

Research Briefing

Gadget girls and boys with their toys:

How to attract and keep more women in engineering

For nearly three decades, governments and industry have sponsored efforts to increase the representation of women in professional engineering, recognising the (largely) untapped pool of talent amongst women. These efforts have had some impact: 18% of engineering students now are women, and 8% of those in engineering jobs. Nonetheless, there is clearly room for improvement – not only in recruiting women into engineering, but also in retaining and promoting those women who do enter the profession. This briefing is being circulated to engineering employers and professional bodies; it offers some solutions for how to attract and keep more women in engineering.

The briefing draws on a recent study conducted by sociologist Dr Wendy Faulkner of the University of Edinburgh, and funded by the Economic and Social Research Council. The study involved interviews and/or observation (through job shadowing) of 66 women and men engineers working in a range of industrial sectors and engineering disciplines. The aim of the study was to explore the suggestion that engineering workplaces are more comfortable to, and more supportive of, men engineers than women engineers.



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Attracting more women: Stereotypes don't help - it's time for a new image!

It goes without saying that we need to sustain efforts to directly increase the proportion of women in engineering. The industry has a particular image problem in recruiting women, because the man engineer is still very much seen as the norm. This means that many clever young women don't even consider a career in engineering. And it means that being a woman engineer marks you out as unusual – as women engineers are constantly reminded by the reactions of others.

The classic stereotype of the engineer is of a man who is brilliant at, and passionate about, technology but not so good at interacting with people. This image not only says 'technology is for men'. It also says being 'into technology' means not being 'into people'. Since women are stereotypically 'into people', the image carries the implicit message that the women engineers are not 'real women' or 'real engineers'!

A major finding of this study is that the classic stereotype of an engineer bears little or no resemblance to actual engineers, or their work.

Women and men engineers alike get excited about technology
Women and men engineers are motivated by broadly the same drivers: they enjoy maths and science, and want to put their problem solving abilities to some 'practical' use. Although rather fewer women than men engineers have a 'tinkerer' background, they all get excited about, and take pride in, the technologies they help create or work with. There are 'gadget girls' as well as 'boys and their toys'; and there also are 'non-techie' men as well as women in engineering.

All engineers are socially skilled
Many engineers are introverts as students, but they all become more extrovert as they gain in professional confidence and experience at work. They have to: it simply isn't possible to do most engineering jobs without some ability to communicate and engage with others effectively! Perhaps for this reason, people skills are not obviously gender differentiated amongst engineers – in spite of stereotypes to the contrary.

Many 'types' of men and women are engineers
Whilst a few engineers do appear to epitomise the classic stereotype, the vast majority are more complex and more diverse than stereotypes allow. Accordingly, many different 'types' of women (and men) enjoy engineering work.

Engineering is both technical and social
Engineering work encompasses a wide variety of jobs and roles. In all of these, the expertise required of engineers is simultaneously social as well as technical (eg, the need to integrate business requirements into 'technical' decisions). This is what makes engineers such interesting people! Yet the image of engineering remains largely technical – in line with the more narrowly technical focus of engineering education (see box below).

The conventional stereotypes of engineers – and of women and men – simply cannot be ignored if we are to come up with better ways of improving the representation of women in engineering.

Accordingly, efforts to tackle the image problem surrounding the recruitment of women into engineering must:

- **Strive to 'normalise' engineering as a career choice for women**, so that people inside and outside of engineering no longer presume that 'the engineer' will be a man.
- **Avoid appealing to gender stereotypes.** Recruitment campaigns have a dual challenge. They should 'speak to' the enthusiasm about maths, science and technology which would-be men and women engineers share. And at the same time, they should speak to the diverse 'types' of people who could enjoy engineering.
- **Promote and celebrate a 'broad church' image of engineering.** Engineering has room for diverse 'types' of people because it encompasses a diverse range of jobs and roles. We must avoid narrowly technical images of engineering work if we are to attract and keep talented people in engineering, by promoting an image of engineering as both 'technical' and 'social'.



Keeping more women (1): Good practice in education and at work helps women, and men, 'become' engineers

Increasing the numbers of women recruited to engineering, though vital, is not sufficient to increase the proportion of women in engineering. Retention is a major issue – especially during the 10 or so years it can take before entrants really become 'fully fledged' engineers. Many women and men are lost to the profession in the course of university education and early years on-the-job. Yet appropriate support and intervention can make a huge difference. We, therefore, need to sustain and promote good practice at university and at work, if we are to keep more women and men in engineering.

Why engineering needs to move away from a 'nuts and bolts' identity: Karen's story

In many workplaces, engineers present themselves as 'nuts and bolts' engineers – even though this identity is at odds with their actual work and even though they never touch a nut or bolt. Arguably, the 'nuts and bolts' identity is a comfortably 'masculine' one for many men, but it can serve to exclude other engineers because does not to capture the diversity of engineering work. One very talented engineer, Karen, left her engineering design company for a project management company – partly because she was not allowed to concentrate on the 'up front' roles in concept design and winning new business for which she has proven aptitude, and partly because she didn't 'belong' in the nuts and bolts culture of the office.

Good practice in engineering education

Engineering faculty can help to 'normalise' the woman engineer, amongst staff and students. In addition, they must be aware of an early confidence loss experienced by some women students.

In terms of curricula, the provision of quality training in hands-on engineering benefits not only women students, but also growing numbers of men, who do not have a 'tinkering' background. Students 'engage' more readily with engineering where the syllabus integrates practical and theoretical elements, eg through project work.

Good practice in supporting junior engineers on the job

Individuals – individual supervisors, mentors, colleagues or managers – can have a huge impact on how smoothly junior engineers move up the learning curve, and on whether or not they stay. There is a strong business case (in terms of stemming losses) for employers to invest in selecting and training mentors and line managers – for example, to build up rather than undermine the confidence of junior engineers, to create opportunities for them to prove themselves successfully, and to encourage a culture where 'there are no stupid questions'.

Some of the support needed during early years on the job comes from peers and, for women, from other women engineers. Employers can do much to ensure that junior engineers are not isolated, and to facilitate networking and mutual support between junior engineers and between women engineers.

Many employers ensure that graduates experience the full range of engineering work. However, women and men engineers alike can end up in jobs which do not suit their skills and interests, or which are dead ends in terms of career progression, and so drift out of the industry or fail to progress in the company (see box below). There is a crying need for ongoing, strategic support and advice over career development if we are to keep talented junior engineers.



Manufacturing may be particularly unsupportive of junior women engineers' careers

Fiona trained in mechanical engineering and always wanted to work in manufacturing. She joined a company with a graduate training scheme and worked her way around the various operations involved. She enjoyed much of the work and had some supportive managers. But eventually she felt her career was 'going nowhere' and now has a university job teaching IT.

Claire also trained in mechanical engineering. Her first job was a university research post where she investigated computer-aided engineering in a number of companies overseas. This built up her confidence as an engineer by giving her practical experience, and enabled her to become chartered. Lacking appropriate advice on how to capitalise on her expertise, however, she ended up teaching computer-aided engineering in universities, which she eventually found dissatisfying. She is now in charge of management and engineering information systems in an R&D firm – which she enjoys but sees as 'not a professional engineering job'.



Keeping more women (2): Nurturing more 'inclusive' workplace cultures

It is frequently claimed that women who enter engineering have to 'fit in' to 'a masculine culture'. The job shadowing conducted for this study revealed a mixed picture. Many features of engineering workplaces appear quite comfortable for all, but some feel and operate like 'men's spaces'.

Many subtle aspects of the culture, which may appear trivial individually, nonetheless together have a 'dripping tap' effect - making it harder for women to 'belong' and get on in engineering.

Non-work topics of conversations

Whilst non-work chat between close colleagues is quite wide ranging and inclusive, the less routine conversations with outside associates tend to lean more readily on stereotypically 'safe' subjects – such as football and families. The more narrow the range of 'admissible' conversation, the more people (men and women) are marginalised or silenced. None of those observed was openly gay.

Humour and sex talk

Engineers generally take a care to avoid potentially offensive jokes and topics of conversation. However, the humour in some workplaces is very coarse and offensive – including, sexist, racist and homophobic jokes as well as 'dirty talk'. Any challenges are muted for fear of being ostracised.

Routine ways of greeting or addressing one another

In general, interactions between engineers are entirely respectful. However, routine ways of greeting or addressing one another tend to be those which men use with other men – 'mate' or 'man', even handshakes – and so are absent when men interact with women engineers. Such 'subtle absences' may mean that women engineers have to work harder than the men to achieve the same level of easy acceptance with new associates or colleagues.

Gendered language

Engineers routinely use the 'generic he' when referring to other engineers. At best, expressions like 'We put our key men forward' or 'Go talk to the electrical boys' render women engineers invisible; at worst, they render the very category 'woman engineer' a non-sequitur! It is not difficult to promote gender inclusive language – in engineering documentation as well as everyday talk.

Social circles and networks

There is considerable mixed-sex socialising and camaraderie amongst engineers, and most organized social activities (except the football sessions!) involve women and men. However, men-only social circles are common in engineering. Some of these have a significant influence on how the job gets done and who gets promoted. Breaking into the 'inner circles' can be difficult for women (and marginal men) – for instance, where they bond on the golf course or over drinking sessions.

Conformity and diversity

Engineering workplace cultures accommodate a range of men – laddish blokes, family men, pranksters, macho men, nerdy men, urbane men, genteel men – and so are likely to feel comfortable to the great majority of men. Women are expected to adapt and become ‘one of the lads’ in order to ‘fit in’ – but, at the same time, not to ‘lose their femininity’.

The ‘in/visibility paradox’ facing women engineers

Women engineers are so visible as women, they are often invisible as engineers. Because the norm is a man engineer, even really experienced women engineers can have to (re)establish their engineering credentials every time they encounter a new colleague or associate – who may otherwise assume they are a secretary!

Sexual visibility and harassment

Women are also (hetero)sexually visible in a way men engineers rarely experience. Most have encountered sexual harassment and/or heavy flirting from men at some point. Often young women are unaware of procedures in place to respond to such harassment.

What can employers do?

There is a strong business case for sustained and sensitive diversity training, as a means of raising awareness of the kind of issues and dynamics signalled here, and so nurturing a workplace where everyone is comfortable and ‘belongs’. To be effective, such efforts must involve all staff, including middle managers, they must be tailored to the particular workforce, and avoid alienating the majority group or creating a backlash.

Diversity efforts need to be seen to have the support of senior management. ‘Top down’ policies can also take the pressure off individual women and men fighting offensive cultures: eg, the banning of pornography. In some workplaces, more needs to be done to increase awareness that sexual harassment and any kind of bullying or sexist or racist behaviour is unacceptable, and of the procedures in place for handling this.

Further copies of this research briefing and the full research report are available from

www.setwomenresource.org.uk



Dr Wendy Faulkner
Reader, Science Studies Unit
School of Social and Political Studies
University of Edinburgh
Adam Ferguson Building
Edinburgh EH8 9LL
SCOTLAND
Tel: +44 131 650 4069
Fax: +44 131 651 1778
Email: w.faulkner@ed.ac.uk

UK Resource Centre for Women in Science,
Engineering and Technology
Listerhills Park of Science and Commerce,
40 - 42 Campus Road,
Bradford BD7 1HR

Tel: 01274 436131
Fax: 01274 436471
www.setwomenresource.org.uk



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