UK-SPEC BASELINE PROJECT

Final Report

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CONTENTS Page

1. INTRODUCTION

1.1 The Engineering Council UK's mission is to set and maintain realistic and internationally recognised standards of professional competence and ethics for engineers, technologists and technicians, and to license competent institutions to promote and uphold the standards.

1.2 Under its Royal Charter, the Engineering Council UK (EC^{UK}) regulates the engineering profession in the UK and formally represents the interests of UK engineers abroad. It is a Designated Authority under the current General Systems Directives.

1.3 All candidates for registration as Chartered Engineer, Incorporated Engineer or Engineering Technician must satisfy the competence standards set by EC^{UK} and be members of an appropriate Licensed Member Engineering Institution. Applicants must show that they have a satisfactory educational base, have undergone approved professional development, and, at interview, must demonstrate their professional competence against specific criteria.

1.4 UK-SPEC is the standard for recognition of professional engineers and professional engineering technicians in the UK. The standard is published by EC^{UK} on behalf of the engineering profession.

2. EXECUTIVE SUMMARY

2.1 This study was commissioned from Illuminas to:

- establish the importance to employers of the various competences required by the UK Standard for Professional Engineering Competence, UK-SPEC (December 2004);
- to establish the extent to which their professional engineers and engineering technicians in the UK demonstrated these competences; and
- to determine whether additional skills, not identified in UK-SPEC, were required.

2.2 It is intended that, as UK-SPEC becomes more widely known and applied, successive studies will be undertaken to assess whether shortfalls in competences are being addressed, and whether the skill set required of professional engineers and engineering technicians by their UK employers has changed in any way.

2.3 The most valuable finding from this study was that UK-SPEC largely reflected employer competence needs, the additional competences identified as desirable being mentioned by only small percentages of employers (the highest being 7% for IT skills).

2.4 Organisations with registered staff tended to require higher standards than those without registered staff at the same level, suggesting that the presence of registrants 'raises the bar' in terms of valuing areas of competence. This was particularly true at Engineering Technician level. At Chartered Engineer level, gaps between 'importance' and 'competence strength' tended to be at a similar level or slimmer for those with registrants, demonstrating the value of registration. This was not so evident at Incorporated Engineer or Engineering Technician level.

2.5 The Engineering Council UK's role as regulator of standards was known to around two-thirds of those interviewed, but only 10% of these could name the Engineering Council UK (or EC^{UK}) as fulfilling this role. The term 'UK-SPEC' was less well known, and the highest awareness was amongst employers in the real estate (consultancy) sector, possibly because they

were the most likely to have registered staff.

2.6 Some competence areas came out as very important but somewhat lacking across both Chartered and Incorporated Engineer levels and amongst both those claiming to employ registered staff and those who did not. These were:

- promoting quality both within and outside the organisation;
- ensuring solutions are cost effective;
- knowing and managing ones own strengths and weaknesses;
- taking responsibility for updating and maintaining own competence;
- project planning.

2.7 Additionally, at Chartered Engineer level the ability to 'meet user needs fully' showed significant gaps, and at Incorporated Engineer level gaps included:

- sound communication in English;
- writing proposals and taking feedback into account;
- identifying and solving problems;
- awareness and sensitivity to the needs and concerns of others;
- organising and leading working teams.

2.8 'Softer skills' were more of a weakness at this level.

2.9 Engineering Technician level showed two major gap areas, and these applied across both those with and without registered staff. These were:

- the ability to go beyond the immediate requirements of the job and use initiative and experience in problem solving;
- carrying out continuing professional development.

2.10 Although the gaps for those with and without (registered) Engineering Technicians were of a similar size, those who have registrants consistently set higher standards, which implied that registered Engineering Technicians were performing at a higher level.

2.11 In terms of future enhancements to UK-SPEC, employers generally seemed to feel that the standard covers the skills areas that they need. There was some suggestion that IT skills would be of increasing relevance across all levels, and also, at senior engineer level, foreign languages. The other competence areas raised tended to be ones that the standard already covered.

3. METHODOLOGY

3.1 The survey was conducted over the telephone, using CATI (computer assisted telephone interviewing). The initial 'filter' interviews were conducted with an uncalibrated random sample of companies who were believed to employ engineers, or engineering technicians. Both line managers (people who worked with and / or managed engineering employees on a daily 'hands on' basis) and HR managers (who may have less day to day understanding of skills levels, but probably a broader overview of skills, recruitment and the business within which the organisation operates) were interviewed, to ensure a thorough understanding of skills areas.

3.2 Respondents were selected using Labour Force Survey (LFS) data that identified the SIC (Standard Industrial Codes), and size bands of the firms employing staff within certain SOC (Standard Occupational Codes) which EC^{UK} identified as likely to cover engineers and technicians. These respondents were then asked whether their firm did in fact employ any engineers or technicians, (no guidance was given as to what was meant by this term – respondents defined this for themselves).

3.3 8,755 firms were contacted in the 'filter' phase, and of these, 830 were interviewed more extensively on the basis that they employed engineers, fitted into the size quotas (see section 4), and were willing to help with this work.

3.4 Fieldwork ran from 9/10/06 to 5/12/06, and a pilot stage was conducted during the early part of this period to ensure that the questionnaire was both comprehensible to those responding to it, and drew out sufficient detail in terms of competences.

3.5 Illuminas, in close conjunction with the Engineering Council UK, spent a great deal of time defining an appropriate form of words to establish, in a neutral way that did not include terminology specific to EC^{UK} or to its standards, the 'level' at

Senior engineers able to design or develop advanced solutions to engineering problems, using new or existing technologies. From this point onwards we will refer to these roles as 'higher degree level, qualified engineer with advanced design capability'
Senior engineers able to implement technological solutions to engineering problems. From this point onwards we will refer to these roles as 'bachelors degree level, qualified engineer capable of implementing new designs'
Engineering technician who uses proven techniques to solve practical engineering problems. From this point onwards we will refer to these roles as 'engineering technician educated to NVQ level 3'

3.6 Anyone who reported having staff at each respective level was *then* asked:

How many of your employees in INSERT EACH RELEVANT LEVEL are actually registered as Chartered Engineers / Incorporated Engineers / Engineering Technicians? (By this we mean would employees describe themselves as a Chartered Engineer / Incorporated Engineer / Engineering Technician on their CV or would put CEng, IEng, EngTech after their name?).

DEFINING THE SECTORS

3.6 A priority in setting up the sampling structure for the study was to ensure that the industry sectors in which engineers are found were fully represented.

3.7 The sample frame was drawn from analysis of the Labour Force Survey (Jan-March 2006) where Standard Industrial Codes [SIC] (US 1972) were described in terms of both Standard Occupational Codes [SOC] and company size.

3.8 The Engineering Council UK identified the SOC definitions within which engineers and / or technicians might be employed, and a sample frame was prepared on this basis.

3.9 Some of the sector categories involved very small sample sizes, so some of the sectors were amalgamated for analysis purposes. Construction, Manufacturing and Real Estate/Renting/Business activities (Consultancy) were large enough in terms of unweighted sample to justify presentation individually, but the following sectors were simply identified as 'other':

- Agriculture
- Fishing
- Mining and Quarrying
- Electricity
- Gas and water supply
- Wholesale/retail & motor trade
- Transport storage & communication
- Financial intermediation
- Public administration and defence
- Education
- Hotels, restaurants
- Health and social work
- Other community, social and personal service activities.

Appendix A contains a full breakdown, by Standard Industrial Code, of business categories where significant numbers of engineers and technicians were "found" in this survey. Annex B gives the quotas for fieldwork met by Illuminas, and the weightings applied.

4. RESULTS

COMPETENCES REQUIRED BY EMPLOYERS AND PERCEPTIONS OF CURRENT STRENGTHS IN UK-SPEC COMPETENCE AREAS

4.1 Each respondent was questioned in detail about their employees and their competence levels (or strength) at a randomly selected *level* (of Chartered Engineer, Incorporated Engineer, or Engineering Technician), as well as about the importance of that competence to them as a business. Analysis of these responses was based on whether the business claimed to have had registered staff at the given level or not.

4.2 For those employing engineers at Chartered and Incorporated Engineer *level,* 41 competences were discussed, whilst for Engineering Technician *level*, 19 areas were examined. As the data charts (Figs 1 – 10, pp 28 – 37) are reasonably dense with information, colour coding has been used to indicate the area of the UK-SPEC standards that the competence area comes from.

4.3 For Chartered and Incorporated Engineer *level*, the colour coding indicates:

	A	Use a combination of general and specialist engineering knowledge and understanding to optimise the application of existing and emerging technology
	B	Apply appropriate theoretical and practical methods to the analysis and solution of engineering problems
	C	Provide technical and commercial management
	D	Demonstrate effective interpersonal skills
	E	Demonstrate a personal commitment to professional standards, recognising obligations to society, the profession, and the environment

and for Engineering Technician *level* the colour scheme indicates:

	A	Use engineering knowledge and understanding to apply technical and practical skills
	B	Contribute to the design, development, manufacture, construction, commissioning, operation or manufacture of products, equipment, processes, systems or services
	C	Accept and exercise personal responsibility
	D	Use effective communication and interpersonal skills
	E	Make a personal commitment to an appropriate code of conduct, recognising obligations to society, the profession and the environment

4.4 Where importance scores are shaded in dark pink this indicates that there is a statistically significant (tested to the 95% confidence interval) difference between this figure and comparative scores in the same row. All scores are sorted by the overall importance given to the competence in question. A green square highlights a competence area where performance gaps need addressing (typically because the competence in question is viewed as very important and the deficit in supply is large). A red circle indicates a wider performance gap than the comparative group, and later, when we look at the differences by sector, *if the green square or red circle is annotated (eg, RE), this indicates that the score in question is statistically significant only from that sector (in this case, Real Estate).*

4.5 Statistical significance was tested using a T-Test that compared mean scores between columns. The test compares mean scores of sub samples from the same overall sample, so in this case we compared the mean score for each skills area amongst companies with some registrants and those without any. Later in the analysis the same tests were run across the 4 sector definitions to identify whether differences in performance gaps were significant (i.e. there is 95% probability that if the same study were carried out again with a different sample of the same structure, there would still be a difference between the two groups compared).

4.6 One of the most useful measures in surveys of this type is a calculated 'performance gap'. This measurement removes the need for separate comparisons of the scores given and the range within which they fall, and instead provides a single measure of perception of how far above, or below, required standards employees are performing. It is a relative rather than absolute measure which removes some of the survey 'noise' in terms of external factors such as the tendency of respondents to develop their own normative framework when responding to questions on the basis of a 10 point scale.

4.7 This score was calculated by subtracting the score given for perceived importance of a competence from that of perceived current strength of performance (i.e. strength in competence minus importance of that competence). In this survey analysis, in most cases a shortfall was left, and there were only a very small number of areas where competence needs were met or exceeded. Figures 1 - 10 (pp 28 – 37) examine variations by whether registered staff are present or not, and by sector.

Chartered Engineers

Comparative competence levels and performance gaps between companies with some or all their Chartered Engineer level engineers registered and those with no registrants (Figs 1 and 2)

4.8 Employers of Chartered Engineers and of non registered engineers at Chartered Engineer level were broadly in agreement about perception of a hierarchy of competence importance, considering 'meeting quality and safety standards, as well as user needs' and 'working within all relevant legislation and regulatory frameworks, including social and employment legislation, health, safety and welfare' as critical (around 9 out of 10 for importance was given for all of these, by both employer types). Those who have employed some, or all, registered engineers at this level gave higher importance scores to some competence areas, possibly indicating that the presence of some registered staff raised an employer's standards. These areas were:

- presenting and discussing proposals, and taking feedback into account;
- complying with the rules of conduct of their own professional body;
- developing imaginative engineering solutions to enhance community welfare, involving the wider community in this where possible.

4.9 There were several competence areas where those with (registered) Chartered Engineers reported a lower performance gap than those without any registered staff, and this is in the context of 'importance' scores at a similar level (so it was likely that it was not being driven by this factor). Given that in terms of these competences, those with Chartered Engineers usually had a smaller performance gap than those without any, in real terms the former were outperforming the latter. Thus those with registered staff tended to perform better in terms of:

- having / using a high level of general engineering knowledge;
- complying with standards set by their professional body;
- evaluating and improving on health and safety systems;
- developing risk management strategies;
- helping team members with achieving their CPD goals;
- being innovative in creating products which enhance the quality of the environment.

4.10 ‘Knowing and managing ones own strengths and weaknesses’ was seen as fairly important (8.1 out of 10), yet an area of weakness for both those with and those without Chartered Engineers. Other areas where performance is particularly weak in comparison with ‘importance’ for both those with and without Chartered Engineers were:

- ensuring solutions meet user needs fully;
- promoting quality both in and outside the organisation;
- ensuring solutions are cost effective;
- taking responsibility for own continuing professional development.

4.11 When the same information was broken down by sector, it was again possible to see differences in performance gaps and the importance that companies accord to different competence areas.

Chartered Engineers

Comparative competence levels and performance gaps between companies in different sectors (Figs 3 and 4)

4.12 Manufacturing firms awarded higher importance scores in some of the competences at the 'most important' end of the perceived competence hierarchy:

- ensuring the solution meets user needs fully;
- possessing and applying a high level of engineering knowledge and understanding;
- promoting quality both in and outside the organisation;
- understanding user requirements for improvements to current products, systems and processes.

4.13 They also seemed to be experiencing the widest competence gaps, and this may have been a result of the lower registration levels within the sector (they received significantly lower scores than another sector in 7 of the competence areas).

4.14 There were a few areas that were rated as 'quite important' but where significant competence gaps existed in several or all sectors:

- promoting quality throughout the organisation and to external contacts;
- knowing and managing own strengths and weaknesses;
- project planning skills;
- taking responsibility for maintenance and updating of skills.

4.15 As these areas also had wider performance gaps than other competence areas across both those employers with Chartered Engineers and those with staff at this level but no one registered, it may be worth examining ways to revise the requirements of the standard in these areas. They may also be productive areas of UK-SPEC coverage to emphasise when articulating the requirements and benefits of registration to employers across all sectors.

Incorporated Engineers

Comparative competence levels and performance gaps between companies with some or all their Incorporated Engineer level engineers registered and those with no registrants (Figs 5 and 6)

4.16 The perceived hierarchy of competence areas for Incorporated Engineers was very similar amongst both those with Incorporated Engineers and those with staff at this level, but none registered. However, there was less evidence than at Chartered Engineer level of those with registered engineers according higher importance in some competence areas – overall the picture was less differentiated between those with registrants and those without, with the exception of 'proactively identifying and assessing market opportunities for new or enhanced engineering solutions', where those without (registered) Incorporated Engineers gave a higher importance rating than those with.

4.17 'Communicating effectively in English' and 'providing cost effective solutions' were areas where both those with and those without registered staff noted a particular performance gap – suggesting that Incorporated Engineer level engineers are lacking in some competence areas where Chartered Engineer level engineers tend to be regarded as competent.

4.18 To a slightly lesser degree both groups experienced similar sized gaps in terms of:

- promoting quality;
- identification of and action against any technical problems;
- managing own strengths and weaknesses;
- being aware of other people's feelings;
- project planning;
- organising / leading teams.

Incorporated Engineers

Comparative competence levels and performance gaps between companies in different sectors (Figs 7 and 8)

4.19 Manufacturing companies rated some competences more important than their counterparts in other areas ('possessing and applying a high level of engineering knowledge' – which the 'other' sector rated equally highly, 'being creative and innovative in developing engineering technology', and 'designing and conducting appropriate research'). These last two competence areas were far higher up the perceived competence hierarchy for manufacturing employers than was the case in other sectors. Construction employers rated 'evaluating and improving on health and safety and welfare systems' higher in terms of importance than those in the manufacturing sector.

4.20 'Communicating effectively in English both orally and in writing' and 'ensuring the solution is cost effective' were both considered very important across all sectors, but there were some large competence gaps reported in these areas (especially in manufacturing and real estate).

4.21 Employers in the manufacturing sector experienced competence gaps to a greater degree than those in real estate / construction in terms of:

- being able to introduce and exploit new technologies;
- being creative and innovative in developing engineering technology;
- working on continuous improvement systems.

4.22 The real estate sector saw a more significant performance gap than those in the construction sector in terms of 'setting up appropriate management systems', and this was not due to higher 'importance' – suggesting a genuine weakness in this area.

4.23 This was a more diverse picture than that seen at Chartered Engineer level, on a sectoral basis, and may suggest that some 'tailoring' for different sectors in terms of promoting the benefits of UK-SPEC, and even the requirements, may be of help in reassuring employers of the benefit of UK-SPEC at Incorporated Engineer level.

Engineering Technicians

Comparative competence levels and performance gaps between companies with some or all their Engineering Technician level engineers registered and those with no registrants (Fig 9)

4.24 Whilst at face value the performance gap revealed by those with some or all their engineering technician level staff registered seemed slightly greater in some cases than that of those with no registrants, those with some / all registered consistently set a higher standard in terms of 'importance' than those who didn't have any (registered) Engineering Technicians. This implied they were actually performing better than those with no one registered. They also enjoyed higher standards in some fundamental skills such as 'strong communication skills in English', 'using appropriate principles to complete tasks' and 'meeting deadlines'.

4.25 This gap was also marked at the more sophisticated end of the competence spectrum, i.e. 'identifying problems in design / development', whereas 'initiative in problem solving' was rated equally important by both those with and without registered Engineering Technicians. Across both those with and those without registered staff, 'using initiative and experience to solve problems' and 'continuing professional development' showed a wide performance gap. Given the close association of National Occupational Standards with technician level assessment, and development of the National Qualifications and Credit Frameworks in the UK (where, for example, 'taking responsibility for initiating … tasks' and 'autonomy of judgement' are now more strongly emphasised at this level) this may be a particularly important aspect to revisit.

4.26 'Safety, adherence to codes of conduct', and 'good practice regarding the environment' were among the most important areas suggested by those with both registered, and non-registered staff, while 'CPD' and 'recognition of obligations to society' were seen as of lesser importance by both. Perhaps surprisingly or perhaps reflecting perception of 'at a technician level', technical skills were rated low in importance, particularly by those without registered technicians who placed 'using appropriate scientific, technical, or engineering principles to complete tasks' third lowest in their 'hierarchy'. 'Meeting targets in terms of quality' was suggested as most important for employers of those both with and without registered status, but 'identification of problems and

their causes' was of lower importance for both groups. 'Ability to take responsibility for oneself' and 'reliable working without supervision' were seen as much more important than 'taking responsibility for others' across all employers, but 'good command of English' appeared to be more important to those who had registered staff than those who did not.

Comparative competence levels and performance gaps between companies in different sectors (Fig10)

4.27 Employers in 'other' industries rated the importance of 'being able to organise materials, components and plant effectively to complete tasks' much lower than those in other sectors, but aside from this, there were no significant variations in the importance given to competence areas by employers in different sectors.

4.28 'Other' employers also identified a wider competence gap with regard to 'observing good practice in environmental terms', than their counterparts in the manufacturing and real estate sectors (this was not due to setting a higher standard with their 'importance' score). Manufacturing employees were suggested as performing poorly compared to those in construction in terms of 'problem identification and solving' (using diagnostic methods to identify causes of any problems and find relevant solutions, and identifying problems in the design / development of products, systems or services). However, the sectors had broadly similar perceived importance hierarchies and performance gaps.

COMPETENCE shortages and future COMPETENCE needs

4.29 The Engineering Council UK was mindful that the sectors in which they operated were those of innovation and change, so it was important to understand which competence areas might be increasing or decreasing in perceived importance. The main competences not currently included in UK-SPEC that employers said that they would add if they personally were to design a standard for senior engineers were:

- communication skills;
- practical skills;
- people and management skills;
- basic engineering skills;
- computer / IT skills;
- financial and financial management skills.

4.30 It is worth noting that these reflect some of the non-technical competences identified as shortfalls by the engineering Sector Skills Councils through the Sector Qualifications Reform Programme.

4.31 All of them were mentioned by between 3% and 4% of those who employed Chartered or Incorporated level engineers. In terms of areas of increased need as their businesses progressed, 'IT skills' (7%), 'environmental awareness and knowledge' (6%), 'project management skills' (3%), 'foreign languages' (3%) 'technical skills' (2%), and 'knowledge of health and safety' (2%), came out most strongly.

4.32 This may simply highlight areas already within UK-SPEC that were of particular interest or relevance for employers, but could be drawn out more when articulating the benefits of having registered staff. However, ICT (and foreign languages to a lesser degree) may be areas to consider for explicit inclusion in any future amendments to the standard.

Senior level engineers

4.33 In terms of the competence shortages perceived when trying to recruit engineering staff at a senior level, 36% of respondents did not feel that they were suffering any competence shortages when recruiting (or could not articulate any). Of those who did, 13% of those employing Chartered or

Incorporated Engineer level staff mentioned difficulty in finding engineers with experience (especially those in 'other' industries).

4.34 Four per cent of those employing these levels of engineers stated that 'practical skills' were hard to come by, and the same proportion found it difficult to recruit people with electrical skills (in construction and real estate mainly).

4.35 Three per cent mentioned – in each of the following cases - 'basic engineering skills' (especially those operating in construction and real estate), 'technical skills' (especially real estate employers), and 'a broad range of skills' (across all sectors).

Engineering Technician level engineers

4.36 If asked to design a standard for engineering technicians, employers who currently employ at this level said that they would include:

- IT (3%);
- finance and financial management (2%);
- practical competence (2%);
- a good all round knowledge of other disciplines (2%).

4.37 When asked about increasing competence needs over the coming years, around half (51%) could either not articulate, or didn't feel that there were any competence needs that would increase at this level over the next few years. Of those who could describe competences they felt would become more important, 'computer and IT' was mentioned by 13% (a further 1% specified 'computer aided design' skills). This was mentioned by a slightly higher proportion of those who had some or all of their engineers at this level registered.

4.38 'Knowledge of health and safety' was mentioned by 4%, 'general further education and training' was cited by 3%, as was 'broad technical skills'. Two per cent cited 'electronics and diagnostics', and 2% 'financial skills and management', while a further 2% spoke about 'the need to understand clients' needs'. The same proportion said that communication skills could increase in importance.

4.39 In terms of skills shortages when recruiting, 39% of respondents either did not believe that they suffered any skills shortages, or could not articulate them. For those who were able to respond, again, 'experience' was the main problem, and 10% mentioned this (rising to 19% of those in 'other' industries). 'Electrical skills' was cited by 5%, especially those in real estate. Four per cent mentioned that it was hard to find people with 'appropriate qualifications' (particularly in 'other' industries), and 'a broad range of skills' was also mentioned by 4%. 'Practical skills', 'IT skills' and 'finding someone reliable and trustworthy' were each mentioned by 3%.

4.40 The similarity between the shortages spontaneously mentioned by employers suggests that these generic areas may be key to promoting UK-SPEC.

AWARENESS OF EC^{UK} AND UK-SPEC

4.41 Around two-thirds of those interviewed stated that they were aware that there was a Chartered body which sets and maintains internationally recognised standards of professional competence and ethics for the engineering industry. Manufacturing firms were the most likely to be aware that such a body existed, with 78% confirming that they knew of this (for all other sectors the comparative figure was 66%). However, only 10% could spontaneously name the Engineering Council UK or EC^{UK} as this body, while the remainder, for perhaps understandable reasons, gave a name approximating to a licensed member (e.g. Chartered Institute of Mechanical Engineers, Chartered Institute of Civil Engineers).

4.42 Overall, awareness of UK-SPEC (as a term) was quite low, at just 17% of respondents.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 The most valuable finding from this study was that UK-SPEC largely reflected employer competence needs, the additional competences identified as desirable being mentioned by only small percentages of employers (the highest being 7% for IT skills).

5.2 Organisations with registered staff tended to require higher standards than those without registered staff at the same level, suggesting that the presence of registrants 'raises the bar' in terms of valuing areas of competence. This was particularly true at Engineering Technician level. At Chartered Engineer level, gaps between 'importance' and 'competence strength' tended to be at a similar level or slimmer for those with registrants, demonstrating the value of registration. This was not so evident at Incorporated Engineer or Engineering Technician level.

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5.4 Some competence areas came out as very important but somewhat lacking at both Chartered and Incorporated Engineer levels and amongst both those claiming to employ registered staff and those who did not. These were:

- promoting quality both within and outside the organisation;
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- taking responsibility for updating and maintaining own competence;
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5.5 Additionally, at Chartered Engineer level the ability to 'meet user needs fully' showed significant gaps, and at Incorporated Engineer level gaps included:

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- identifying and solving problems;
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APPENDIX A

Full breakdown of industries/businesses where engineers were found

A / B / C: Agriculture, Fishing, Mining and Quarrying	
Bituminous Coal & Lignite Mining	18.2%
Construction Sand & Gravel Mining	18.2%
Dimension Stone Mining	9.1%
Limestone Mining	9.1%
Metal Mining Services	9.1%
Misc Oil & Gas Field Services	9.1%
Miscellaneous Stone Mining	9.1%
Oil & Gas Field Exploration Services	9.1%
Potash, Soda & Borate Mineral Mining	9.1%
D: Manufacturing	
Agricultural Machinery Manufacturers	0.6%
Air & Gas Compressor Manufacturers	0.3%
Air/heating/refrigeration Equipment Mfrs	0.6%
Aircraft Engine Manufacturers	1.6%
Architectural/ornamental Metal Work Mfrs	2.5%
Asphalt Felt & Coating Manufacturers	0.3%
Ball & Roller Bearing Manufacturers	0.6%
Beet Sugar Manufacturers	0.6%
Biological Product Manufacturers	0.9%
Biscuit & Cracker Manufacturers	0.3%
Boat Builders & Repairers	0.3%
Bread & Bakery Product Manufacturers	0.6%
Building Brick & Tile Manufacturers	0.3%
Calculator Manufacturers	0.3%
Cane Sugar Manufacturers	0.6%
Cane Sugar Refiners	0.3%
Canned Speciality Manufacturers	0.3%
Carbon Black Manufacturers	0.3%
Cathode Ray TV Picture Tube Mfrs	0.3%
China Plumbing Fixture Manufacturers	0.3%
Coated Fabric Manufacturers, Ex Rubber	1.6%
Combustion Engine Electrical Equip Mfrs	0.3%
Computer Manufacturers	0.9%
Concrete Brick & Block Manufacturers	0.9%
Connector Mfrs-Electronic Applications	0.6%
Construction Machinery Manufacturers	0.3%
Contract Tool & Die Manufacturers	0.6%
Cyclic Coal Tar Crudes & Products Mfrs	0.3%
Electric Meter Manufacturers	0.3%
Electrometallurgical Product Mfrs	0.9%
Electronic Capacitor Manufacturers	0.3%
Enameled Sanitary Ware Manufacturers	0.3%
Engineering & Scientific Equipment Mfrs	1.6%
Environmental Contrl Dev Mfrs	0.3%
Fabricated Plate Work Manufacturers	0.9%
Flat Glass Manufacturers	1.3%
Flour & Grain Mill Product Mfrs	0.3%
Frozen Specialty Manufacturers	1.6%
Furnace Manufacturers	0.3%
Garden Equipment Manufacturers	0.6%
Gaskets, Packing & Sealing Device Manufacturers	0.3%

Hoist, Crane & Monorail System Mfrs	0.6%
Household Cooking Equipment Mfrs	0.3%
Industrial Instrument Mfrs	0.6%
Industrial Pattern Manufacturers	0.9%
Industrial Truck, Tractor Etc Mfrs	0.6%
Lift & Escalator Manufacturers	0.9%
Machine Tool Accessory Manufacturers	1.9%
Made Up Glass Product Manufacturers	0.6%
Malt Beverage Manufacturers	0.6%
Meat Packing Plant Operators	0.6%
Metal Can Manufacturers	0.3%
Metal Cutting Machine Tool Manufacturers	1.3%
Metal Door, Window & Screen Mfrs	0.3%
Metal Forming Machine Tool Manufacturers	0.9%
Misc Aircraft Part Manufacturers	1.6%
Misc Chemical/Chemical Preparation Mfrs	0.6%
Misc Concrete Product Manufacturers	0.3%
Misc Electrical Machinery & Equip Mfrs	0.9%
Misc Electronic Component Mfrs	1.9%
Misc Fabricated Rubber Product Mfrs	0.9%
Misc Food Preparation Manufacturers	1.3%
Misc General Industrial Machinery Mfrs	2.5%
Misc Hardware Manufacturers	1.6%
Misc Household Appliance Manufacturers	0.6%
Misc Industrial Inorganic Chemicals Mfrs	0.9%
Misc Industrial Organic Chemical Mfrs	0.3%
Misc Internal Combustion Engine Mfrs	0.6%
Misc Lighting Equipment Manufacturers	0.6%
Misc Measure & Control Device Mfrs	0.9%
Misc Non-Electrical Machinery Mfrs	1.3%
Misc Office Machine Manufacturers	0.3%
Misc Plastic Product Manufacturers	8.2%
Misc Power Transmission Equipment Mfrs	0.3%
Misc Service Industry Machine Mfrs	0.3%
Misc Special Industry Machinery Mfrs	1.3%
Misc Transport Equipment Manufacturers	0.9%
Miscellaneous Manufacturing Industries	2.5%
Miscellaneous Metal Work Manufacturers	1.9%
Miscellaneous Prepared Animal Food Mfrs	0.3%
Motor & Generator Manufacturers	0.6%
Motor Vehicle Manufacturers	1.3%
Motorbikes, Bicycles & Parts Mfrs	0.3%
Narrow Fabrics & Smallware Mills	0.9%
Non-Clay Refractory Manufacturers	0.3%
Non-Electrical Heating Equipment Mfrs	0.6%
Oil Field Machinery Manufacturers	0.6%
Orthopedic/Surgical Appliances & Supplies Mfr	0.3%
Perfume & Cosmetic Manufacturers	0.9%
Pharmaceutical Preparation Manufacturers	0.6%
Piston, Carburettor & Valve Mfrs	0.3%
Plastic Material & Synthetic Resin Mfrs	0.9%
Poultry Dressing Plant Operators	0.3%
Power, Distribution & Transformer Mfrs	0.3%
Pump Manufacturers	0.9%
Railway Equipment Manufacturers	0.6%

Ready Mixed Concrete Manufacturers	0.3%
Rubber & Plastic Hose & Belting Mfrs	0.3%
Rubber Reclaimers	0.3%
Sausage & Other Meat Product Mfrs	0.9%
Semiconductor Manufacturers	1.3%
Sheet Metal Work Manufacturers	2.5%
Shipbuilders & Repairers	0.9%
Soap & Other Detergent Manufacturers	0.3%
Steel Pipe & Tube Manufacturers	1.6%
Steel Sheet & Bar Manufacturers	1.6%
Steel Wire & Nail Manufacturers	1.3%
Stone Cutters & Finishers	0.6%
Storage Battery Manufacturers	0.3%
Surgical/Medical Instrument Mfrs	0.3%
Sweet & Confectionery Product Mfrs	0.6%
Switchgear & Switchboard Manufacturers	0.9%
Telephone & Telegraph Equipment Mfrs	0.3%
Tyre & Inner Tube Manufacturers	0.6%
Vehicle Parts & Accessory Manufacturers	1.3%
Vehicular Lighting Equipment Mfrs	0.3%
Wine & Brandy Manufacturers	0.3%
Wood Household Furniture Mfrs Ex Uphlstrd	0.3%
Woven Carpet & Rug Manufacturers	0.9%
X-ray Apparatus & Tube Manufacturers	0.3%
E: Electricity, Gas and Water	
Electric Services	26.3%
Gas & Other Services Combined	15.8%
Irrigation Systems	5.3%
Miscellaneous Sanitary Services	10.5%
Natural Gas Distribution	26.3%
Water Suppliers	15.8%
F: Construction	
Carpenters	8.2%
Electrical Work Contractors	10.6%
Excavating & Foundation Contractors	0.6%
Glass & Glazing Work Contractors	1.2%
House Building Contractors	15.3%
Industrial Building Contractors	1.8%
Masonry & Stonework Contractors	1.2%
Misc Building Equipment Installers	0.6%
Misc Special Bldg Trade Contractors	3.5%
Miscellaneous Heavy Construction	7.1%
Operative Builders	7.1%
Plastering & Insulation Contractors	3.5%
Plumbing, Heating & Air Cond Contractors	13.5%
Residential Building Contractors	10.0%
Road Construction	8.8%
Roofing & Sheet Metal Work Contractors	1.2%
Tile Marble & Mosaic Work Contractors	1.2%
Utility Service Line Construction Contractors	4.1%
Wrecking & Demolition Contractors	0.6%

G: Wholesale retail & motor trade, transport, storage & communication	
Misc Paper Product Wholesalers	33.3%
Miscellaneous Transportation Services	33.3%
Tyre & Tube Wholesalers	33.3%
J: Financial Intermediation	
Allied Svcs To Securities & Commodities	12.5%
Commodity Contracts Brokers & Dealers	9.4%
Insurance Agents, Brokers & Services	18.8%
Life Insurance	6.3%
Miscellaneous Financial Institutions	31.3%
Miscellaneous Insurance Carriers	9.4%
Security Brokers & Dealers	12.5%
K: Real estate, renting & business activities	
Miscellaneous Business Services	10.9%
Real Estate Agents & Managers, including Commercial & Industrial Property Companies, Developers, Etc	77.6%
Research & Development Laboratories	11.5%
L: Public administration & defence	
Central Government	46.9%
Courts	8.2%
Fire Brigade Services	8.2%
National Security Forces	8.2%
Police Force Services	28.6%
M: Education	
Schools	40.7%
Technical Colleges	11.1%
Universities, Colleges, Prof Schools	48.1%
N,O,H: Hotels and restaurants, health & social work and other community, social and personal	
Alcoholic Drink Establishments	16.2%
Eating Establishments	24.3%
General Medical & Surgical Hospitals	5.4%
Hotels, Motels & Tourist Resorts	21.6%
Miscellaneous Health & Allied Services	27.0%
Miscellaneous Specialty Hospitals	2.7%
Psychiatric Hospitals	2.7%

ANNEX B

SAMPLE AND WEIGHTING

The quotas for fieldwork were taken from the Labour Force Survey [LFS] at a 1:1 ratio, in order to ensure that smaller companies did not consume the entire sample and sufficient large and medium firms were sampled at a level that allowed accuracy in findings.

Figure A: Fieldwork (full interview) quotas set according to LFS data (smaller sectors combined)

%	**Number of employees**		
	Under 25	**25-499**	**500 +**
A / B / C: Agriculture, fishing, mining, quarrying	0.3	0.7	0.2
D: Manufacturing	8.4	17.3	8.5
E: Electricity, gas & water	0.4	1.2	0.5
F: Construction	8.5	8.4	1.4
G: Wholesale retail & motor trade, transport storage & communication	3	4.8	2.7
J: Financial intermediation	0.2	1.1	2.2
K: Real estate renting & business activities	6.2	8.5	3.3
L: Public administration & defence	0.5	2.2	2.6
M: Education	0.2	1.4	1.3
N / O / H: Health & social work, other community social & personal service activities, hotels & restaurants	1.1	1.7	1.3
Totals	28.7	47.4	24

These quotas were achieved as set in all cases except wholesale / retail and motor trade, where the response rate was only marginally above zero. Employers in this sector very seldom reported employing any engineers or technicians.

Data was weighted retrospectively to reflect the LFS in terms of sector, size and number of engineers as accurately as possible, which generally meant applying a higher weight to the smaller businesses and a smaller one to the companies with greater employee numbers.

Figure B: Engineering occupation employee counts in companies interviewed

	Under 25	25-499	500+	Table Sum %
A / B / C: Agriculture, fishing, mining and quarrying	0.1	2.4	0.1	2.6
D: Manufacturing	2.9	14.7	27.8	45.4
E: Electricity, gas and water supply	0.2	1.1	6.1	7.4
F: Construction	3	8.6	2.3	13.8
G: Wholesale and retail motor trade and repairs and transport storage	.	.	1	1
J: Financial intermediation	0.1	0.7	1.5	2.3
K: Real estate, renting and business activities	2.2	6.9	3.5	12.6
L: Public administration and defence	0.1	2.1	5.2	7.5
M: Education	0.1	1.3	2.7	4.1
N / O / H: Health and social work, other community social and personal service activities, hotels and restaurants	1.6	0.7	1.2	3.5
	10.1	38.5	51.4	100

This was weighted back to the LFS data (figure A) with a slight redistribution to cover the missing cells in wholesale and retail trade. This resulted in weights being applied as follows:

1-24	25-499	500+
1.88148	0.81597	0.30955

PROFILE OF COMPANIES

At an overall level, 69% of those interviewed were line managers (including Managing Directors, Heads of Engineering, and Technical Directors / Managers) and 27% were Human Resources Managers, or in HR roles dealing with engineers. 5% had other job roles.

Fig 1. Chartered Engineers v. non registrants

	Some / all registered		Non registered		All
	Importance	Performance Gap	Importance	Performance Gap	Importance
Base:	*205*		*177*		*382*
Ensuring that the solution meets the relevant quality and safety standards	9.1	-0.3	9.0	-0.5	9.0
Ensuring that the solution meets the needs of the user fully	9.0	-0.6	8.9	-0.6	8.9
Working within all relevant legislation and regulatory frameworks, including social and employment legislation, health, safety and welfare	9.0	-0.4	8.8	-0.5	8.9
Communicating effectively in English both verbally and in writing (formal / informal)	8.7	-0.5	8.5	-0.5	8.6
Possessing and applying a high level of general engineering knowledge / understanding	8.7	-0.4	8.5	-0.7	8.6
Promoting quality throughout the organisation and to customer / supplier networks	8.5	-0.6	8.4	-0.8	8.4
Ensuring that the solution is cost effective	8.5	-0.7	8.3	-0.6	8.4
Developing and implementing appropriate hazard identification and risk management systems	8.3	-0.3	8.3	-0.6	8.3
Ability to be constructive as both a team leader and member	8.3	-0.5	8.2	-0.6	8.3
Presenting and discussing proposals and taking feedback into account	8.4	-0.6	8.0	-0.6	8.2
Complying with the rules of professional conduct of own professional body	8.5	-0.2	7.9	-0.5	8.2
Identify problems with implementation and acting to combat them	8.2	-0.6	8.2	-0.6	8.2
Evaluating and improving on health, safety and welfare systems	8.3	-0.4	8.1	-0.7	8.2
Being able to understand user's requirements for improvements to current processes, systems or products	8.2	-0.7	8.1	-0.5	8.2
Knowing and managing own strengths and weaknesses	8.1	-0.9	8.1	-0.9	8.1
Ensuring that implementation comes in on budget, even in the light of emerging challenges to the implementation programme	8.1	-0.7	8.1	-0.7	8.1
Project planning skills - i.e. ensuring the correct level and sequencing of resources when implementing engineering solutions	8.1	-0.7	8.1	-0.8	8.1
Undertaking engineering design and developing fit for purpose engineering solutions	8.0	-0.4	8.0	-0.5	8.0
Be able to resolve conflicts constructively	8.2	-0.6	7.8	-0.6	8.0
Proactively identify opportunities for improvements to current processes or systems	8.1	-0.6	7.9	-0.6	8.0

Fig 2. Chartered Engineers v. non registrants

	Some / all registered		Non registered		All
	Importance	Performance Gap	**Importance**	Performance Gap	**Importance**
Base:	205		177		382
Taking responsibility for maintaining and updating their own engineering skills and knowledge	8.1	-0.8	7.8	-0.9	8.0
Testing the suitability and effectiveness of engineering solutions	8.0	-0.3	7.7	-0.4	7.9
Ensuring the application of quality management principles by team members and colleagues	7.9	-0.5	7.8	-0.6	7.9
Having an awareness and sensitivity to the needs and concerns of other people	7.9	-0.5	7.8	-0.7	7.9
Being able to introduce and exploit new and advancing technology	7.9	-0.5	7.6	-0.3	7.7
Assisting individual team members in achieving continuing professional development goals	7.7	-0.5	7.8	-1.0	7.7
Ensuring that the solution meets requirements in terms of its social and environmental impacts	7.8	-0.4	7.5	-0.3	7.7
Organising and leading working teams	7.7	-0.4	7.6	-0.5	7.7
Being creative and innovative in developing engineering technology	7.7	-0.5	7.5	-0.4	7.6
Design, implement, and evaluate continuous improvement systems	7.6	-0.6	7.5	-0.6	7.6
Negotiation skills in making contractual arrangements with clients, sub contractors and suppliers	7.3	-0.4	7.4	-0.4	7.4
Keeping abreast of technological developments through study, research or experimentation	7.4	-0.5	7.1	-0.6	7.3
Innovating in the development of products and services that do not adversely affect the environment	7.2	-0.2	7.1	-0.5	7.2
Ensuring that the solution meets the appropriate aesthetic requirements	7.2	-0.2	7.2	-0.2	7.2
Designing and conducting appropriate research in an organised and cost effective manner to inform the design of engineering solutions	7.2	-0.4	7.0	-0.7	7.1
Being innovative in creating products which enhance the quality of the environment	7.2	-0.2	7.0	-0.6	7.1
Setting up appropriate management systems	7.1	-0.4	7.1	-0.6	7.1
Proactively identify and assess market opportunities for new or enhanced engineering solutions	6.9	-0.6	6.9	-0.5	6.9
Identify and exploit opportunities for developing and transferring technology	6.7	-0.5	6.9	-0.6	6.8
Being aware of intellectual property rights issues and taking the appropriate steps to secure IPR when required	6.5	-0.3	6.6	-0.6	6.5
Developing imaginative engineering solutions to enhance community welfare, involving the wider community in this where possible	6.6	-0.2	6.0	-0.4	6.4

Fig 3. Importance scores and performance gaps by sector – CEng

	Manufacturing		Construction		Real Estate		Other	
	Importance	Performance Gap	Importance	Performance Gap	Importance	Performance Gap	Importance	Performance Gap
Base:	*165*		*71*		*76*		*70*	
Ensuring that the solution meets the relevant quality and safety standards	9.2	-0.5	9.0	-0.4	8.9	-0.3	9.0	-0.5
Ensuring that the solution meets the needs of the user fully	9.2 **Const.**	-0.7	8.7	-0.5	8.8	-0.5	8.9	-0.6
Working within all relevant legislation and regulatory frameworks, including social and employment legislation, health, safety and welfare	8.8	-0.4	8.9	-0.5	9.1	-0.6	8.9	-0.5
Communicating effectively in English both verbally and in writing (formal / informal)	8.5	-0.5	8.6	-0.4	8.8	-0.5	8.7	-0.5
Possessing and applying a high level of general engineering knowledge / understanding	8.8 **Oth.**	-0.6	8.5	-0.5	8.7	-0.5	8.2	-0.4
Promoting quality throughout the organisation and to customer / supplier networks	8.6 **Oth.**	-0.8	8.5	-0.7	8.5	-0.5	7.9	-0.6
Ensuring that the solution is cost effective	8.6	-0.9 **R.E.**	8.3	-0.5	8.4	-0.4	8.1	-0.6
Developing and implementing appropriate hazard identification and risk management systems	8.4	-0.7 **R.E.**	8.4	-0.5	8.2	-0.2	7.9	-0.4
Ability to be constructive as both a team leader and member	8.3	-0.7	8.3	-0.5	8.2	-0.3	8.1	-0.5
Presenting and discussing proposals and taking feedback into account	8.1	-0.7	8.2	-0.5	8.4	-0.6	8.2	-0.5
Complying with the rules of professional conduct of own professional body	8.1	-0.4	8.4	-0.3	8.4	-0.2	7.9	-0.4
Identify problems with implementation and acting to combat them	8.3	-0.7	7.9	-0.6	8.5	-0.5	8.1	-0.6
Evaluating and improving on health, safety and welfare systems	8.2	-0.6	8.4	-0.5	8.0	-0.4	7.9	-0.6
Being able to understand user's requirements for improvements to current processes, systems or products	8.4 **Const.**	-0.9 **Const.**	7.7	-0.5	8.2	-0.5	8.0	-0.4
Knowing and managing own strengths and weaknesses	8.0	-1.0	8.1	-0.7	8.4	-1.0	7.9	-0.5
Ensuring that implementation comes in on budget, even in the light of emerging challenges to the implementation programme	8.1	-0.9	7.9	-0.6	8.4	-0.7	7.9	-0.5
Project planning skills - i.e. ensuring the correct level and sequencing of resources when implementing engineering solutions	8.1	-0.8	7.9	-0.8	8.3	-0.5	8.0	-0.8
Undertaking engineering design and developing fit for purpose engineering solutions	8.1	-0.5	8.0	-0.4	7.8	-0.2	8.3	-0.3
Be able to resolve conflicts constructively	8.0	-0.8 **Const.**	8.1	-0.3	8.1	-0.6	8.0	-0.6
Proactively identify opportunities for improvements to current processes or systems	8.2	-0.8	7.8	-0.6	8.1	-0.5	7.8	-0.3

Fig 4. Importance scores and performance gaps by sector – CEng

	Manufacturing		Construction		Real Estate		Other	
	Importance	Performance Gap	Importance	Performance Gap	Importance	Performance Gap	Importance	Performance Gap
Base:	*165*		*71*		*76*		*70*	
Taking responsibility for maintaining and updating their own engineering skills and knowledge	7.9	-0.9	7.8	-0.7	8.2	-0.9	8.1	-0.9
Testing the suitability and effectiveness of engineering solutions	7.8	-0.4	8.0	-0.3	7.9	-0.3	8.0	-0.5
Ensuring the application of quality management principles by team members and colleagues	8.1	-0.6	7.7	-0.5	8.0	-0.4	7.5	-0.6
Having an awareness and sensitivity to the needs and concerns of other people	7.9	-0.7	7.9	-0.5	7.9	-0.5	7.8	-0.6
Being able to introduce and exploit new and advancing technology	7.8	-0.6	7.6	-0.1	8.0	-0.5	7.6	-0.4
Assisting individual team members in achieving continuing professional development goals	7.6	-0.9	7.9	-0.7	7.7	-0.4	7.7	-0.7
Ensuring that the solution meets requirements in terms of its social and environmental impacts	7.8	-0.3	7.5	-0.2	7.6	-0.5	7.7	-0.4
Organising and leading working teams	7.6	-0.7 **R.E.**	7.6	-0.4	7.7	-0.2	7.6	-0.5
Being creative and innovative in developing engineering technology	7.7	-0.6 **Oth.**	7.5	-0.3	7.7	-0.5	7.0	-0.1
Design, implement, and evaluate continuous improvement systems	7.7	-0.8	7.5	-0.5	7.4	-0.5	7.3	-0.5
Negotiation skills in making contractual arrangements with clients, sub contractors and suppliers	7.4	-0.6	7.3	-0.3	7.5	-0.4	7.3	-0.2
Keeping abreast of technological developments through study, research or experimentation	7.2	-0.5	7.3	-0.6	7.5	-0.6	7.1	-0.6
Innovating in the development of products and services that do not adversely affect the environment	7.2	-0.4	7.4	-0.5 **Oth.**	7.4	-0.2	6.3	0.0
Ensuring that the solution meets the appropriate aesthetic requirements	7.2	-0.2	6.8	-0.3	7.4	-0.3	7.2	-0.2
Designing and conducting appropriate research in an organised and cost effective manner to inform the design of engineering solutions	7.3	-0.8 **R.E.**	7.1	-0.6	7.2	0.0	6.8	-0.3
Being innovative in creating products which enhance the quality of the environment	7.1	-0.5	7.5	-0.6	7.2	0.0	6.8	-0.3
Setting up appropriate management systems	7.2	-0.6	7.0	-0.5	7.0	-0.3	7.3	-0.6
Proactively identify and assess market opportunities for new or enhanced engineering solutions	6.9	-0.6	7.2	-0.8	6.6	-0.4	6.6	-0.3
Identify and exploit opportunities for developing and transferring technology	6.9	-0.6	6.6	-0.5	6.9	-0.5	6.6	-0.5
Being aware of intellectual property rights issues and taking the appropriate steps to secure IPR when required	6.9	-0.7	6.4	-0.2	6.3	-0.2	6.1	-0.5
Developing imaginative engineering solutions to enhance community welfare, involving the wider community in this where possible	6.1	-0.3	6.6	-0.5	6.7	-0.1	6.0	0.0

Fig 5. Incorporated Engineers v. non registrants

	Some / all registered		Non registered		All
	Importance	Performance Gap	Importance	Performance Gap	Importance
Base:	*124*		*51*		*175*
Ensuring that the solution meets relevant quality / safety standards	8.9	-0.6	8.9	-0.6	8.9
Working within all relevant legislation and regulatory frameworks, including social and employment legislation, health, safety, welfare	9.0	-0.5	8.7	-0.5	8.9
Ensuring that the solution meets the needs of the user fully	8.8	-0.6	8.9	-0.4	8.9
Communicating effectively in English both verbally and in writing	8.8	-0.8	8.7	-0.9	8.8
Ensuring that the solution is cost effective	8.6	-0.9	8.7	-1.0	8.6
Possessing / applying a high level of general engineering knowledge	8.5	-0.6	8.4	-0.7	8.5
Developing / implementing appropriate risk management systems	8.5	-0.7	8.4	-0.6	8.5
Promoting quality throughout the organisation and to customer and supplier networks	8.3	-0.8	8.4	-0.8	8.4
Being able to understand user's requirements for improvements to current processes, systems or products	8.4	-0.4	8.3	-0.7	8.4
Presenting / discussing proposals and taking feedback into account	8.4	-0.7	8.2	-0.7	8.3
Ability to be constructive as both a team leader and member	8.3	-0.6	8.4	-0.4	8.3
Identify problems with implementation and acting to combat them	8.3	-0.7	8.3	-0.8	8.3
Complying with the rules of professional conduct of own professional body	8.4	-0.4	8.1	-0.3	8.3
Be able to resolve conflicts constructively	8.3	-0.7	8.1	-0.5	8.2
Evaluating and improving on health, safety and welfare systems	8.4	-0.7	7.9	-0.4	8.2
Knowing and managing own strengths and weaknesses	8.4	-0.8	8.0	-0.7	8.2
Having an awareness and sensitivity to the needs and concerns of other people	8.0	-0.8	8.2	-0.7	8.1
Project planning skills - i.e. ensuring the correct level and sequencing of resources when implementing engineering solutions	8.0	-0.7	8.2	-0.8	8.1
Ensuring that implementation comes in on budget, even in the light of emerging challenges to the implementation programme	8.1	-0.6	8.1	-0.9	8.1

Fig 6. Incorporated Engineers v. non registrants

	Some / all registered		Non registered		All
	Importance	Performance Gap	Importance	Performance Gap	
Base:	*124*		*51*		*175*
Organising and leading working teams	8.2	-0.7	7.8	-0.8	8.1
Proactively identify opportunities for improvements to current processes or systems	8.1	-0.5	7.9	-0.7	8.0
Undertaking engineering design and developing fit for purpose engineering solutions	8.0	-0.6	8.1	-0.6	8.0
Ensuring the application of quality management principles by team members and colleagues	7.9	-0.7	8.0	-0.7	7.9
Taking responsibility for maintaining and updating their own engineering skills and knowledge	8.1	-0.9	7.6	-0.6	7.9
Negotiation skills in making contractual arrangements with clients, sub contractors and suppliers	7.8	-0.6	8.0	-0.6	7.9
Ensuring that the solution meets requirements in terms of its social and environmental impacts	8.0	-0.6	7.6	-0.7	7.9
Assisting individual team members in achieving continuing professional development goals and objectives	7.7	-0.6	8.0	-0.7	7.8
Testing the suitability and effectiveness of engineering solutions	7.5	-0.5	8.1	-0.6	7.7
Being able to introduce and exploit new and advancing technology	7.6	-0.3	7.6	-0.5	7.6
Being creative and innovative in developing engineering technology	7.5	-0.6	7.5	-0.7	7.5
Design, implement, and evaluate continuous improvement systems	7.5	-0.5	7.3	-0.7	7.4
Setting up appropriate management systems	7.4	-0.5	7.2	-0.9	7.3
Keeping abreast of technological developments through study, research or experimentation	7.4	-0.6	6.9	-0.4	7.2
Ensuring that the solution meets the appropriate aesthetic requirements	7.3	-0.3	6.9	0.1	7.1
Designing and conducting appropriate research in an organised and cost effective manner to inform the design of engineering solutions	7.1	-0.7	7.1	-0.6	7.1
Being innovative in creating products which enhance the quality of the environment	7.0	-0.6	7.0	-0.3	7.1
Innovating in the development of products and services that do not adversely affect the environment	7.0	-0.6	7.2	-0.3	7.1
Proactively identify and assess market opportunities for new or enhanced engineering solutions	6.5	-0.4	7.4	-0.7	6.8
Being aware of intellectual property rights issues and taking the appropriate steps to secure IPR when required	6.7	-0.6	6.6	-0.5	6.7
Identify and exploit opportunities for developing/transferring technology	6.4	-0.4	7.0	-0.8	6.7
Developing imaginative engineering solutions to enhance community welfare, involving the wider community in this where possible	6.3	-0.3	6.4	-0.2	6.3

Fig 7. Importance scores and performance gaps by sector – IEng

	Manufacturing		Construction		Real Estate		Other	
	Importance	Performance Gap	Importance	Performance Gap	Importance	Performance Gap	Importance	Performance Gap
Base:	*57*		*35*		*34*		*49*	
Ensuring that the solution meets relevant quality / safety standards	9.0	-0.7	9.1	-0.4	8.9	-0.8	8.6	-0.5
Working within all relevant legislation and regulatory frameworks, including social and employment legislation, health, safety, welfare	8.3	-0.5	9.2	-0.4	8.9	-0.7	9.3	-0.5
Ensuring that the solution meets the needs of the user fully	8.7	-0.3	9.1	-0.7	9.0	-0.6	8.7	-0.6
Communicating effectively in English both verbally and in writing	8.8	-0.9	9.0	-0.6	8.3	-1.0	8.8	-0.7
Ensuring that the solution is cost effective	8.7	-1.2	9.1	-0.7	8.2	-1.1	8.2	-0.6
Possessing / applying a high level of general engineering knowledge	8.8 **Const.**	-0.6	7.9	-0.3	8.5	-0.8	8.9 **Const.**	-0.8
Developing / implementing appropriate risk management systems	7.9	-0.6	8.8	-0.4	8.5	-1.0	8.9	-0.6
Promoting quality throughout the organisation and to customer and supplier networks	8.2	-0.7	8.9	-0.7	8.2	-0.9	8.3	-1.0
Being able to understand user's requirements for improvements to current processes, systems or products	8.4	-0.8	8.2	-0.4	8.6	-0.5	8.2	-0.5
Presenting / discussing proposals and taking feedback into account	8.0	-0.6	8.7	-0.7	8.4	-0.9	8.4	-0.6
Ability to be constructive as both a team leader and member	8.0	-0.6	8.8	-0.5	8.1	-0.6	8.6	-0.4
Identify problems with implementation and acting to combat them	8.4	-0.9	8.4	-0.6	8.2	-0.9	8.0	-0.6
Complying with the rules of professional conduct of own professional body	8.0	-0.3	8.7	-0.4	8.1	-0.4	8.5	-0.3
Be able to resolve conflicts constructively	8.0	-0.8	8.7	-0.4	8.0	-0.6	8.3	-0.6
Evaluating and improving on health, safety and welfare systems	7.6	-0.3	8.8 **Man.**	-0.5	8.3	-0.8	8.7	-0.7
Knowing and managing own strengths and weaknesses	8.2	-0.8	8.4	-0.5	8.2	-0.9	8.2	-0.7
Having an awareness and sensitivity to the needs and concerns of other people	8.1	-0.9	8.2	-0.4	7.7	-0.9	8.4	-0.7
Project planning skills - i.e. ensuring the correct level and sequencing of resources when implementing engineering solutions	8.2	-0.9	8.3	-0.5	7.6	-0.9	8.1	-0.6
Ensuring that implementation comes in on budget, even in the light of emerging challenges to the implementation programme	8.1	-0.8	8.1	-0.3	8.0	-1.1	8.1	-0.8
Organising and leading working teams	8.2	-0.8	7.7	-0.3	8.3	-1.2 **Const.**	8.1	-0.6

Fig 8. Importance scores and performance gaps by sector – IEng

	Manufacturing		Construction		Real Estate		Other	
	Importance	Performance Gap	Importance	Performance Gap	Importance	Performance Gap	Importance	Performance Gap
Base:	*57*		*35*		*34*		*49*	
Proactively identify opportunities for improvements to current processes or systems	8.2	-0.9	8.1	-0.4	7.7	-0.4	7.9	-0.6
Undertaking engineering design and developing fit for purpose engineering solutions	8.0	-0.5	8.6	-0.4	7.7	-0.9	7.6	-0.6
Ensuring the application of quality management principles by team members and colleagues	7.9	-0.7	8.3	-0.4	7.7	-1.0	7.7	-0.7
Taking responsibility for maintaining and updating their own engineering skills and knowledge	7.9	-0.9	7.8	-0.7	7.7	-0.7	8.2	-0.8
Negotiation skills in making contractual arrangements with clients, sub contractors and suppliers	7.7	-0.8	8.2	-0.4	8.0	-0.5	7.5	-0.7
Ensuring that the solution meets requirements in terms of its social and environmental impacts	7.5	-0.8	8.2	-0.4	8.3	-0.7	7.7	-0.6
Assisting individual team members in achieving continuing professional development goals and objectives	7.7	-0.6	8.4	-0.4	7.6	-0.8	7.7	-0.8
Testing the suitability and effectiveness of engineering solutions	8.0	-0.6	8.0	-0.5	7.3	-0.6	7.1	-0.6
Being able to introduce and exploit new and advancing technology	7.9	-0.7 **R.E.**	7.4	-0.3	7.4	0.0	7.7	-0.5
Being creative and innovative in developing engineering technology	8.2 **Const. & Oth.**	-1.0 **Const.**	6.8	-0.2	7.7	-0.7	6.8	-0.6
Design, implement, and evaluate continuous improvement systems	7.7	-1.1 **Const.**	6.8	-0.2	7.7	-0.6	7.4	-0.4
Identify and exploit opportunities for developing / transferring technology	7.2	-0.8	6.2	0.0	6.8	-0.7	6.0	-0.2
Setting up appropriate management systems	7.4	-0.5	7.4	-0.2	7.1	-1.2 **Const.**	7.2	-0.6
Keeping abreast of technological developments through study, research or experimentation	7.3	-0.8	7.2	-0.5	7.1	-0.3	7.1	-0.6
Ensuring that the solution meets the appropriate aesthetic requirements	7.1	0.1	6.8	-0.1	7.9	-0.5	6.7	-0.1
Designing and conducting appropriate research in an organised and cost effective manner to inform the design of engineering solutions	7.9 **Oth.**	-1.0	6.8	-0.3	6.8	-0.6	6.1	-0.6
Being innovative in creating products which enhance the quality of the environment	7.0	-0.8	7.4	-0.4	7.2	-0.4	6.7	-0.6
Innovating in the development of products and services that do not adversely affect the environment	7.2	-0.7	7.6	-0.4	7.0	-0.5	6.1	-0.2
Proactively identify and assess market opportunities for new or enhanced engineering solutions	6.7	-0.6	7.2	-0.6	7.0	-0.7	6.0	-0.1
Being aware of intellectual property rights issues and taking the appropriate steps to secure IPR when this is required	6.8	-0.4	6.2	-0.4	7.3	-0.9	6.6	-0.8
Developing imaginative engineering solutions to enhance community welfare, involving the wider community in this where possible	6.2	-0.6	6.4	0.1	6.2	-0.2	6.6	-0.5

Fig 9. Engineering Technicians v non registrants

Base: some / all registered = 174, non registered = 104

	Some / all registered		Non registered		
	Importance	Performance gap	Importance	Performance gap	Overall Importance
Meeting agreed targets in terms of quality	9.2	-0.5	8.8	-0.3	9.1
Manage and apply safe systems of work	9.1	-0.6	8.7	-0.4	8.9
Comply with appropriate codes of practice at all times	9.1	-0.4	8.6	-0.5	8.9
Observe good practice with regard to the environment	8.9	-0.5	8.4	-0.2	8.7
Taking responsibility for seeing a task or process through to completion	8.8	-0.4	8.5	-0.6	8.7
Make risk assessments wherever necessary	8.7	-0.4	8.5	-0.4	8.6
Work reliably without the need for close supervision	8.6	-0.4	8.5	-0.6	8.6
Meeting agreed targets in terms of deadlines	8.8	-0.6	8.2	-0.5	8.6
Work effectively with clients, colleagues, suppliers and the public	8.6	-0.5	8.4	-0.4	8.5
Meeting agreed targets in terms of cost	8.4	-0.6	8.6	-0.5	8.5
Ability to organise effectively materials, components or plant to complete tasks	8.4	-0.5	8.5	-0.4	8.4
Ability to go beyond the immediate requirements of the job and use initiative and experience to solve problems or improve processes	8.4	-0.8	8.3	-0.9	8.4
Use effective communication and interpersonal skills in English, orally, in writing and electronically	8.5	-0.5	7.7	-0.5	8.2
Carry out continuing professional development to ensure competence is maintained and updated	8.2	-0.8	7.8	-0.8	8.0
Recognise obligations to society	8.1	-0.4	7.7	-0.2	8.0
Use appropriate scientific, technical, or engineering principles to complete tasks	7.9	-0.6	7.3	-0.4	7.7
Use diagnostic methods to identify causes and find solutions to technical problems	7.7	-0.6	7.5	-0.7	7.6
Identify problems in design or development of products and systems or services	7.8	-0.4	6.8	-0.5	7.4
Allocate and supervise the work of others	7.3	-0.4	7.2	-0.2	7.3

Fig 10. Importance scores and performance gaps by sector – Eng Tech

	Manufacturing		Construction		Real Estate		Other	
	Importance	Gap	Importance	Gap	Importance	Gap	Importance	Gap
Base:	*95*		*64*		*55*		*59*	
Meeting agreed targets in terms of quality	9.2	-0.4	9.1	-0.3	9.2	-0.4	8.6	-0.7
Manage and apply safe systems of work	8.8	-0.5	8.8	-0.4	9.3	-0.4	8.8	-1.0
Comply with appropriate codes of practice at all times	8.9	-0.5	8.9	-0.3	9.1	-0.3	8.5	-0.7
Observe good practice with regard to the environment	8.7	-0.3	8.6	-0.4	9.1	-0.2	8.5	-1.0 Man/RE
Taking responsibility for seeing a task or process through	8.7	-0.6	8.7	-0.4	8.9	-0.4	8.3	-0.6
Make risk assessments wherever necessary	8.7	-0.4	8.5	-0.3	8.7	-0.3	8.6	-0.8
Work reliably without the need for close supervision	8.6	-0.5	8.6	-0.4	8.8	-0.6	8.0	-0.5
Meeting agreed targets in terms of deadlines	8.5	-0.6	8.6	-0.4	8.8	-0.4	8.4	-0.8
Work effectively with clients, colleagues, suppliers and the public	8.5	-0.6	8.4	-0.3	8.8	-0.3	8.2	-0.6
Meeting agreed targets in terms of cost	8.5	-0.6	8.7	-0.5	8.5	-0.4	7.9	-0.5
Ability to organise effectively materials, components or plant to complete tasks	8.7	-0.6	8.5	-0.2	8.5	-0.6	7.5	-0.6
Ability to go beyond the immediate requirements of the job and use initiative and experience to solve problems or improve processes	8.2	-0.9	8.7	-0.9	8.2	-0.7	8.4	-0.9
Use effective communication and interpersonal skills in English	8.2	-0.5	8.1	-0.6	8.5	-0.4	8.0	-0.6
Carry out continuing professional development to ensure competence is maintained and updated	7.8	-0.7	8.3	-0.6	8.2	-0.7	8.0	-1.1
Recognise obligations to society	7.8	-0.2	7.8	-0.2	8.7	-0.4	7.8	-0.7
Use appropriate scientific, technical, or engineering principles to complete tasks	7.5	-0.6	7.9	-0.4	7.7	-0.5	7.7	-0.8
Use diagnostic methods to identify causes and find solutions to technical problems	7.6	-0.9 Const.	7.6	-0.3	8.0	-0.6	7.4	-0.7
Identify problems in design or development of products and systems or services	7.7	-0.7 Const.	7.4	-0.2	7.4	-0.3	6.7	-0.8
Allocate and supervise the work of others	7.2	-0.4	7.5	-0.2	7.2	-0.2	7.0	-0.5