the value of a true partnership approach, involving mutual respect and a shared commitment to understanding and meeting the other's needs, and agreed that, where this happened, the relationship was effective and beneficial to both parties.

4. Future changes in recruitment strategies

4.1 Employers were asked to say whether they felt it likely that their recruitment strategy would change in the future, in response either to developments in the wider higher education context or to commercial pressures. Few employers felt able to talk about this area in any detail but several themes began to emerge from those expressing an opinion:

a) Amongst bigger employers particularly, there seems to be a move towards engaging with students at an earlier stage in their engineering education, either in the first year of a degree course or even prior to this in schools and colleges in an attempt to interest them in an engineering career. In this respect, there seemed to be a role for broader education about what a career in engineering might actually involve, plus a more specific drive to sponsor such students deemed to have the appropriate academic ability and motivation through apprenticeship and similar programmes.

b) A couple of employers were anticipating that higher tuition fees might reduce the supply of good graduates and were, therefore, looking to recruit highly skilled people from different sources, possibly through foundation degrees or HNCs. In this scenario, traditional graduates would need to be looked at in a different light, possibly more specifically as *'high fliers'* or future senior managers. This might mean that fewer were recruited and that entry criteria were higher, possibly making a masters-level qualification a prerequisite.

c) Some employers were attempting to change their methods of engaging with graduates in order both to make contact with a wider range and to keep up with developing trends and technologies. One employer, for example, was experimenting with social media such as Facebook and Twitter, as a means of expanding its communication channels, although in a guarded way (described as a *'toe in the water'*), as they were mindful of the dangers of employers being seen to encroach on students' social media spaces.

e) Employers' selection processes

This section outlines the main stages of the recruitment process adopted by employers in the survey, and the primary reasons why applicants were rejected at each one. In general, most employers seemed to use three stages but some, often smaller ones, reduced this to two.

1. Selection process: first stage (application form/CV)

1.1 The majority of employers used an online application process to which any interested students or graduates making speculative enquiries were directed in the first instance. In most cases this process consisted of an online application form although, for a small minority of employers, applicants were also requested to upload their CV and a cover letter.
Only one employer, a smaller one recruiting on a very ad hoc basis, asked for a written CV and cover letter to be sent to them.

1.2 Employers were more evenly divided, however, between those requiring applicants to apply for a specific vacancy and those only needing a generic application for their graduate programme. Interestingly, one small employer, offering a small number of specific vacancies a year, argued that they didn't want applicants to tailor their applications for particular posts, preferring instead to

identify the required skills and experience from applicants' generic CVs. One employer allowed applicants to upload their application and register for future vacancies and job alerts.

1.3 In general, the type of information sought at the application form stage was similar for most employers. This was largely personal data about the applicant, their academic study and qualifications, and their work experience and extra-curricular activities. Where more specific questions were put to applicants, these tended to invite them to explain their interest in engineering and motivation for applying, along the following lines:

- *Why did you choose to study your particular degree?*
- *Why did you apply to X?*
- *Why are you interested in the X graduate development programme?*
- *Why should you be selected for the X graduate development programme?*

1.4 Some employers, especially those using a more sophisticated scoring system to assess applications, posed specific questions about particular skills or attributes ('competence-based questions') that they were seeking, which invited an evidence-based response, for example:

- *Tell us about a time when you worked as part of a team. What was your role and how successful were you?*

1.5 It was difficult to establish an accurate sense of the numbers of applications received per post and the proportion of applicants rejected on their applications alone. Certainly, several of the larger employers indicated that the former ran into several hundreds or even, in a couple of cases, thousands requiring the use of a fairly mechanistic process to whittle these down to a manageable number, often resulting in between 50% and 80% being rejected at this stage. It was clear, therefore, that this first stage accounted for the vast majority of unsuccessful applications and that, if applicants were able to successfully negotiate this hurdle, their chances of being recruited improved markedly. Several employers helpfully gave some statistics that illustrate this fairly severe culling rate.

	Number of applications	**Number (%age) rejected**
Employer A	1448	836 (58%)
Employer B	666	554 (83%)
Employer C	650 – civil engineering 429 – mechanical engineering 708 – electrical engineering	527 (81%) 296 (69%) 517 (73%)

Table 1: Approximate proportions of applicants rejected at the application stage

1.6 Employers were forthcoming about the reasons why applicants were rejected on the basis of their application forms. In some cases, applicants did not have a relevant degree subject or did not meet the academic entry criteria in other ways (for example, they did not possess enough UCAS points or had lower than the 2:1 required). Some employers received many applications from international students without the legal right to work in the UK and who were consequently rejected for this reason.

1.7 The majority, however, were rejected for reasons falling into three main categories.:

a) Many applications exhibited poor spelling, grammar and punctuation. For most employers, such applicants were not demonstrating the attention to detail that they would be expected

to display in the job. These shortcomings are, in many respects, a gift to selectors looking for reasons to reject applicants.

b) Some applicants did not answer the competence questions well enough by either avoiding them completely or not providing enough evidence for the selector to make a reasonable judgement about them. For instance, one employer reported that an applicant, when asked about a particular competence, responded that they were *'unable to provide an example'*. Another employer complained that too many applicants merely cut and pasted material from the company's own website in response to questions, rather than go to the bother of thinking for themselves. Another felt that some candidates misunderstood the point of some of the competence questions and would, for example, answer a question about *'teamwork'* by talking at length about their *'leadership'* skills; as the employer pointed out, leadership, whilst perhaps a valuable trait, is not the same as teamwork!

c) Employers felt that many graduates did not use the opportunity presented by the application form to sell themselves and seemed to approach the process of completing it in a very mechanistic way. One employer speculated that such applicants were perhaps becoming bored with the whole business of applying for jobs and not appreciating that the onus was on them to make an employer want to find out more about them by displaying their interest and enthusiasm. In this context, some employers found that graduates appeared to know little about the company to which they were applying and made scant effort to tailor their application to their requirements. Linked to this was a feeling that many graduates were unable to demonstrate, or perhaps did not have any, enthusiasm for a career in engineering to the extent that one employer wondered why they bothered applying at all.

'In activities and interests they can be very weak like ''I go to the gym. I socialise'': there's nothing substantial there. They don't sell themselves and they miss the opportunity to sell themselves. And where we say ''a maximum of 10,000 characters'' we mean that; and ''use the space'' but some of them put one sentence. There's no time or thought been put into it. There's a real emphasis on those text based questions and that's what can help them stand out from another candidate.'

1.8 Whilst all the above would appear to be just reasons for rejecting applications, occasionally employers indicated that their rationale was slightly less reasonable. One employer, for example, talked about applicants being rejected because they had attended a *'poor university'* although, when pressed how this would be judged, was only able to say that they had evidence from previous recruits that *'some are better than others'*. Another echoed this by commenting that they looked for *'decent university, hands-on experience, good grades'* but was not able to elucidate any further on what was implied by *'decent'*.

2. Selection process: second stage (telephone interview; psychometric tests)

2.1 About half of the employers in the survey operated a second stage in their recruitment process, normally consisting of a telephone interview supplemented, in some cases, by online aptitude tests. In three cases, however, the second stage consisted of online aptitude tests only and, in one instance, success in the telephone interview led to an invitation to take online tests. Those employers not using a second stage in their processes instead invited those applicants successful at the application stage to the final stage, normally an assessment centre or final interview.

2.2 In general, the larger employers employed a structured interview technique in the telephone interviews probing applicants on the key competencies that they were seeking. In some cases, this was done partly to test out the responses given on the application form; in other words, checking

that the applicants could back up their claims with more specific evidence. Employers also used the interview to pick up on any areas of doubt that they had identified from the application form and to investigate applicants' motivation for applying and what they knew about the company. One of the smaller employers indicated that the objectives of the telephone interview were quite limited being merely to check out a candidate' salary expectations and their right to work in the UK.

2.3 The most common aptitude tests used by employers were those assessing their verbal and numerical reasoning. Applicants were given a period of time, typically a week or ten days, within which they had to complete the tests, normally taking about an hour. Candidate' scores were then compared against graduate norms although limited leeway was granted by some employers. One employer asked applicants to sit an online situational reasoning test first before inviting those passing this to take verbal and numerical reasoning tests. Another large employer invited those passing the latter to sit a two-hour online assessment that tested them against 12 dimensions to produce a profile of strengths and weaknesses.

2.4 Employers reported that candidates who were not successful at the telephone interview typically demonstrated two main weaknesses:

a) Many either failed to live up to the impression created by their application form or were unable to add substantially to this in the interview.

b) Some applicants made it very hard for the interviewer by the brevity of their responses or the lack of detail contained within them. Some employers rejected those who did not sound enthusiastic about a career in engineering, by not being prepared to talk sensibly about their project or work experience for example, or who were unable to sell themselves effectively in the interview.

3. Selection process: third stage (assessment centre)

3.1 The vast majority of employers used assessment centres as the final stage of the selection process. There were significant variations in the proportion of applicants who were successful in being invited to this stage. The table below indicates this disparity, although it should be noted that several employers were quoting from memory rather than actual statistics.

	Proportion of second stage applicants invited to third stage (assessment centre)
Employer A	30 out of 50 (60%)
Employer B	About 50%
Employer C	About 25%
Employer D	401 out of 612 (66%)
Employer E	About 50%
Employer F	Civil (28%) Electrical (44%) Mechanical (46%)
Employer G	About 50%
Employer H	About 15% of all applicants

Table 2: Approximate proportions of applicants invited to assessment centre

3.2 Assessment centres typically lasted a day but in one case this stretched over two days and involved a social occasion (dinner) where applicants could meet recent graduates and managers in a less formal setting. One employer did not use an assessment centre but preferred a second panel interview comprising four HR staff and divisional managers and focussing on applicants'

competencies, especially from extra-curricular activities, and motivation. Another employer, from the SME sector, described their assessment centre as more of *'a long interview with exercises'* rather than a traditional assessment centre.

3.3 Most employers in the survey employed similar activities, often in combination, in their assessment centres, including:

- Group tasks/discussions
- Presentations
- Psychometric tests
- Interviews
- Other activities

These are each dealt with in more detail in the sections below.

- ***Group tasks/discussions***

This might either be technical (i.e. related to the engineering industry) or non-technical (e.g. a topic of more general interest, a 'desert island' type scenario, or a practical 'building' task) designed to allow candidates to demonstrate various skills including interpersonal (listening and communicating), team work, time management, organisation, analysis, problem solving, logic, leadership, delegation, calculation and ability to focus. The exact nature of the task or discussion might vary according to the function for which candidates were being assessed. At least one employer felt that applicants were increasingly aware of the required behaviours in group discussions, and consequently behaved unrealistically, leading him to question privately how useful such exercises were in helping to discriminate between candidates. Another employer commented that they did not use a group task as they used the occupational personality questionnaire (see below: Psychometric tests) to identify relevant behaviour traits.

- ***Presentations***

Again, these might either be technical (e.g. about a final year project) or non-technical (e.g. finest achievement), or, in one instance, candidates were offered a choice of both technical and non-technical options; and were generally quite short (between five and ten minutes long). In some cases, candidates were given the topic in advance and were therefore able to prepare but, more commonly, they were informed of this at the assessment centre and given between half an hour and an hour to prepare. There was normally a short period after the presentation for questions. Assessors were looking for evidence of communication skills, analytical ability, ability to handle data, organisation, time management and, in the case of technical presentations, technical understanding.

- ***Psychometric tests***

These tended to be for numerical and verbal reasoning with a few employers also including spatial and abstract reasoning tests. In the case of one employer, these tests were set in order to test the validity of performance by candidates in the same tests taken online earlier in the selection process. A small minority of employers also asked candidates to sit the Occupational Personality Questionnaire in order to assess their fit with the company in terms of their values and preferences.

- ***Interviews***

Many employers required candidates to attend two interviews: a technical interview with line managers or technical supervisors and a competency-based interview with HR staff. These interviews lasted between thirty and ninety minutes and were structured with similar questions being asked of all candidates and the use of scoring templates, based on key required competencies, to ensure objectivity when comparing assessments. There was slightly more variation with smaller

employers who tended to place greater emphasis on a more hands-on approach; for example, one employer gave all candidates a piece of metal and asked them to talk about it in terms of its properties, how it might have been produced, what it might be used for etc. Several employers commented that the interview was the most important part of the assessment centre with one indicating that the technical interview was given twice the weighting of the other elements.

- ***Other activities***

As noted above, there was considerable uniformity about the type of activities making up assessment centres but several employers varied the content a little. One employer used a role-play exercise in which candidates were provided with a written briefing followed by a one-to-one interview with a senior manager at which they had to present and defend their recommendations. Another employer similarly used a written test in which candidates were required to tackle a generic problem and identify possible solutions.

3.4 In addition to the various assessment exercises described above, all employers felt assessment centres gave applicants the chance to view their working surroundings and to talk to managers and other staff, particularly recent graduate recruits. Opportunities to meet the latter were frequently not moderated by senior staff in order to allow them to express their opinions freely and hence provide a 'warts and all' impression of the organisation.

3.5 Employers identified reasons why applicants were unsuccessful at assessment centres and these shortcomings are described within each of the main activity headings below.

- ***Grouptasks/discussions: candidates' shortcomings***

During group discussions many candidates failed to do themselves justice by, for example, not contributing to the discussion or not expressing their views assertively and displaying confidence. One employer complained that it was impossible for them to judge the calibre of an applicant if they did not say anything and merely sat on the sidelines. Alternatively, probably in an attempt to compensate for lack of confidence, some graduates were guilty of going to the opposite extreme and attempting to dominate the discussion thus denying other applicants the opportunity to speak. One employer felt that behaviour of either type was possibly the result of nerves and that it was up to the employer to put candidates at their ease during the assessment centre. Employers generally were looking for people who could influence the group, and who would challenge others to defend their opinions, but in a sensitive and appropriate way so that the group as a whole came to sensible decisions without rancour and discord.

'When there's a group exercise, have they participated or have they stood on the side? Have they stood on the side and then gone ''Well, I know what the answer is'' and just done it themselves or have they had some degree of communication: have they …… been able to say ''Look, this to me looks like the shape of this problem''? ……And being able to win and influence and bring people along rather than standing up and having an argument about whether or not that should be right ……. .''

- ***Presentations: candidates' shortcomings***

Several employers commented on applicants who presented poorly. The main problems here centred on inadequate preparation (in cases where candidates were given prior notice of the presentation topic), or on an inability to present a coherent case with substance and a clear understanding of the key issues. Some candidates confused volume of content for clarity of argument, a difficulty that sometimes led them to run over their allocated time, a cardinal sin in the eyes of some employers. In other situations, where they were asked to review evidence and present

recommendations based on this, the weaker candidates either ignored elements of the evidence that did not fit with their argument or, occasionally, made no recommendations at all.

- ***Interviews: candidates' shortcomings***

Most importantly, all employers drew attention to shortcomings in candidates' interviews. These fell into several categories:

a) Many candidates demonstrated poor interview technique and, specifically, a lack of adequate preparation. Candidates apparently did not seem to understand what was happening in the interview and had not come prepared to deal with questions about their motivation, competence, skills and suitability. They therefore struggled to answer questions about their reasons for wanting a career in engineering or how they might have developed the skills sought by the employer. In particular, many had not researched the company properly to obtain a thorough understanding of the key selection criteria and to prepare evidence to show they met these by reflecting adequately on their skills and attributes, or were unrealistic about the career path and benefits that the company might offer them. Consequently, for many candidates there appeared to be a huge gap between the information provided on their application form and that which they revealed at interview. One employer said that they would expect a good candidate to use the interview to their advantage by going into greater detail about areas dealt with only superficially on the application form, but many were reportedly unable to do this. In this context, it is noteworthy that some employers felt that graduates with work or other extra-curricular experience had more evidence to draw on in these situations, so generally performed better, although this was not always the case.

b) Linked to the above, other candidates were felt to lack confidence and be unwilling to sell themselves or to reveal their personality at interview. Again, employers were not looking for a slick sales job from candidates but more an understanding of the rules of engagement at interviews, a keenness to enter enthusiastically into the encounter, and a desire to express themselves and to enter into a dialogue with the employer.

c) Some employers referred to graduates' lack of commercial knowledge and experience. In essence, this boiled down to an inability to appreciate the business imperatives driving a company and to place their individual role within a broader context. For instance, one large employer considered that many applicants were unable to appreciate the potential contributions to be made by other engineering disciplines to their own area: for example, how electrical systems perform in a mechanical environment. As most employers were effectively engaged in project management on a large scale, this inability to think laterally about how such an approach affected their specific role and expertise concerned them. Other employers mentioned that graduates were limited in their grasp of the commercial environment and how it relied upon the virtues of effective teamwork and communication, and the overriding need to have regard to the 'bottom line'. Significantly, employers thought that graduates with work experience, particularly, although not exclusively, those who had completed a year-long placement, were less likely to exhibit these weaknesses and more likely to have found their work experience to be a useful introduction to wider commercial considerations. One employer, who used the role-play exercise as part of their assessment, felt strongly that this favoured those with work experience who were better able to think on their feet when challenged on their conclusions by a senior manager.

d) By far the most serious weakness identified by employers, however, was an inability to apply basic engineering principles and concepts to everyday work situations. Several complained

that graduates might have passed their degree with flying colours but seemed unable to make connections between their theoretical knowledge and practical problems. For example, one employer described graduates as being unable to look at a turbine blade and answer basis questions about it, such as: what is it made of?; what are its properties?; how might it be used? This weakness also manifested itself when graduates were talking about their final year project but were unable to explain its salient technical elements in any detail.

'…….. they'll describe their final year project; so we'll start asking them questions about the project management elements of it because that's something that's quite important: how you organise yourself, what barriers and challenges have you had? …… What changes can you make that will improve the temperature? ''Well, we look for materials''. What kind of materials? What's the difference between high chrome and low chrome? And there's just nothing: they're not able to articulate the technical elements and the important technical features about their final year project, which is something that they've lived and breathed for the last nine months and they should know it quite intimately.'

e) More specifically, some employers referred to graduates' inability to recall or handle formulae, calculations or principles when discussing engineering problems. They were perceived either to have forgotten basic knowledge that they should have been taught in their first year, not fully appreciating that this was meant to have been built on in subsequent years and to act as a foundation for future learning and problem-solving; or to be too reliant on technology for making calculations or providing answers to questions. One smaller employer said that he wanted graduates to be able to do paper calculations using basic formulae rather than relying on a computer to do this for them. He felt that this facility was an important check on more automated methods and, during the interview, he would check out graduates' ability in this respect with various practical challenges. His company now took the approach of using the selection process as a method of identifying what remedial work they would need to do with new recruits and then putting this in place soon afterwards.

'The biggest problem that we have with graduates …… an example of which is we present someone with a problem: they have a simply supported beam with a force at one end and we say ''You put this through your FEA analysis on the computer and the computer says the peak stress is 30,000 megapascals, or something like that. Do you think that's right?''. And nearly everybody says ''yes'' so you ask ''Why do you think that's right?''; '' Because the computer says it's right''. ……. So not only do they not have a feel for it not being right…… That feel is not there…… but that's our biggest challenge and what we have to do is de-learn graduates that the computer is not the answer; the computer is just a big calculator. But within that computer are all the equations that you should know how to use on paper. So we make people do the hand calcs all the time.'

As mentioned elsewhere, most employers used technical assessments in their assessment centres, either by having technical managers present in an interview panel or by including such elements within presentation or group tasks. Consequently, these technical weaknesses were quickly picked up by employers and acted as a key discriminator between good and poor candidates.

4. Feedback to candidates

4.1 About half the employers were prepared to give feedback on performance to candidates, most commonly after the assessment centre stage. Only one employer was happy to do this earlier in the process, largely due to the greater numbers involved. A couple provided this feedback without being asked by candidates, whereas for the majority, this was only done on request. One employer had

given feedback in the past but now no longer did so, arguing that many graduates did not like what they heard and the whole process was too time-consuming.

4.2 Particular mention must be made in this context of one employer who provided all candidates with an A4 written summary of their performance in all elements of the assessment centre, including an occupational preference questionnaire summary.

e) Employers' advice for institutions and students/graduates

Employers were asked whether, from their experience of recruiting graduates and dealing with universities, they had any advice for both institutions, in terms of the support they provide to their students, and students and graduates, in terms of how they might help themselves.

1. Advice for institutions

1.1 Whilst some employers were reluctant to offer any advice to institutions, a few major themes emerged from those that were. Several employers expressed strong views about how engineering departments might develop their curricula in order better to reflect the realities of an engineering career, amidst a general feeling that there needed to be a *'better fit'* between the curriculum and industry. This might be effected in various ways: bringing employers in as guest lecturers to talk about the practical application of engineering principles, for example, or by seeking the advice of industrial experts when planning new modules. One employer went further and stressed the virtues of interdisciplinarity to ensure that graduates were exposed both to other branches of engineering and to other scientific disciplines so that expertise permeated the boundaries between them. This approach would mirror the way in which industry routinely brought people together from different backgrounds to collaborate on a project.

'What would be nice would be a university where you didn't get walls between faculties: you're a mechanical engineer and you're engaged on a project with a software engineer and a mathematician or astronomer, something like that; and all of these things work and there's a kind of exchange of expertise across the boundaries. I notice it's quite funny at (institution) because the space operation in the Physics bit hardly ever speak to the electronics people and yet they've got the same kind of design imperatives and stuff.'

1.2 On this theme a number of employers talked about the importance of helping students understand the practical application of engineering theory in solving the types of problems that engineers in industry often faced. One employer felt that students sometimes relied too heavily on computers to overcome such challenges without fully understanding the fundamental engineering principles that these employed; computers had their place but students should be able to tackle problems on paper before resorting to technological solutions. Another referred to the benefits of work-related learning and work placements in helping to make these connections.

'Trying to integrate as many practical skills as possible because I think it brings it alive for people; so increasing the amount of practical activity can only ever be a good thing. I know some universities are good at it, some aren't; and that could just involve having to do a sandwich year. But the argument from the universities is that it's very difficult to organise because it's hard to place people: it is, but if you do it, they'll get a job at the end of it.'

1.3 Some employers thought that students knew too little about careers in engineering, lacked awareness of which employers were leaders in any particular field, and did not understand how to find out about graduate opportunities. In this context, one employer said that if students were studying offshore turbines, for example, then they should also be taught about major employers in

this field and, perhaps, taken on visits to see theory in practice. Another felt that all engineering departments should have dedicated staff with a careers responsibility to establish profitable links with employers. One smaller employer argued strongly that students needed to have their awareness raised about the SME sector as he felt that larger employers dominated in terms of publicity and marketing, although ultimately the former employed more graduates.

1.4 A common theme developed by employers concerned the deficit they perceived in students' understanding of the recruitment process and their ability to sell themselves effectively. Employers placed the onus on institutions to ensure that their students prepared adequately by:

- researching employers before applying to them
- understanding their own balance of skills, attributes and interests and how these affected their career aspirations
- demonstrating professionalism when communicating with employers
- compiling CVs and applications that combined information with impact
- appreciating the dynamics of the interview situation and how they could influence these for their advantage

1.5 One employer recommended that sessions covering these topics should be compulsory and delivered within the curriculum whilst another highlighted the value of Insight and similar courses for bringing employers and students together and teaching business professionalism.

1.6 A small minority of dissenting voices, however, suggested other perspectives. One employer thought that universities already did a good job in running skills sessions and that it was up to students to attend these and demonstrate their motivation. Another felt that universities and the workplace were very different and that it was not an institutional responsibility to inform students about the latter except to point out that different dress and behaviour codes applied, whilst another argued that universities should concentrate in teaching the *'engineering mathematics'* and leave it up to employers to instruct graduates in *'enterprise, business awareness and presentation skills'*.

'I'd rather they just spent time learning some engineering maths. The other stuff you learn at work. Presentation skills: we're talking about engineers here; they're not ever going to be the best presenters in the world and we can teach them that stuff. …… Probably (employer) and (employer) say something different but we need someone to hit the ground running from an engineering point of view; the other stuff we can teach them. The engineering bit takes a long time to teach. That sounds a bit negative but I've noticed there is an increase in people saying ''My entrepreneurial skills are very good'' – who cares?'

2. Advice for students

2.1 The advice offered to graduates was more straightforward with most employers agreeing that *'getting relevant work experience'* was the single most beneficial activity a student could do; as one employer put it, *'summer vacations are not just for sitting around on a beach'*. Another emphasised the value of students' forging links with employers through project work.

2.2 Some broadened this to include other extra-curricular activities with the intention of encouraging graduates to stand out from the crowd. The advice was not to rely on their course for all their skills development, and to exploit their cultural capital - friends, family and contacts – when seeking experience and researching the job market. One employer suggested that students improve their communication skills in particular, whilst another argued that students should not allow the current obsession with getting a good degree to blind them to the importance of improving their skills, and exploring the job market. By contrast, one small employer urged students to get the basics

right – engineering maths, principles, formulae and calculations – as the rest can be learnt through experience later.

2.3 Closely linked to this was an exhortation to take advantage of every opportunity presented to them by the institution and, in particular, all the activities organised by the careers service, especially those involving employers such as presentations and fairs. In relation to the latter, one employer advised students to prepare properly so that they could talk with confidence to employers attending such events.

2.4 Other employers focused on the application process and advised students to:

- research employers properly before applying
- widen their net to include smaller employers
- tailor their CVs to the requirements of different employers
- understand what is on offer and how they meet the selection criteria
- be positive, show energy and drive
- tell employers what they, as graduates, can do for them rather than the other way round.

G. Literature Review

Introduction

The *HE STEM Project: Unemployment of Engineering Graduates; the Key Issues*, in its proposal summary, states that:

'There is substantial evidence of demand from engineering employers for engineering graduates. However, the 2010 HESA Destinations Survey data shows a 13% unemployment rate figure for engineering with, in addition, a proportion of graduates employed in non-graduate level jobs. The aim of this project is to unpick this figure and break it down into its contributory factors so as to explain the discrepancy.'

This literature review has been written in order to inform, illuminate and to provide a background and context for the above by drawing together a range of studies, research and comment. It has been divided into sections as follows:

1. The UK Engineering Industry: background
   Broad engineering sectors; regional variations; engineering roles; graduate output from engineering degrees; and demographic and gender issues.

2. Recruitment in the Engineering Industry
   Recruitment intentions, confidence and difficulties; professional staff shortages; and why STEM graduates might enter non-STEM jobs.

3. Skills Shortages in the Engineering Industry
   Employers' perceptions of graduates' skills deficiencies, particularly applying knowledge to real-life problems; the tension between 'specialised' and 'generic' skills; the public perception of engineering skills; and differences between large employers and SMEs.

4. Work Experience and Placements

The importance of work experience in building careers awareness; work experience in the recruitment process; academia's views on work experience; and 'experience-led' alternatives to placements.

5. Graduate Intentions and Choices
   The uncertainty of many STEM graduates' career aspirations; the impact of contingency on graduates' career paths; and a questioning of 'simplistic' model underpinning STEM policy.

6. Collaboration between Higher Education and the Engineering Industry
   Different levels of engagement; tensions between 'research' and 'teaching'; communication channels between HE and industry; 'experience-led' degree components; the tripartite model; staff development; importance of careers services.

1. The UK Engineering Industry: background

Engineering UK's *Engineering UK 2011: The State of Engineering* includes an analysis of the size of the UK engineering industry and its major sectors. From data in the Annual Business Inquiry (ABI), it concludes that there were 553,182 engineering businesses in the UK in 2008 (about 14.8% of the ABI total) and, of these, over half were in Construction (292,762 businesses), with the next biggest sector being Manufacturing (131,782). These dwarfed the number of businesses in the remaining engineering sectors (Architectural and engineering activities; Land transport and transport via pipelines; Telecommunications; Water supply, sewerage etc.; Mining and quarrying; and Electricity, gas, steam and air conditioning supply). The Manufacturing sector, however, had the biggest turnover (£502,703m), over double that of Construction (£223,322m), and also employed the most staff (2.8m out of a total for the engineering industry of 5.9m workers), although, with 254 workers per company, the Electricity, gas, steam, and air conditioning supply sector employed more workers on average.

The report also includes a 2009 analysis of engineering enterprises by size (turnover and employment) and region indicating considerable variations. South-East England accounts for the largest number of employees in engineering companies (17.9%) and the largest share of turnover (20.6%). When combined with the shares for London (10.3% and 18.2% respectively), there is a clear preponderance of engineering enterprises in southern England. The figures for the West Midlands (employment: 10.4%; turnover: 8.6%) and, particularly, for the East Midlands (employment: 7.2%; turnover: 5.5%) show comparatively less engineering activity. In addition, whilst across the UK as a whole 42.1% of engineering employees are in companies employing over 250 employees, this figure is only 36.3% for the East Midlands (although higher in the West Midlands at 41.9%). These larger companies are more likely to have comprehensive training programmes recruiting sizeable numbers of graduates.

The report also makes very specific references to the urgent need to decarbonise the UK economy, the potential growth in jobs in the renewable energy sector, and the potential impact of this on the engineering and manufacturing industries. It concludes that the skills demanded by industry in response to these developments will not be fundamentally different from the existing skills base but that the application of these skills will change and that *'engineers will be required to expand their current skills base, which will remain valid and transferable within the green economy'*.

The Institution of Engineering and Technology's *Skills and Demand in Industry Annual Survey 2010* indicates that 13% of staff in surveyed organisations held engineering or technical roles and nearly two-thirds of these (8%) were professional engineers (chartered engineers or those operating at chartered level). These are the roles that engineering graduates would be expected to enter after the academic stage of their education/training. The proportions of professional engineers across

different engineering sectors varied considerably, from 1.9% in Broadcast and Media (ignoring the tiny sector of Pharmaceutical and Health Technologies which employed none) to 10.2% in Electrical, 11.6% in Transport, and 19.7% in Aerospace. By function, the highest proportions of professional engineers were employed in Consulting (14%), Research (8.2%), Development and Design (7.5%), and Engineering and Technology Services (6.9%).

The Royal Academy of Engineering's 2007 report, *Educating Engineers for the 21st Century*, states, however, that the UK's *'basic output of engineers is effectively stagnating'*, indicating that between 1994 and 2004 the number of students on engineering degrees in UK universities remained at 24,500 each year despite a 40% increase in university admissions generally over the same period. With less than half of these graduates choosing to enter the profession after completing their studies, the report concludes that this placed the UK at a disadvantage in comparison with the BRIC (Brazil, Russia, India and China) economies producing more engineering graduates, and called for action to *'counter and reverse these trends'*.

This conclusion is echoed in the Royal Academy of Engineering's 2010 report, *Engineering Graduates for Industry* which states that *'there are indications that the number of engineering graduates will not be sufficient to meet the longer term skills demands of industry'*. It quotes the Institution of Engineering and Technology's *Engineering and Technology Skills and Demand in Industry* report in 2008 that '*33% of respondents were experiencing problems recruiting graduate engineers'* identifying *'civil engineering and energy as areas with high recruitment needs'*. It also cites 2009/10 data from Engineering UK showing that, although applicant numbers for engineering and technology degrees had risen by 16% since 2007, the number of engineering graduates was unlikely to meet industry's requirements, *'partly due to the need to replace engineers who are retiring'*. The Institution of Engineering and Technology's *Skills and Demand in Industry Annual Survey 2010* supports this view, estimating that, between 2008 and 2010, the proportion of engineering and technical employees over the age of 40 increased from 45.6% to 50.9% whilst those under the age of 30 decreased from 24.7% to 20.1%.

An important issue that crops up in several reports is that of widening participation with women, black and ethnic minority students and some socio-economic groups under-represented in engineering generally. In this context, the Institution of Engineering and Technology's *Skills and Demand in Industry Annual Survey 2010* includes data indicating that, whilst 20% of employees in engineering companies overall were women in 2010, the proportion of those employed in engineering and technical roles was lower (only 5% of professional engineers, for example). Engineering UK's *Engineering UK 2011: The State of Engineering* report cites gender inequality in engineering as a key challenge for the industry, stating that *'In 2009, fewer than 13% of new Chartered Engineers were female, and the UK has the lowest percentage of female professional engineers in Europe'*. The same report demonstrates that application rates from women to different degree disciplines vary considerably; those for most disciplines ranged between 6.5% and 15.3% in 2008/09 although the rates for Production and Manufacturing Engineering and for Chemical, Process and Energy Engineering were higher, at 22% and 26.7% respectively.

2. Recruitment in the Engineering Industry

The Institution of Engineering and Technology's *Skills and Demand in Industry Annual Survey 2010* reveals that many organisations were experiencing difficulties in recruiting staff in 2010 after these problems had receded somewhat in 2009. In particular, 20.8% reported difficulties in recruiting graduate engineers (in 2008: 33%; in 2009: 16%) and 22% in recruiting engineering management (13% in 2009), compared with only 12.8% and 6% having similar problems with regard to engineering technicians and apprentices respectively.

Furthermore, 41% of engineering organisations planned to recruit new engineering and technical staff in the following 12 months, a considerable increase over the previous year (22%). These intentions were particularly marked in the Computing and IT (65.7%), Energy (50.3%), Defence (48%) and Aerospace (47.6%) sectors. In terms of function, the highest recruitment intentions were recorded for Consulting (51.7%) followed by Development and Design (46.7%), Research (43.9%), and Engineering and Technology Services (43.9%). Of this recruitment, organisations reported that 51% was to be of experienced staff (a significant increase on 2008 when the comparative figure was 32%) and 26% of graduates (marginally lower than 2008's 28%). The biggest changes were the proportions of postgraduates (down from 24% to 14%) and school leavers (down from 16% to 9%).

When asked about their confidence that they would be able to recruit suitable engineering and technical staff in the following year, organisations were more confident than in 2008 but still regarded a lack of suitably qualified candidates on the job market (43.4%) as the biggest single cause for concern, although shortages or difficulties with specific skills (34%) and candidates lacking the right experience (26.4%) were also major hurdles. These three factors were also anticipated as being significant obstacles to recruitment over the next five years. It is worth noting that, of the three key factors identified, the third (candidates lacking the right experience) demonstrated the greatest increase since 2008 and was clearly a matter of growing concern.

The Royal Academy of Engineering's 2007 report, *Educating Engineers for the 21st Century* draws attention to the recruitment problems of many companies surveyed, in particular their difficulty in attracting *'enough of the best'*. This was regarded as concerning, in the context of predictions that graduate engineers will make up an increasing proportion of the workforce in the next ten years, and its negative impact was already being seen in new product development and business growth. In particular, employers expressed concerns about graduates' ability to apply knowledge to real industrial problems and how this had become more acute in recent years.

Engineering UK's *Engineering UK 2011: The State of Engineering* found that the incidences of hard-to-fill and skills shortage vacancies for professional staff in the engineering industry were both 20%, twice as high as those for UK employers generally, and points out the inevitable impact in terms of: increased workloads of other staff; delay in developing new products/services; increase in operating costs; and loss of business.

The Department for Business, Innovation and Skills Research Paper 31: *STEM Graduates in Non-STEM Jobs* investigated why some STEM graduates (including Engineering graduates) chose not to work in occupations related to their degrees. The report concluded that as many as two-thirds of Engineering students (at all levels – undergraduate, masters and PhD) definitely wanted a degree-related career, a proportion that, although higher than for other STEM subjects, still leaves at least a third considering other alternatives. It was found that those who had firmer career plans when starting their degree were more likely to wish to enter a STEM occupation and that *'degree-related work experience had a strong influence on developing a career plan, mostly towards a STEM occupation'*. Most students had chosen to study a STEM subject for interest and enjoyment rather than any career-related reasons, and, even for those that did fall into this category, the choice was more to do with keeping career options open than in order to *'accelerate them to a specific STEM occupation'*. The study also found that, although only about 11% of STEM students reported that they wanted to work in employment unrelated to their degree, *'a larger and more significant proportion have only vague or no career plans'*. Many final-year students '*had not made job applications halfway through their final year, and roughly a quarter expect to take time out or enter temporary work next, deferring any long-term career direction decision'*.

The reasons STEM students seek careers in STEM degree-related areas were *'the potential for interesting work and to use their learning and specialist skills'*. On the other hand, the reason why some chose non-STEM careers was, quite simply, because those careers were seen to be of more interest. Although salary levels were an important factor in many graduates' choices, this was not the main impetus except for a small minority of, mainly male, graduates. More important, particularly for 'undecided' graduates were the *'profile and reputation of certain major employers…….with well-established and substantial graduate schemes'*, making this appear to be the *'mainstream'* career route. Employers in the study also felt that STEM careers had a less attractive image in the eyes of students, arising in part from a *'lack of real knowledge about STEM employment and unrealistic expectations among many STEM graduates'*.

The impact of salaries on the attractiveness of different career options is not clear and the evidence from different sources is inconsistent. Engineering UK's *Engineering UK 2011: The State of Engineering* cites evidence from the Association of Graduate Recruiters (AGR) that median graduate starting salaries in 2010 for various sectors of engineering were: Manufacturing Engineering (£25K); Electrical/Electronic Engineering and Mechanical Engineering (£24.5K); Civil Engineering (£23.5K), all in the lower half of a table headed by Investment Banking (£38.25K) and Legal Work (£35K). The CBI's 2010 report, *Ready to Grow: business priorities for education and skills*, is also quoted on median graduate salaries, however, and indicates that those in Engineering have the second highest median starting salary, along with Legal, at £22K (behind Managerial at £23K). Finally, research from the Royal Society of Chemistry suggests that, whilst the lifetime earnings premium for all graduates, compared with those entering work with A-levels, is £160,000, the premium for an Engineering graduate is £243,730.

3. Skills Shortages in the Engineering Industry

The Institution of Engineering and Technology's *Skills and Demand in Industry Annual Survey 2010* includes data on the incidence of skills shortages amongst new engineering recruits at different levels. Although the proportion of organisations reporting that, across all engineering and technical staff, *'recruits do not meet expectations'* had reduced from 39% in 2008 to 32.7% in 2010, the proportion reporting such a deficit for graduates remained fairly constant at 43% (in 2008: 44%; in 2009: 43%). This level of skills shortage was higher than those for school-leavers (34.5%), postgraduates (26.8%) and experienced staff (26.5%). More specifically, the report indicated that the primary area where graduates exhibited a deficit was in practical experience (29.5% of employers reported this), more than technical expertise (13%), communication skills (9%), leadership skills (8%) or ability to work on own initiative (7%).

The same report also found that 38% of employers had concerns about the loss of skills or knowledge due to restructuring in the current economic conditions. This proportion was highest for employers in the Transport (51.4%), Energy (50%), Building and Construction and Pharmaceutical and Health (both at 42.9%) sectors but lowest for those in Defence (22.7%), Education and Skills (25%), Electrical (27%) and Aerospace (27.3%).

The Department for Business, Innovation and Skills Research Paper 31: *STEM Graduates in Non-STEM Jobs* found that STEM Specialist employers (those seeking core STEM competences in graduates) used the most targeted approaches to securing the STEM skills they needed but perceived deficiencies in *'some STEM graduates' technical ability and subject knowledge, and in some cases also in their lack of commercial awareness'*. Although STEM Generalist employers (employers who might prefer STEM graduates or find them suitable) did not encounter particular recruitment difficulties, both these and Non-STEM employers (those with no overt demand for STEM graduates) agreed with STEM Specialist employers that some STEM graduates *'lacked some of the*

broader behavioural skills sought of graduates, such as particular team-working, communication and time management/ organisational skills, as well as more commercially-related skills'.

On the other hand, the study also found that STEM graduates were employed in all areas of the economy in many Non-STEM job roles in both the public and private sectors, and that, although few were using their specific degree knowledge, *'almost all used the general and broader skills learned while doing a STEM degree to a much greater extent'*. Skills of high value to Non-STEM employers included *'a particularly logical approach to solving problems'.*

The National HE STEM Programme's 2011 *Employability Skills Review* draws together a range of findings from other bodies and, in relation to graduate skills, notes the growing importance of a *'T-shaped'* skills set where *'the depth of the functional or disciplinary skills is enhanced by the horizontal ability to apply knowledge across various work-based situations'*. In combination with management, leadership and enterprise, these skills are no longer regarded as discretionary but *'are increasingly being acknowledged as critical to UK employers in hi-tech, science-based industries'*. The report cites the UK Commission for Employment and Skills identification of the following key skills for managers, professionals and associate professionals:

- management and leadership skills
- professional skills
- technical and equivalent skills
- intermediate and vocational skills
- customer service and employability

The report also quotes the Confederation of British Industry (CBI) 2010 report, *Ready to Grow: business priorities for education and skills,* indicating that STEM graduates in particular were not demonstrating generic employability skills at recruitment, defined by the CBI as:

- self-management
- team working
- business and customer awareness
- problem solving
- communication and literacy

Finally, the report reproduces a review of the current Quality Assurance Agency (QAA) benchmark statements for the main STEM subjects (Chemistry, Physics, Maths and Engineering) cross-referenced to generic employability statements to illustrate how these statements currently reflect the theme of employability (as defined in the CBI's report mentioned above). The conclusion drawn is that, overall, *'the most significant gaps appear in references to Business and Customer Awareness, Application of Numeracy, and Self-Management'*. More specifically, although Engineering was the only subject whose statements mentioned business and customer awareness (possibly because it is more of an applied discipline than the others), they exhibited gaps in relation to communication, application of numeracy, and application of IT.

The above findings are echoed by, and elaborated on in, the Royal Academy of Engineering's 2007 report, *Educating Engineers for the 21st Century,* which states that:

'Engineering businesses now seek engineers with abilities and attributes in two broad areas – technical understanding and enabling skills. The first of these comprises: a sound knowledge of disciplinary fundamentals; a strong grasp of mathematics; creativity and innovation; together with the ability to apply theory in practice. The second is the set of abilities that enable engineers to work

effectively in a business environment: communication skills; team working skills; and business awareness of the implications of engineering decisions and investments.'.

The report then defines three distinct elements in the role of the professional engineer in the business world: *'that of the **technical specialist**, imbued with expert knowledge; that of the **integrator** able to operate across boundaries in complex environments; and that of the **change agent** providing the creativity, innovation and leadership necessary to meet new challenges'*.

The report's research findings on this topic in relation to graduates are instructive. Industry, whilst apparently generally satisfied with the current quality of graduate engineers, is finding *'the ability to apply theoretical knowledge to real industrial problems'* more elusive. This attribute, the '*single most desirable attribute in new recruits',* is more highly regarded by employers than other important attributes: theoretical understanding; creativity and innovation; team working; technical breadth; and business skills. The same study also found that, although the majority (68%) of universities agreed with this list and ranking, some (particularly in the Russell Group) felt that theoretical understanding was the most important. The report concluded that universities must continue to teach the 'core engineering' fundamentals with the emphasis being on *'the ability to understand and apply theory to real problems*' and a *'limited requirement for training in key business skills, envisaged primarily as commercial awareness – an understanding of how businesses work and the importance of the customer – combined with the basic principles of project management'*.

In this context, the Royal Academy of Engineering's 2010 report, *Engineering Graduates for Industry* refers to *'the tension between the need to educate students as specialists whilst developing them as generalists'* and *'the swinging pendulum over the decades between theoretical knowledge and practical skills'*. It then describes the Conceive, Design, Implement and Operate (CDIO) initiative within education that *'emphasises the technical fundamentals, while strengthening the learning of personal and interpersonal skill; and product, process, and system building skills'* before concluding that solutions to this tension do not lie in merely increasing course content, but that the *'two sets of skills can be, indeed are best, taught alongside each other using 'soft' skills in the context of technical skills'*.

Engineering UK's *Engineering UK 2011: The State of Engineering* puts this into a broader context of graduates more generally. It cites the 2009 report by Universities UK and the CBI, *Future Fit: Preparing graduates for the world of work*, which contains an analysis of the extent to which employers feel that graduates are equipped with employability skills. The largest perceived area of weakness was business and customer awareness, with 35% of employers being dissatisfied. This compares with much lower levels of dissatisfaction for other areas: self-management (20%); communication and literacy (13%); problem solving (11%); team working (10%); application of numeracy (8%) and IT skills (2%).

The same report also identifies important issues relating to the public perceptions of engineering, particularly the attributes considered important in an engineer, and how these might militate against recruitment into the profession. For example, being *'inventive or innovative'* was seen as a major requirement for an engineer although only a third of 17-19 year olds felt themselves to be so, whilst *'communication and social skills'* were not regarded as important attributes for an engineer although a clear majority of the same group identified these as key traits they possessed themselves. The report concluded that *'to reverse the negative view of engineering and make it more accessible and attractive to females, the creative and people aspects of engineering need to be communicated better'.*

Finally, although it might be assumed that large and small employers have very different needs, the Royal Academy of Engineering's 2007 report, *Educating Engineers for the 21st Century,* found little difference between the requirements for graduate engineering skills of large companies and SMEs, apart from the fact that the latter prefer *'graduates with some experience of the commercial world whereas major companies with their own graduate training schemes tend to recruit directly from universities'*. The report also points out that less than half the SMEs included in their survey operated such training schemes compared with almost 90% of large employers (over 500 employees), and that *'measures to support the introduction of structured graduate training schemes within the SME sector could, therefore, prove of great value'*.

The same organisation's 2010 report, *Engineering Graduates for Industry,* goes further in suggesting that there is a danger that the voices of major employers dominate the debate about the needs of industry to the exclusion of smaller businesses. Whilst small firms (10-50 employees) employ more than 58% of the private sector workforce, only 15% of their staff are educated to degree level, compared with over 30% in the biggest companies, and *'research from the Federation for Small Businesses states that more than 20% of small firms would take on a graduate, yet nearly half are unaware that they can run internship schemes'*. The result might be that *'SMEs may look increasingly to universities to supplement their courses with industry-based experience'*.

4. Work Experience and Placements

The Department for Business, Innovation and Skills Research Paper 31: *STEM Graduates in Non-STEM Jobs*, in its overall conclusions, surmises that many STEM graduates choose to enter non-STEM careers because of lack of knowledge or experience of STEM careers and concludes that *' Increasing opportunities for STEM-degree related work experience would be beneficial in developing better understanding of these areas'*.

Not only does work experience lead to a better understanding of industry and career opportunities, but, according to the Royal Academy of Engineering's 2007 report, *Educating Engineers for the 21st Century*, it is a *'primary factor in the recruitment policies of the great majority of companies and is highly influential in determining the selection of job applicants for interview'*. Many large graduate employers use their in-house work placement programmes as a channel of recruitment, regarding them, in some respects, as an extended assessment centre. For SMEs, with their *'distinct preference for graduates with some experience of the commercial world'*, the value of work experience is possibly even greater.

Whilst the report states that the majority of courses (76%) within its survey included work placements, it also found that there was little support for the view that more sandwich placements were required or that these should be made a specific requirement of degree programmes, as academic staff felt that this would place *'unacceptable burdens and constraints on course administration*'. Departments concurred, however, with the view that their courses needed to provide students with more experience in the application of theoretical understanding to the type of problems they would encounter in industry. This could be achieved in many ways, however, primarily through *'problem-based learning approaches combined with design/make activities and other types of individual and group project work'*, although such approaches resulted in curricular, staff training, and resource demands which needed addressing.

These views are supported by the National HE STEM Programme's 2011 *Employability Skills Review* which states that *'the increased provision of relevant work experience or industrial placements encourages students to pursue a STEM-based career and provides an effective method of allowing students to develop valuable business and technical skills'*. The Royal Academy of Engineering's 2010 report, *Engineering Graduates for Industry* goes further than this and, whilst acknowledging that *'students with industrial experience are more likely to seek and find employment in engineering and technology related jobs on graduation'*, concedes that some institutions have difficulty in sourcing placement opportunities and that not all students take up available placements anyway. It concludes that the solution lies in *'experience-led'* approaches to engineering courses, i.e. *'industrially relevant course content which should be integral within every undergraduate degree course'*. The case studies in the report provide many examples of this approach including:

- industrial simulation
- sponsored programmes
- industrial liaison boards
- project-based learning
- industrial group projects
- lectures/seminars/case studies from industry
- influence of part-time and mature students on full-time students
- site visits and field trips
- national and international competitions

The Institution of Civil Engineers, in its 2008 report *UK Civil Engineering Education in the Twenty-first Century*, provides a slightly different take on this topic by comparing the transition from civil engineering undergraduate studies into the profession with other comparable occupations, citing architecture and medicine as exemplars where graduates are expected to complete at least a year of monitored professional experience before embarking on a chosen specialisation. Considering the first year that MEng graduates are in industry as a *'transition year'*, in which they had to achieve a number of development objectives, possibly assessed by an academic institution, might also provide the necessary credits to satisfy the Bologna declaration and reduce the time required to reach chartered engineer status.

5. Graduate Intentions and Choices

The Department for Business, Innovation and Skills Research Paper 31: *STEM Graduates in Non-STEM Jobs* questions the assumption that STEM graduates, and so by implication Engineering graduates, necessarily intend to pursue a STEM-related career: *'This 'default' career direction is clearly not what many STEM students or graduates have in mind or are adhering to'.* Various factors contribute to this conclusion including the view that *'career paths* (are) *less simple and less predictable than generally thought'* and that students and graduates' career decision-making is very fluid. For example, the report highlights the fact that many graduates are undecided about career direction when they graduate, delaying making any job applications until after they have left university, and *'those choosing to take time out or enter temporary work were amongst the least 'decided' and potentially the most likely to drift away from STEM'*. Moreover, graduates' eventual job destinations did not always match up with their career intentions prior to graduation and many who had applied only for STEM jobs whilst at university secured non-STEM employment afterwards, and vice versa. Perhaps most importantly, for a minority *'particular individual circumstances became more important than strategic career-thinking, as they had to take into account their own personal responsibilities or the impact of potential decisions on personal relationships'*. The report draws attention to the importance of *'pragmatic and tactical considerations'* combined with *'what remained of their (*graduates'*) prior aspirational thinking'*.

Overall, the report suggests that policy makers need to take more account of the broad career aspirations of STEM graduates, and the impact of contingency on their ability and willingness to put these into effect, and to have less faith in the simplistic model that *'choosing to study a STEM subject leads to entering a STEM job'*. In other words, the *'STEM 'pipeline' model which has formed part of the government's STEM skills strategy…..may require some rethinking'*. In addition, given the wide range of career opportunities that is open to them, more needs to be done, by business and academia alike, both to inform STEM students and graduates of the nature and requirements of STEM careers and to ensure that they are equipped with the appropriate skills and knowledge required by STEM employers.

6. Collaboration Between Higher Education and the Engineering Industry

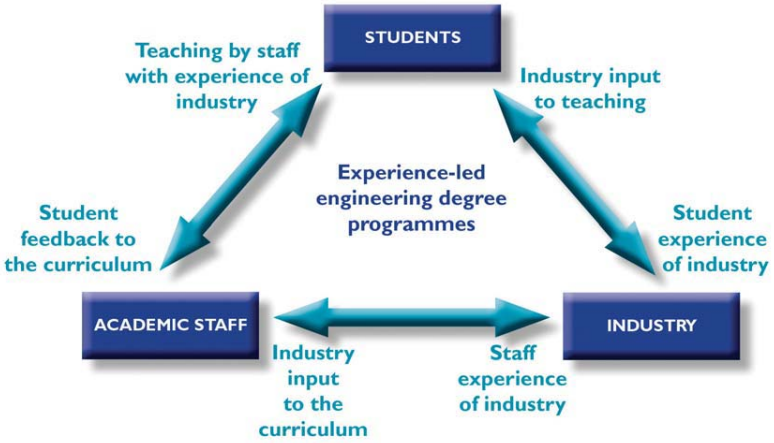
The pressing need for industry and academia to work closely together in the interests of all parties – students and graduates, employers, and institutions – and the needs of the UK economy more widely is stressed in several reports. The Royal Academy of Engineering's 2007 report, *Educating Engineers for the 21st Century,* identifies two levels of engagement: *'the provision by industry of strategic advice to help shape course development and operational engagement whereby students can experience real-life industrial engineering challenges'*. These can be achieved, it suggests, through industrial advisory (or steering) committees, accreditation, visiting professors, project topics and facilities, visits, work placements, recruitment, with the most important according to employers, in terms of *'the employability and contribution of graduate recruits',* being industrial experience.

The report also highlights the unintended consequences of the emphasis on research output occasioned by the Research Assessment Exercise (now the Research Excellence Framework) and the compromising of *'the prestige of and resource for teaching in research-active engineering departments'*. This last point is echoed by the Institution of Civil Engineers' 2008 report *UK Civil Engineering Education in the Twenty-first Century*, in which attention is drawn to the impact of the RAE on academic staff recruitment where the *'trend is towards those academics that have progressed via A-levels, undergraduate studies, postgraduate studies, possibly some post-doctoral studies, into full-time university appointments'*. The report concludes that *'in due course, civil engineering degrees will be taught in many universities by a team of academics without much industrial experience, which may not prove good for the profession'*.

The Royal Academy of Engineering's 2010 report, *Engineering Graduates for Industry,* stresses the communication channels that *'help to inform universities about the skills requirements for engineering graduates'* and cites a range of formal to informal interactions exemplified by the institutions within the study. These include:

- recruitment of staff from industry into academia
- informal links between academics and engineers from industry at all levels
- industrial advisory/liaison boards
- strategic partnerships including research and knowledge transfer partnerships
- employer links through careers services and recruitment processes
- staff secondments to industry and visits to students on placement
- students' reporting to departments after placements
- links with alumni organisations and talks from recent graduates
- links with Sector Skills Councils which bring academia and industry together
- reading national and regional reports and studies

Overall, as mentioned in Work Experience and Placements, the report identifies the importance of *'experience-led'* components within engineering degrees and emphasises that the successful delivery of these *'depends on a strong tripartite relationship between staff, students and industry'* (see figure below) that impacts *'directly on both teaching and curriculum development'*. The report then lists the benefits to students of experience-led activities and also how degrees containing these meet the graduate recruitment requirements of industry.



Relationships between academic staff, students and industry for experience-led engineering degree programmes (reproduced from Engineering Graduates for Industry, The Royal Academy of Engineering, February 2010)

The report concludes with eight key themes from its analysis of the institutional case studies distilled into three recommendations, the third of which is crucial in this context:

1. Experience counts and relevance motivates (i.e. *'experience-led components must be embedded into every engineering degree'*)
2. Preferential ring-fenced investment in experience-led HE engineering is required to deliver the higher skills needed
3. Significant time and energy should be directed towards building, enhancing and sustaining university/industry partnerships

The National HE STEM Programme's 2011 *Employability Skills Review* addresses this issue directly and suggests that institutions develop their staff capacity and capability in this area through, for example:

- recognising and rewarding staff involved in employer engagement activities
- encouraging staff with little or no industrial experience to undertake collaborations or secondments
- creating employer forums that allow industry to contribute to curriculum development
- establishing 'communities of practice' to foster discussion, advice and development opportunities

In addition, it stresses the importance of departments' forging strong links with university careers services; these have the main institutional responsibility for providing careers information and guidance, possess many valuable employer links, and can contribute effectively to departmental employability initiatives and support provided within teaching programmes.

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H. Appendices

Appendix 1: Graduate Interview Topic Guide

Topic	Questions	Prompts
1. Career aspirations	What kind of job are you looking for?	Find out level, occupation and industry to get as specific a response as possible.
	Are you considering jobs outside engineering and, if so, why?	Find out if this was because they couldn't get a job in engineering or for other reasons.
	Are you considering both graduate and non-graduate level jobs?	Find out if this is because they couldn't get a graduate job or for other reasons.
	Where would you prefer to work?	Probe on location or regions they would consider: *Near home; specific radius around home; East or West Midlands; central England; UK-wide; anywhere*.
	Are you looking for a particular salary level?	Find out roughly what this level is or prompt with: *Any 10-15K 16-20K 21-25K >25K*
	When did you start applying for jobs?	Find out if this was: - before they left University and, if so, when? - after they left University and, if so, how long afterwards?
2. Job seeking strategy	How do you find out about job vacancies?	Find out precise details of sources: *Careers service; websites; agencies; family/friends; press.*
	Are you targeting particular types of employers in terms of size?	Find out if they are considering only large employers or also small (<50 employees) and medium-sized (<250 employees) enterprises (SMEs).
	Do you find that any of these methods are more successful than others?	'Success' might mean just getting a response or a first interview rather than an actual job offer.
	Do you make speculative applications? If 'Yes', how do you identify employers to approach speculatively?	Find out if they understand what is meant by this (i.e. sending out unsolicited applications).
	Has your job seeking strategy changed at all over the last few months?	Find out whether the experience of unemployment has made them widen their choice, change aspirations etc.
3. Applications and interviews	How many applications did you make before graduating? How many applications have you made since graduating?	Try to get as precise a figure as possible or prompt with: *None 1-20 21-40 41-60 >60* Check the reasons for any differences.
	Roughly how many applications do you now make per week?	Try to get as precise a figure as possible or prompt with:

		None 1-10 11-20 21-30 >30
	How many interviews did you have before graduating? How many interviews have you had since graduating?	Try to get as precise a figure as possible or prompt with: *None 1-10 11-20 21-30 >30* Check the reasons for any differences.
	What type of interviews have these been?	Many employers use telephone interviews as the first screening stage so find out what the graduate's main experience has been.
	How many assessment centres did you attend before graduating? How many assessment centres have you attended since graduating?	Try to get as precise a figure as possible or prompt with: *None 1-5 6-10 11-20 >20* Check the reasons for any differences.
	Did you seek/get any feedback from employers who you applied to or who interviewed you? If 'Yes', what did they say to you?	Some employers will provide feedback on application forms or interview style although this is becoming less common.
4. Activities whilst at University	Did your degree programme include any input on careers or employability?	If 'Yes', find out what these were: *Work experience; careers module; PDP; employer talks; skills sessions.* At what level were they delivered? *1st year 2nd year 3rd year 4th year* Were these assessed as part of the curriculum?
	How useful did you find this? How useful have you found it since graduation?	Probe as to why the input was found to be either useful or not useful.
	Did you use the Careers Service at University during your time there? If 'Yes', what did you use it for?	If 'Yes', find out precise details: *Careers advice; CV/application form/ interview advice; workshops; employer presentations; careers fairs; Leicester Award [or Loughborough Award; Personal Skills Award etc.]; Tomorrow's Managers.*
	How useful did you find this service? How useful have you found it since graduation?	Probe as to why the service was found to be either useful or not useful.
	Did you gain any work experience whilst at University?	Find out precise details: *Part-time job during term-time; vacation work; work placement through course; internship; STEP placement.*
	Did you do any volunteering whilst at University?	Find out precise details: *Type of volunteering; through University or*

		not; how long for; level of commitment.
	Did you get involved with the Students' Union whilst at University?	Find out precise details: *Type of activity, e.g. sports club, political society, sabbatical role; how long for; level of commitment.*
5. Help sought since graduation	Have you sought any help or support in your job seeking? If 'Yes', from whom?	Find out precise details: *Personal tutors; careers service; websites; agencies; friends and families; professional bodies; others.*
	How useful have you found this help?	Probe as to why this help was found to be either useful or not useful.
	Are you a member of a professional engineering institution?	The main ones are: *Institution of Chemical Engineers* *Institution of Civil Engineers* *Institute of Mechanical Engineers* *Institution of Electrical Engineers* *Institute of Electrical and Electronics Engineers* *British Computer Society* *Royal Aeronautical Society*
6**. Perceived difficulties in getting a job**	Why do you think you are having/have found difficulty getting a job?	Probe to find out more precise details if first response is just 'too much competition' or 'the economy'.
	Are you having difficulties with any particular aspect of the process? Why do you think this is the case?	Probe to find out if they feel they are falling down at particular points: Finding vacancies; applications; first interview; second interview/assessment centre
	Is there anything more that the University might have done to help/prepare you?	For example: *Providing work experience; CV/application advice; employer contacts; skills development; careers advice.*
	Is there anything more that you could have done whilst at University to help/prepare yourself?	For example: *Work experience; volunteering; Students' Union; using Careers Service; Leicester Award; applying for jobs earlier.*
	What advice would you give to current Engineering students about getting a job after graduation?	This might prompt some thoughts that have not come out in other areas of the interview.

Appendix 2: Employer Interview Topic Guide

1. Graduate career opportunities	
Questions	**Prompts**
Please describe the types of graduate opportunities that you have.	*Find out as much detail as possible about the range and level of opportunities including whether graduates are recruited into specific vacancies or onto a graduate training scheme.*
Do you prefer to take new graduates or will you consider those who graduated in previous years? **If the latter, are you looking for any particular experience?**	*Some employers prefer graduates straight from degree courses whilst others are more open. Find out why this is the case and what advantages they see in their particular policy.*
What is the expected career progression of graduates?	*Find out if there are expected 'mileposts' in progression to particular levels of responsibility.*
Do you recruit graduates into non-graduate jobs? **If 'Yes', what is their expected career progression?**	*Sometimes employers will recruit graduates into non-graduate positions and this can provide an alternative route to an engineering career.*
Where are these opportunities located?	*Find out whether graduates are expected to be particularly mobile or whether they might stay in a particular location for a long time.*
What salaries are new graduates paid? **What is their likely salary progression?**	*Find out roughly what this level is or prompt with:* *10-15K 16-20K 21-25K >25K*
Are there any other benefits within a new graduate's package that you would highlight?	*For example: profit sharing; healthcare; company car; travel subsidy etc.*
2. Employer's requirements	
Questions	**Prompts**
What are the key basic selection criteria that you expect graduates to meet?	*For example: MEng or BEng; degree class; UCAS points; specific degree modules.*
Is work experience important in the selection process? **If 'Yes', does this work experience have to be related to the applicant's career choice?**	*Many employers prefer or even require relevant work experience. Find out precisely what they prefer/require, for example: sandwich year/year in industry; vacation work; work-based/work-related learning; any work experience; volunteering etc.*
Are extra-curricular activities important in the selection process? **If 'Yes', what type of extra-curricular activities do you particularly value?**	*Many employers view these positively as indicators of graduates' involvement and skills development.* *These include: Students' Union; clubs and societies; volunteering; enterprise; community activities; sports and leisure activities etc.*
What skills do you particularly seek in new graduates?	*Find out as specifically as possible what these are, for example: communication; leadership; organisation; teamwork; adaptability; analytical ability; IT skills etc.*

What is your opinion of skills awards such as the Leicester Award (Loughborough Award; Personal Skills Award etc.)?	*Find out if they are aware of these, and, if so, what benefits they feel they confer on participants, for example: skills development; skills awareness; reflection; employer contact etc.*
Do you prefer applicants to belong to their appropriate professional body?	*Many professional bodies allow student membership. Find out if the employer values this as a sign of motivation and/or commitment.*
3. Recruitment process	
Questions	**Prompts**
When do you begin the graduate recruitment process?	*Employers start recruiting at various times in the year, for example: before final year; at start of final year; during final year; ad hoc when vacancies arise; anytime*
Where do you advertise your job vacancies?	*Find out precise details of locations:* *careers service; own website; other websites; agencies; press.*
Do you get involved in any direct recruitment activities on university campuses?	*Find out about, for example: presentations; skills workshops; careers fairs; event sponsorship etc.*
Do you target particular institutions or courses?	*Find out if they have links with particular institutions and why they feel this is helpful.*
What works most successfully in your graduate recruitment strategy?	*Find out how they judge 'success' and whether they feel any specific activities or approaches lead to this more than others.*
Does your recruitment strategy produce enough good applicants for you to choose from?	*Many employers complain that they receive many applications but not enough good ones. Find out if they feel this is the case.*
Are there any areas in which you struggle to recruit good applicants? **Why do you think this is the case?**	*Find out any specific details about recruitment shortages and the reasons for these, for example: deficiencies in degree programmes; lack of graduates; lack of skills required; lack of work experience; competition from better paid careers etc..*
Do you think your recruitment strategy will change at all over the next few years and, if so, how?	*Find out if they anticipate any significant changes in the light of factors such as: the recession; rising tuition fees; social networking etc.*
4. Applications, interviews and assessment centres	
Questions	**Prompts**
How do interested applicants apply to you in the first instance?	*Find out if this is via an application form (online or paper-based); CV and covering letter; online screening tool etc.*
Approximately how many applications do you receive per post?	*Get as precise a figure as possible or prompt with:* *1-10 11-20 21-40 41-60 61-80 >80*
Do you accept speculative applications?	*Find out if they understand this concept (i.e. receiving unsolicited applications) and how they deal with them.*
Approximately what proportion of applicants is rejected at the application stage?	*Get as precise a figure as possible or prompt with (%ages):* *1-10 11-20 21-30 31-40 41-50 >50*
Why are applicants commonly rejected at this stage?	*Find out specific reasons, for example: not meeting basic requirements; poor grammar/spelling; poor presentation; lack of information*
Approximately what proportion of applicants is offered an interview?	*Get as precise a figure as possible or prompt with (%ages):* *1-10 11-20 21-30 >30*

What type of interviews are these?	*Employers use different interview techniques, for example: telephone interviews; line manager interviews; panel interviews; technical interviews etc. They might also be a combination of these, for example a technical interview with a line manager.*
Why are applicants commonly rejected at this stage?	*Find out specific reasons, for example: inadequate preparation; poor personal presentation; lack of knowledge of company; lack of motivation etc.*
Do you run assessment centres and, if so, what form do these take?	*Employers use different techniques during assessment centres, for example: group discussion; psychometric tests; presentation; case study analysis etc.*
Approximately what proportion of applicants is invited to an assessment centre?	*Get as precise a figure as possible or prompt with (%ages):* *1-10 11-20 21-30 >30*
Why are applicants commonly rejected at this stage?	*Try to find out specific reasons, for example: inadequate preparation; poor personal presentation; lack of knowledge of company; lack of motivation; poor team skills etc.*
Do you provide feedback to rejected applicants, either automatically or on request? **If 'Yes', what form does this take?**	*Some employers will provide feedback on application forms or interview style although this is becoming less common.*
5. Employer's activities on campus	
Questions	**Prompts**
Do you get involved in any activities, not solely related to recruitment, on university campuses? **If 'Yes', what types of activities?** **If 'No', why not?**	*If 'Yes', find out what these were, for example: work experience; work-related learning; Awards programmes; Student's Union involvement; presentations; skills sessions; sponsorship etc.* *If 'No', find out why they decided not to.*
How do you decide which universities to collaborate with?	*Employers often collaborate with specific institutions, often at a department or programme level.* *Find out if this is based on any criteria: league tables; previous graduates recruited; academic reputation etc.*
How useful do you find these links?	*Find out if they feel this is successful in terms of the numbers and standard of graduates recruited.*
How would you describe your relationship with university careers services?	*The relationship between an employer and the careers service can be crucial in meeting the needs of both the employer and institution. Find out how this is working generally: do they find careers services open, flexible, proactive and responsive etc.?*
What would you describe as their strengths and weaknesses?	*Probe as to why the service was found to be either useful or not useful.*
Do you have any advice for university careers services?	*Find out if there is anything they would advise from an employer's perspective.*
6. Final thoughts	
Questions	**Prompts**

Is there anything more that universities might do to help/prepare graduates for their careers?	*Probe if necessary on, for example: providing work experience; CV/application advice; interview practice; employer contacts; skills development; careers advice etc.*
Is there anything more that students could do whilst at University to help/prepare themselves?	*Probe if necessary on, for example: work experience; volunteering; Students' Union; using Careers Service; doing Award programme; applying for jobs earlier etc.*
What advice would you give to current Engineering students about getting an engineering job after graduation?	*This might prompt some thoughts that have not come out in other areas of the interview.*

Appendix 3: Student Guide based on extract from employers' report

HE STEM Engineering Project 2011: employers' views on engineering graduates and how they perform during the recruitment process

The following report is based on interviews with nearly twenty engineering companies (both large and small) that regularly recruit engineering graduates from a range of disciplines. They were asked for their views on graduates, what they looked for in these, and why applicants were commonly rejected at various stages of the application process.

1. Academic qualifications
Most employers were looking for at least a 2:1 degree from new graduates, preferably at MEng level, although some would accept a BEng plus a further MSc qualification. Many stressed that this was because it shortened the time necessary for a graduate to achieve chartered status as required by the professional bodies. A minority of employers would accept below a 2:1 degree. For niche roles, especially with smaller employers, the precise modules studied within an applicant's degree course were seen as important and these would be looked at carefully on the application form.

For some employers, UCAS points were an important filter, with scores of about 300 points being quoted. The most commonly sought subjects were Maths, Physics and Chemistry at grade C and above. Occasionally these precise requirements would be lowered in cases of shortage, such as electrical/electronic engineering, but employers generally resisted doing this, preferring sometimes to leave posts vacant rather than to lower standards.

2. Work experience
Employers valued graduates with work experience as this was felt to:

- demonstrate the candidate's motivation and interest in engineering as a career;
- give graduates an understanding of the world of work and commercial awareness;
- help applicants to demonstrate employability skills and therefore give them an edge, particularly at the interview and assessment stages.

Some employers insisted on applicants having work experience in engineering rather than in catering or retail for example. They argued that any candidate with a strong interest in engineering should have been able to find a summer placement. Others felt that any type of work experience was useful as it provided graduates with an insight into work place values and practices.

3. Extra-curricular activities
Generally, employers regarded extra-curricular activities, such as students' union activities and volunteering, as valuable as they:

- were evidence of a wider *'perspective'* or *'engagement'* and provided graduates with a more *'holistic view'*;
- showed graduates' '*get up and go'* or *'something extra'*, linked to overall motivation;
- provided the chance for graduates to learn new skills such as *'leadership'* and *'teamwork'* through e.g. sports and the Duke of Edinburgh Award scheme.

Most employers agreed, however, that these did not carry the same weight as either academic qualifications or work experience, although one felt that an interest in *'engineering-related'* hobbies, e.g. car mechanics, showed career motivation and interest.

4. Skills sought by employers
Most employers agreed about the most important skills sought as follows :

Main skill area	**Also referred to as:**
Leadership	Role model; energising others; taking responsibility; credibility; confidence; challenging; courage; integrity; direction
Teamworking	Relationship building
Communication and interpersonal skills	Relationship building
Analysis/problem-solving	Handling data; method; logic
Creativity/innovation	Flexibility; adaptability; agility; challenging
Planning and organising	Project management
Business understanding/commercial awareness	'Thinking the business'; realism; judgment
Performance	Execution; delivery; impact; direction

Several employers also referred to graduates' ability to apply their technical skills and knowledge in a business or workplace context, and used selection exercises to test their ability to recall engineering principles and techniques and how these could be used to solve problems. One employer described this as challenging applicants to *'think on their feet'* and thought that this distinguished graduates with an instinct for engineering from those who knew the theory but no more.

5. Reasons for first stage rejections (applications and CVs)
Apart from those without the required academic qualifications, the majority of unsuccessful applicants were rejected for the following reasons:

- Poor spelling, grammar and punctuation showing a lack of attention to detail that they would be expected to display in the job.
- Answering the competence questions inadequately by either:
    - avoiding them completely (one applicant, when asked about a particular competence, responded that they were *'unable to provide an example'*);
    - misunderstanding them, for example confusing *'teamwork'* with *'leadership'* skills, or;
    - not providing enough evidence for the selector to make a sensible judgement.
- Cutting and pasting material from the company's own website, rather than thinking for themselves.

- Missing the opportunity to sell themselves on the application form, or to show enthusiasm and interest so that the employer would want to find out more about them.
- Appearing to know little about the company to which they were applying and making little effort to tailor their application to their requirements.

6.Reasons for second stage rejections (screening/telephone interviews)
Candidates who were unsuccessful at this stage often demonstrated two main weaknesses:

- Many either failed to live up to the impression created by their application form or were unable to add substantially to this in the interview.
- Some made it very hard for the interviewer by the brevity of, or lack of detail within, their responses. Some employers rejected those who did not sound enthusiastic about a career in engineering or who were unable to sell themselves effectively.

7. Stage three rejections (assessment centres)
Employers gave reasons why candidates often performed weakly in the various activities held at assessment centres.

a) Group discussions
Many candidates did not contribute to the discussion or express their views assertively and confidently, making it impossible for the employer to assess what they had to offer or to judge their calibre. Some went to the opposite extreme and dominated the discussion, thus denying other applicants the opportunity to speak, and made the mistake of thinking that *'leadership'* was the most important factor, when, in fact, *'teamwork'* was much more highly rated.

Employers generally were looking for people who could influence the group, by listening and challenging others to defend their opinions sensitively and appropriately, and who sought consensus so that the group as a whole came to sensible decisions.

b) Presentations
The main problems with candidates' presentations were:

- Inadequate preparation (in cases where candidates were given prior notice of the presentation topic).
- An inability to present a coherent case with substance and a clear understanding of the key issues.
- Confusing volume of content for clarity of argument, a difficulty that sometimes led applicants to run over their allotted time, a cardinal sin in the eyes of employers.
- When asked to review evidence and present recommendations based on this, candidates either ignored elements of the evidence that did not fit with their argument or, occasionally, made no recommendations at all.

c) Interviews
Most importantly, all employers drew attention to perceived shortcomings in candidates' interviews. These fell into several categories:

- Poor interview technique and, specifically, poor preparation for questions about their motivation for an engineering career or how they might have gained the skills sought by the employer.
- Lack of research into the company to gain an understanding of the selection criteria and to prepare evidence to show they met these by reflecting on their skills and

attributes. Employers expect good candidates to use the interview to go into greater detail about areas dealt with only superficially on the application form. Graduates with work or other extra-curricular experience were felt to have more evidence to draw on in these situations, so often performed better.

- Low confidence and an unwillingness to sell themselves or to reveal their personality at interview. Employers were not looking for a slick sales job from candidates but a willingness to express themselves and to enter into a dialogue with the interviewer.
- Lack of commercial knowledge and experience, leading to an inability to appreciate the business imperatives driving a company and to place their individual role within a broader context. Many applicants did not appreciate the potential contributions to be made by other engineering disciplines to their own area: for example, how electrical systems perform in a mechanical engineering environment.
- Limited grasp of the importance of effective teamwork and communication in a commercial environment and the need to attend to the *'bottom line'*. Graduates with work experience were less likely to exhibit these weaknesses and more likely to have found this a useful introduction to wider commercial considerations.
- Most seriously, an inability to apply basic engineering principles and concepts to everyday work situations. For example, one employer described graduates as being unable to look at a turbine blade and answer basic questions about it, such as: '*What is it made of?'; 'What are its properties?'; 'How might it be used?'.* Graduates also did not fully appreciate that basic first year knowledge, such as formulae and calculations, was intended to be a foundation for future learning and problem-solving. Some were over-reliant on computers for making such calculations and unable to do paper calculations to confirm computer work. One employer used various practical tests during the interview to check graduates' ability in this respect.

8. Overall advice for students

The employers were asked for any specific advice that they would give to current engineering students. The key points made were as follows:

- *'Getting relevant work experience'* was the single most beneficial activity suggested; as one employer said, *'summer vacations are not just for sitting around on a beach'*. Another stressed the value of making links with employers through project work.
- Some employers advised students to get involved in extra-curricular activities in order to try to stand out from the crowd by developing their skills and experience.
- Some employers suggested using friends, family and contacts (often referred to as *'cultural capital'*) for work experience and for researching the job market.
- Employers urged students to take up opportunities provided by their institution to develop their employability and make contacts with employers, particularly all careers service activities such as presentations and fairs.
- Students were also advised to prepare properly for such events so that they could talk confidently to employers and ask sensible questions of them.
- Other employers focused more on the application process and advised students to:
    - research employers properly before applying;
    - widen their net to include smaller employers when applying for jobs;
    - tailor their CVs to the requirements of different employers;
    - understand what is on offer, what skills and experience are being sought and how they meet the selection criteria;
    - be positive, show energy and drive;
    - tell employers what they, as graduates, can do for them rather than the other way round.