“We must challenge the stereotyping and bias that can still pervade our culture, particularly within the male dominated engineering and technology sectors. Attracting and retaining a more diverse workforce will maximize innovation, creativity and competitiveness.”

(Success through STEM, STEM Business Group November 2013)

“...some of the statistics highlighted in the IET’s report have not changed significantly since 2005… For example, the number of women in engineering has remained under 10 per cent of the total engineering workforce in the UK; the gender balance in the profession remains one of the worst in Europe.”

(Skills & Demands from Industry - 2015 Survey, IET)

“Retention of women in science, engineering and technology (SET) is an important issue, with economic and social justice implications. [...] The situation… is sometimes described as “the leaky pipeline”; as scientists and engineers flow along the science career pipeline … they ‘leak out’ and are lost to science.”

(Diversity in Engineering, Women’s Engineering Society, September 2014)

About this document

There is much data and information out there on gender, diversity, STEM and engineering in particular. The Women’s Engineering Society does not try to replicate the good work carried out by others. Instead this document tries to pull together a few pieces of data and statistics with the intention to help WES members and others to understand what the issues might be.

In case of errors & omissions, suggestions for additions, or queries & requests for further information, please let me know (email info@wes.org.uk, please set the subject to WES Statistics, and mark it FAO Sarah Peers).

Dr Sarah Peers
January 2018

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Key Statistics and Messages

The following are some key pieces of data are extracted from the following sections and which are the most often requested.

- 2017 surveys indicate 11% of the engineering workforce is female.\(^{(1)}\) This is a positive change from the 9% in 2015.\(^{(2)}\) On the other hand the number of women registered engineers and technicians (i.e. CEng, IEng, EngTech has dropped from 6% to 5% of total.\(^{(4, 5)}\)
- The UK has the lowest percentage of female engineering professionals in Europe, at less than 10%, while Latvia, Bulgaria and Cyprus lead with nearly 30%.\(^{(5)}\)
- 15.1% of engineering undergraduates in the UK in 2017 are women.\(^{(2)}\) Compare with India: where over 30% of engineering students are women.\(^{(6)}\)
- The proportion of young women studying engineering and physics has remained virtually static since 2012.\(^{(7)}\)
- The number of women in computing degree programmes appears to be falling: 14% in 2010 and 13% in 2014.\(^{(8)}\)
- In 2015/16 women accounted for only 6.8% of Engineering apprenticeship starts and 1.9% of Construction Skills starts.\(^{(9)}\)
- Only around 20% of A Level physics students are girls and this has not changed in 25 years.\(^{(10)}\)
- There is now very little gender difference in take up of and achievement in core STEM GCSE subjects.\(^{(11)}\)
- 61% of engineering employers say a recruitment of engineering and technical staff with right skills is a barrier to business.\(^{(12)}\) 32% of companies across sectors have reported difficulties recruiting experienced STEM staff, and 20% find it difficult to recruit entrants to STEM.\(^{(13)}\)
- The UK needs to significantly increase the number of people with engineering skills. In 2014, one report put the annual shortfall of STEM skills at 40,000.\(^{(14)}\) In 2017, the annual shortfall of the right engineering skills is anywhere between 25,500 (level 3) and upto 60000 (over level 4 skills).\(^{(1)}\) We need to double, at least, the number of UK based university engineering students.\(^{(12)}\)
- Women and men engineering and technology students express similar levels of intent to work in engineering & technology, but 66.2% of the men and 47.4% of the women 2011 graduates of eng/tech programmes went on to work in engineering and technology.\(^{(15)}\)
- Women Fellows of the Royal Academy of Engineering: 2% in 2006 and 4% in 2014.\(^{(16)}\)
- BUT In a survey of 300 female engineers, 84% were either happy or extremely happy with their career choice.\(^{(17)}\)
- AND Engineering students are second only to medics in securing full-time jobs and earning good salaries.\(^{(17)}\)
- Engineering is important to the UK: it contributes 26% of our GDP\(^{(2)}\) or £127,580,000,000 to our economy.
• Enabling women to meet their full potential in work could add as much as $28 trillion to annual GDP in 2025.(18)

• In 2010 nearly 100,000 female STEM graduates were unemployed or economically inactive. (19)

• Diversity matters: companies are 15% more likely to perform better if they are gender diverse. (20)

• Diversity is crucial for innovation: in a global survey, 85% corporate diversity and talent leaders agreed that “A diverse and inclusive workforce is crucial to encouraging different perspectives and ideas that drive innovation”. (21)

• The National Centre for Universities and Business offer an excellent infographic poster, Talent2030 Dashboard, which shows progress to their targets for women in engineering. In 2017, one of their targets was met: 50% of Physics GCSE students were girls.

Sources
11. Joint Council for Qualifications, which represents the seven largest awarding bodies in the UK, from their online sites http://www.jcq.org.uk/examination-results/gcses/2017
17. Britain has got talented female engineers, RAEng and Atkins 2013 http://www.raeng.org.uk/publications/other/britains-got-talented-female-engineers

NB All URLs above accessed January 2018
Schools & Girls

• According to a British Gas survey, almost half (48%) of young women do not even consider careers in STEM sectors, citing a lack of STEM knowledge (30%), a perception that the industries are sexist (13%), and a belief that STEM careers are better suited to the opposite sex (9%).
  (Research highlights STEM gender gap, The Engineer, 10 August 2015 https://www.theengineer.co.uk/research-highlights-stem-gender-gap/ )

• According to research by Engineering UK in 2011, the main reason for the low number of women in engineering is girls’ subject choices in school.
  (Engineering UK, An investigation into why the UK has the lowest proportion of female engineers in the EU, April 2011)

• In polling carried out for Tomorrow’s Engineers Week, more boys (+9%) reported being encouraged to think about engineering as a career, particularly by parents.

• In 2015, 17% of STEM teachers think that a career in engineering is undesirable for their students. This rises to 19% for the 25-44-year-old STEM teacher group.

• Only 35% of STEM teachers felt confident in giving engineering careers advice, and this has remained unchanged for a few years.

• Almost half of all maintained co-ed schools in England (49%) sent no girls on to take A Level physics in 2011.
  (It’s Different for Girls, Institute of Physics, 2012 http://www.iop.org/education/teacher/support/girls_physics/different/page_61620.html )

• The IoP’s Closing Doors report identifies schools that do not tackling gender bias in choice of subjects, and “49% of schools actually making the gender imbalance … worse”.

• There has, however, been some progress in recent years. For example, according to Tomorrow’s Engineers, the percentage of secondary school age children who would consider a career in engineering increased from 29% to 47% between 2011 and 2014, BUT only 29% of those being girls. However, only 34% said they know what to do next in order to become an engineer.
On the other hand, men and women receive different careers advice at school, according to a 2014 City & Guilds survey of 2000 young professionals. The top 3 career choices recommended to girls are nursing & care, teaching, medical. For boys the top 3 are IT, engineering and finance. (See details of City & Guild 2014 survey here: http://www.cityandguilds.com/news/March-2014/apprenticeships-not-just-for-boys#.VIMwsvKLTNM and infographic here: http://www.cityandguilds.com/news/March-2014/infographic-careers-advice-girls-v-boys#.VIMsi_KLTNM)

Female and male A Level students in STEM subjects will be, based on current expected changes, equally represented in 2058. However, trends are not necessarily always on the up, as noted by Talent 2030. (Research Briefing No. 11; Tomorrow’s Women, Tomorrow’s World; UK Resource Centre for Women in Science, Engineering and Technology; March 2009; National Centre for Universities and Business, Talent 2030 Dashboard, 2015 http://www.ncub.co.uk/reports/talent-2030-dashboard-2015.html)

GCSEs and A Levels

Note: Where sources are not provided below, data is taken from Joint Council for Qualifications, which represents the seven largest awarding bodies in the UK, from their online sites https://www.jcq.org.uk/examination-results/gcses/2017 and http://www.jcq.org.uk/examination-results/a-levels/2017.

It is clear that there are indicators of gender playing a big part the types of programmes boys and girls select. There are big gender gaps in GCSE topics such as construction (under 5% girls) and health & social care (around 5% boys) leading to a knock-on effect on post-16 choices. (What subjects did students do best and worst in on GCSE Results Day 2017? 21 Aug 2017, Daily Telegraph http://www.telegraph.co.uk/education/2016/08/25/what-subjects-did-students-do-best-and-worst-in-on-gcse-results/)

At GCSE, there is some gender divide in subject choices as seen in the JCQ ‘Differences between male and female GCSE subject choices’ chart below.
• For the core STEM GCSEs there are few gender differences, apart from Design & Technology and ICT (both have with girls making up just under 40% of total). Computing has a meagre 19% being girls, even after much outreach to encourage the uptake of coding. Engineering and Construction have very low number of girls taking these (9.7% and only 34 out of 690).

• As from 2015, girls are more likely than boys to achieve high grades are across nearly all STEM GCSE subjects (e.g. in 2017, in D&T where 26.9% of female entrants achieve A*-A/9-7 compared to 12.1% of male entrants, and in Engineering, where the respective figures are 14.9% girls and 6.7% boys). Still in 2017, girls did slightly less well than boys in the core Mathematics GCSE, but did better in Maths (Additional) although there is not much difference either way.

• The good news on D&T is that attainment gaps have clearly closed and reversed since Ofsted reported in 2011 “the attainment gap between high GCSE grades for girls and lower grades for boys is one of the widest and has grown since 2007”. What is not known is whether stereotypes are now challenged: in 2011 Osfted reported negatively, reporting that schools did not encourage non-stereotypical choices so that “girls take up textiles and food technology instead of electronics”.

• In 2015, the DfE announced a the good news of an increase in takeup of STEM GCSEs. It is to be noted however that the lauded Computing and Engineering GCSEs are at the bottom of the gender league.

• The gender gap in Physics A Level, a key requirement for engineering programmes, continues: in 2012 it was the second most popular A Level subject for boys in England, but only 17th amongst girls.

• In 2017, only 21.5% of A Level physics students are girls (a slight drop from 23.7% in 2014 and same as in 2015. Proportions have remained around 20% over the past 25+ years.

• Of those who do take STEM A Levels, generally a few more girls achieved A*- B combined grades compared to boys in STEM subjects in 20171. Boys do slightly better in Chemistry (+1.4%) and in Further Maths (+0.1%).

• Girls do well in Physics 51.6% of female entrants gaining A*-B, compared to 49.6% of male entrants, but this is a levelling out from previous years.

• Where girls do not always do as well as boys is in Maths, where boys beat them at grades A and A*, and in Further Mathematics, where boys beat at A*, but in A grades girls do very slightly better. Girls do catch up and start to overtake by grade B.

1 An aside: In fact in 2015 in nearly all subjects girls have done better cumulatively, aside from some modern foreign languages, namely Spanish, French, German, rather undermining the common gender-biased assumption that girls have better language skills.
Also to be noted are the even lower proportions of girls taking Computing A Level: a total of only 816, representing just over 9.8% of entrants. However the numbers and proportions seem to be steadily growing from 2014 (314 and 7.5%). Girls did very well compared to boys until 2016, but this year 2017, boys have outperformed girls (37.8% of boys achieving grades A* to B, cf. 35.8%).

In 2015, 39% of mathematics A Level entries were female; this seems to be holding steady compared to recent years. The good news is that numbers of students taking maths are rising - slowly.

The other gender gap is in Psychology, where a mere 25% of entrants are boys, and where girls completely outperform boys.

The Gatsby Foundation have reported succinctly on the gender divide across STEM GCSEs, A Levels and apprenticeships as shown below. (NB Psychology is not included in the analysis. Although not considered a ‘facilitating’ subject, it is still a science)


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See the Russell Group’s guide Informed Choices on what is meant by a facilitating A level subject http://russellgroup.ac.uk/for-students/school-and-college-in-the-uk/subject-choices-at-school-and-college/
Further Education, Vocational & Apprenticeships

Note: There have been considerable changes to the vocational qualifications landscape in the past 7 or so years that makes it difficult to track progress on diversity: removal of the Diplomas (2013), introduction of the QCF framework in 2010 and related decline in NVQs, and now removal of apprenticeship frameworks replaced by new standards and the new Higher Apprenticeships. Gender diversity in vocational education/apprenticeships has rarely been commented on and those working in apprenticeships do not often refer to diversity. This makes it a little tricky to look at historical trends, but we can, it is not looking good. It is tempting just to summarise with “it was bad, and it is still bad.”

- NB See above for the Gatsby comparisons of GCSEs/A Levels and apprenticeships.


- The good news however is that a UK government supported network, Apprenticeship Diversity Champions Network (ADCN) has been set up in 2017 to encourage diversity in apprenticeships. This has set a target for increased BAME (black Asian and minority ethnic communities) of 20% in apprenticeships. The bad news is that it does not look at distribution across programmes and so does not consider gender diversity. (Press release New employers network launched to help promote and champion diversity in apprenticeships, Department for Education, Feb 2017 https://www.gov.uk/government/news/network-established-to-encourage-diversity-in-apprenticeships)

- A Young Womens’ Trust report of 2016 finds that in sectors such as engineering, women make up a lower proportion of apprentices than a decade ago – for every female apprentice working within engineering there are 25 male apprentices and is possibly in decline (4.6% 2002 to 3.8% in 2014). In construction, there are 56 men to every woman; in plumbing, there are 74 men to every woman. (Making Apprenticeships Work for Young Women, Young Womens’ Trust, 2016 https://www.youngwomenstrust.org/assets/0000/2906/Making_Apprenticeships_Work_for_Young_Women.pdf)

- In 2015/16, only 7% of those completing Engineering BTEC were female, a slight increase from the 5% in 2005/6. But for Construction BTEC the proportion was 9% representing a slight decrease from 11% in 2005/6. (Engineering UK 2017: The State of Engineering, http://www.engineeringuk.com/media/1355/enguk-report-2017.pdf)

- In 2015/16 only 5-7% of entrants to HNCs and HNDs in engineering were female, representing a slight rise in recent years. But just under 10% of entrants to Foundation Degrees in engineering were female: a slight decrease. (Engineering UK 2017: The State of Engineering, http://www.engineeringuk.com/media/1355/enguk-report-2017.pdf)

- There is also high gender imbalance in take up of engineering and related NVQs/SVQs/QCFs/VRQs as shown by the following % achievements by women:
  - Engineering & manufacturing technologies – 12.4%
  - Construction, planning and the built environment - no figure given!
- Information and communication technology – 36.8%
- Across all engineering related Sector Subject Areas the figure is 21.0%

At first glance these figures look like impressive increase from previous years (except for Construction!) but it should be noted that these figures are difficult to interpret given the changes in vocational qualifications.


• It is reported that gender stereotyping is dissuading young women from pursuing careers in traditionally male industries, resulting in women ending up in low-paid jobs. 3.4% of engineering & manufacture apprentices are female.


• A 2014 City and Guilds survey also indicated that only 17% of young women were encouraged to consider apprenticeships, as compared to a third of young men.


• In 2014/15, 53% of apprenticeships starts were by women and 47% by men. On the other hand, female apprenticeship 2013/14 starts in the following frameworks are: Engineering – 3.8%, Construction Skills – 1.7%, compared to Children’s Care Learning and Development – 94.2%.


• The Gatsby Foundation note: “The figures for advanced (level 3) apprenticeships in engineering are stark. Throughout the last decade, no more than 5% of starts were girls in any one year. Worryingly, in 2014/15 girls accounted for only 4% of starts.”


• Perkins also reported on the historical gender gap in engineering apprenticeships – indicative of the gender gap found in other vocational engineering programmes.

(Professor John Perkins’ Review of Engineering Skills, November 2013)

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3 Good news: there is now official breakdown of achievement data by gender and apprenticeship for 2014/15. This section to be updated in future.

4 See section Equal Pay for info on apprentices, gender and pay.
• There is still little governmental analysis and breakdowns of gender, BAME and other forms of diversity across apprenticeship programmes. In 2015 there were around 200 frameworks listed, 12 include “engineering” in the title and many others were also for engineering or technology roles: this makes it difficult to understand the scale of the gender divide. House of Commons briefing papers (latest in 2017) do not even hint at the diversity issue in apprenticeships.


• The top engineering & tech apprenticeships started by women in 2013/14 by proportion are: IT User (41%), Supply Chain Management (33.3%), Aviation Ops on the Ground (30.6%), and Food Manufacture (29.1%). By numbers, the top apprenticeships for women are: Industrial Applications (2140, representing 14.4% of starts), IT User (1330), IT and Telecoms Professionals (1060, representing 10.8% of starts), Food Manufacture (880) and Engineering (590, representing 3.8%).


• The Gatsby Foundation also note: “Science apprenticeships, although low in number, are typically taken by girls. Dental nursing and veterinary nursing, 97% and 95% female apprentices respectively, account for three-quarters of all science-based advanced apprenticeship starts.”


Higher Education

Note: The 2014 WES report Diversity in Engineering is a good starting point to understand some of the issues for women engineering students: see http://www.wes.org.uk/diversityinengineering. Where sources are not provided below, data has been obtained from HESA Free Statistics Online https://www.hesa.ac.uk/free-statistics. Issues of citations and women academics are not covered here: see http://www.wes.org.uk/highlycited.

• Between 1980 and 2009 the proportion of women at university rose from 40% to 54%. In 2017, it is reported at 56%.

(Professor Alan Smithers, University of Buckingham; article in The Independent, 5 March 2009; www.independent.co.uk/news/education/education-news/alan-smithers-does-it-matter-that-mainly-boys-do-physics-406756.html

University gender gap at record high, The Guardian, 28 August 2017

• At degree level, there are marked differences in the STEM undergraduate subjects which attract males and females:
  - Males dominated undergraduate degrees starts in Engineering and Technology (83%), Computer science (83%) and Architecture, Building and Planning (64%).
  - Females dominated undergraduate degree starts in Subjects Allied to Medicine (79%), Veterinary science (76%) and Agriculture and Related Subjects (62%).
In 2012/13 the number of applications into engineering was 32,026 (an increase of 5.5%, almost double the +3.1% for all subjects). 87.1% of the applicants were male and 12.9% were female. There is considerable variation, however:

- Production and manufacturing engineering (23.4%)
- Chemical, process and energy engineering (25.7%)


The number of women in computing degree programmes appears to be falling: 14% in 2010 and 13% in 2014, again with variation in different specialisms.


For more examples of variation in different engineering subjects: in 2010/11, 29% of chemical engineering graduates were female compared to 17% civil engineering, 14% electronic engineering, and 9% mechanical engineering.

(Diversity in Engineering, Women's Engineering Society, September 2014)

Once students have made the transition to higher education to study engineering and technology subjects, gender is a more significant factor than social class in determining occupation types.

(Diversity in Engineering, Women’s Engineering Society, September 2014)

Women engineering and technology university students share similar career ambitions to men students: overall 60-70% of final year white and BME students stated in a survey that they were intent on pursuing a career in engineering/technology.

(Diversity in Engineering, Women’s Engineering Society, September 2014)

Men were much more likely than women, however, to be in engineering and technology occupations six months after completion of their courses: for example of 2010/11 graduates of a bachelor engineering course, 66.2% of the men were working in engineering, and only 47.4% of the women were in engineering.

(Diversity in Engineering, Women’s Engineering Society, September 2014)

The overall retention rate of female SET graduates is far lower than that of males, 25% compared with 40%.

(Diversity in Engineering, Women’s Engineering Society, September 2014)

The proportion of young women studying engineering and physics has remained virtually static since 2012. Any increase in postgraduates is largely due to international students.


The proportion women in those qualifying in undergraduate Engineering and Technology courses actually dropped from 14% to 13.7% in 2015, and is now back upto 14.4%. There have been fears of a downward trend.

• Engineering students are second only to medics in securing full-time jobs and earning good salaries (In 2012, 83% in full time jobs within 6 months, and earning £769 median weekly gross earnings).
   (Britain has got talented female engineers, RAEng and Atkins 2013, http://www.raeng.org.uk/publications/other/britains-got-talented-female-engineers)

• In university engineering departments around 80% of male and 20% of females worked as full time academic staff in 2011/12.
   (HESA staff data – not free!)

• A 2012 European Commission study found that around 42% of UK academic staff are women but at the most senior research grade it is around 17%, below the EU average.
   (Women in scientific careers, House of Commons Science and Technology Committee - Sixth Report, January 2014)

Employment & Industry

• 2017 surveys indicate 11% of the engineering workforce is female. This is indicating some positive change but not a big enough change to be sure the trend is upwards. On the other hand the number of women registered engineers and technicians (i.e. CEng, IEng, EngTech) has dropped from recent highs of 6% to 5%.

• The numbers of women actually working in engineering are not really changing:
   see Figure 1 below:
   (Disruptive Diversity, A report for the ICE, October 2015 – http://www.wes.org.uk/content/disruptive-diversity)

![Figure 1 UK Engineering Employees by Gender](https://www.wes.org.uk/content/disruptive-diversity)

• Women engineers and technicians eligible for professional registration (CEng, IEng, EngTech) and registered women engineers and technicians were reported in 2015 at 6% for both. In 2017, only 4.9% of registrants are female.
• In the tech sector, the number of women working in information technology and computing in the UK represents only 15% of the total and is not growing. The proportions of women vary according to role: in the lucrative software engineer roles it is reported to be as low as 4% and leadership roles are at 5%.


• In construction, an article notes “Women make up just 11% of the entire workforce, but even this figure includes many who work behind a desk, often in design, management or secretarial roles. On building sites themselves, it is estimated that 99% of workers are men.”

(Where are all the women? Why 99% of construction site workers are male? The Guardian, 15 May 2015 https://www.theguardian.com/careers/careers-blog/2015/may/19/where-are-all-the-women-why-99-of-construction-site-workers-are-male)

• In 2014, CaSE reported a need for upwards of 450,000 new STEM based technicians by 2020, and put the annual shortfall of STEM skills at 40,000.


• The UK needs to significantly increase the number of people with engineering skills. In 2014, CASE put the annual shortfall of STEM skills at 40,000. In 2017, the annual shortfall of the right engineering skills is anywhere between 25,500 (level 3 – equivalent to A Level /technical level skills) and up to 60000 (over level 4 skills – that is to say high level skills including graduates). We need to double, at least, the number of UK based university engineering students.


• Engineering is very important to the UK: it contributes 26% of our GDP or £127,580,000,000 to our economy.


• A 2013 report notes that even if we level up achievements (in the case of boys) and take up (in the case of girls) of science GCSEs and A Levels, and assuming a 59% take up of STEM beyond school, the UK would only see an extra 18,000 STEM graduates a year and not the extra 40,000 required. The report also highlights that 80% of new STEM demand is in engineering and IT. To satisfy demands in engineering, 1 in 5 of all 21 year olds in the UK would need to enter engineering.


• Between 2012 and 2020, the UK economy will require 830,000 professional scientists, engineers and technologists, largely to replace those leaving engineering practice e.g. through retirement. This works out at over 100,000 new professionals each year.

(Jobs and Growth: the importance of engineering skills to the economy, Royal Academy of Engineering, July 2012)
• Over the next 3-5 years, demand for more people with higher-level skills is expected to be particularly strong in construction (+73%), manufacturing (+69%) and engineering, science and hi-tech (+52%).

• 61% of engineering employers say a recruitment of engineering and technical staff with right skills is a barrier to business.
  (Skills and Demand in Industry 2017 Survey, IET https://www.theiet.org/factfiles/education/skills2017-page.cfm)

• Nearly a third of companies (32%) surveyed by the CBI in 2015 had difficulties recruiting experienced STEM staff, and 20% find it difficult to recruit entrants to STEM. 52% expect those difficulties to persist in the next three years.

| Exhibit 18 Current difficulties in recruiting people with STEM skills and knowledge (%) |
|---------------------------------|-----------------|-----------------|-----------------|
| Experienced staff               | 22              | 26              | 26              |
| Postgraduates                   | 18              | 18              | 17              |
| Graduates                       | 25              | 26              | 26              |
| Technicians                     | 14              | 21              | 26              |
| People to train as apprentices  | 12              | 22              | 26              |
| 0                               | 10              | 20              | 30              | 40              | 50              |

• Proportion of women in SET employment will not reach 50% in the 21st century.
  (Research Briefing No. 11; Tomorrow's Women, Tomorrow's World; UK Resource Centre for Women in Science, Engineering and Technology; March 2009)

• In 2012, only 39% of female engineering graduates entered roles in engineering and technology, compared to 50% of males. However three quarters of both male and female final year engineering students reported (a survey of over 4500) expecting to work in engineering roles.
  (SET to Lead survey reported in: Jobs for the Boys?, Peters and McWhinnie, July 2013)

• In 2010 nearly 100,000 female STEM graduates were unemployed or economically inactive.

• 13% of all those working in occupations classed as STEM (including health occupations) are women. 1 in 8 STEM jobs are taken up by women.
• Fewer than one in ten (9.8%) of STEM managers are female.

• Just over one in ten (11%) of STEM business owners are women, compared to one in three (33%) who are owners of non-STEM businesses.

• Part-time working at management levels remains rare in the UK: 27% of the UK workforce works part-time, of which 74% are women and just 6.5% of part-time workers are employed in the occupational category of managers and senior officials.
  (Labour Force Survey 2012)

• Opportunities for flexible working in STEM sectors are sparse, and where they are offered, they are often in poorly paid jobs, with short-term contracts. 50% of available part-time work in Wales is low paid work.
  (WEN Wales cited research in Women in Workplace, Business, Innovation and Skills Committee - First Report, June 2013)

• In 2017, only 11% of engineering companies offer flexible working. Only 15% make any particular efforts to attract and retain – compared to 34% surveyed in 2016.
  (Skills & Demands from Industry - 2017 Survey, IET)

• In a survey carried out by WES in 2014 a high 60% of women found that there were barriers which prevented them returning to careers in STEM after a career break.
  (Women in STEM: Are you in or Out?, WES, 2014 http://www.wes.org.uk/return)

• And in the same survey, 28% of women have left STEM after maternity breaks. Reported barriers to returning to STEM included: financial (including the cost of childcare) - 52%; lack of flexibility in the workplace (not enough flexitime, job sharing, condensed hours, part time opportunities) - 27%; not enough training, guidance, and support offered - 25%.
  (Women in STEM: Are you in or Out?, WES, 2014 http://www.wes.org.uk/return)

• BUT in a survey of 300 female engineers, 84% were either happy or extremely happy with their career choice and two thirds claimed advantages to being a woman in engineering.
  (Britain has got talented female engineers, RAEng and Atkins 2013, http://www.raeng.org.uk/publications/other/britains-got-talented-female-engineers)

• Engineering sectors contribute an estimated £455.6 billion to Gross Domestic Product (GDP) in 2014, 27.1% of the £1,683 billion total.

• Diversity matters: companies are 15% more likely to perform better if they are gender diverse, and 35% more likely if ethnically diverse.
International & Immigration

- The UK has the lowest proportion of female engineers in the European Union, less than one in ten engineering professionals is a woman. It is less than 10% comparing to Latvia 30% and some following countries like Bulgaria, Cyprus, and Sweden who also stand significantly higher than UK.

![Proportion of female engineering professionals in EU countries](https://uk.rs-online.com/web/generalDisplay.html?id=women-in-engineering)


- NB Another and more up-to-date graphic (as a GIF) can be found on here: [https://uk.rs-online.com/web/generalDisplay.html?id=women-in-engineering](https://uk.rs-online.com/web/generalDisplay.html?id=women-in-engineering). Note it does not include references.
• Engineering and technology subjects in UK higher education institutions recruit 32% of their students from overseas.  
  (HESA, Students in Higher Education Institutions 2013)

• In India, despite being ranked 19th in gender equity among the G20 countries, females on engineering courses account for over 30% compared to the UK’s 13-16%.  
  (Engineering Is a Man’s Field: Changing a Stereotype with a Lesson from India, Scientific American, 2013 http://blogs.scientificamerican.com/guest-blog/engineering-is-a-mane28099s-field-changing-a-stereotype-with-a-lesson-from-india/)

• The UK currently relies on inward migration for engineering skills: immigrants (EEA and non-EEA) account for 20% of professionals in strategically important sectors such as oil and gas extraction, aerospace, and computer, electronic and optical engineering.  
  (NIESR, Skilled immigration and strategically important skills in the UK economy 2012. Not all companies can or want to use migration to fill skills gaps: the use of non-UK nationals is limited in some sectors, for example by security restrictions or concern about retention)

• Enabling women to meet their full potential in work could add as much as $28 trillion to annual GDP in 2025, raising global economic output by 26 percent over a business-as-usual scenario.  

Equal Pay and the Gender Pay Gap

The very good news is that the new legislation requiring all companies with 250 or more employees to report on their gender pay gap as from April 2018 will mean that in future we may have the data to understand how working in STEM sectors impact on the women’s pay.

• In 2013, the median basic income for male registered engineers and technicians (£55,000) was 19.7% higher than that of females (£45,941). This reflects exactly the 2013 national gender pay gap for the UK.  

• But note: There is much bigger differential between all part-time workers of both genders and full-time workers. It particularly hits women because they are about three times more likely to be working part-time. The good news, however, is that the gender pay gap is decreasing AND part-time pay is increasing too.  

• According to the Women’s Business Council, a large part of the gender pay gap could be explained by the roles and sectors that men and women work in. Women are more likely to work in sectors that are low paid and compared to men who are more likely to work in higher paid STEM sectors.  
Apprenticeships and pay: why does the gender divide in apprenticeships matter?
Because there is a big differential in pay across frameworks and sectors. A 2011 report showed that a fully qualified apprentice in construction and engineering earned on average over £22k; an equivalent fully qualified apprentice in education (e.g. child care) or retail (e.g. beauty) earned around £16k. Technical engineers can expect to command high salaries afterwards as it is technical skills that are globally in high demand.


Some good news: there are some reports that gender pay gap in engineering is closing. In 2013, the gap in engineering was reported to be a mere 10% (cf. 19.7% for the UK population as a whole). Furthermore and according to a Reed 2014 engineering sector survey, men earned just 4% more with salaries of £33,583 compared to £32,096 for women.

(Male-dominated engineering has an 87 per cent gender gap - but it pays pretty well, Daily Telegraph, 23 June 2015 http://www.telegraph.co.uk/women/womens-business/11692996/Women-In-Engineering-Day-Gender-gap-in-male-dominated-industry-falls.html )

Women in Leadership & Innovation

In 1991 the number of female professors of physics in the UK doubled: it went from one to two! By 2009/10, it had risen to 36 out a total of 650 professors of physics.

(Part quoted from Tapping all our Talents: Women in science, technology, engineering and mathematics: a strategy for Scotland, April 2012)

Just 17% of all professors working in science, technology, engineering and mathematics are women.

(Women in scientific careers, House of Commons Science and Technology Committee - Sixth Report, January 2014)

Fellows of the Royal Academy of Engineering: 2% in 2006 and 4% in 2014.

(Why engineering should be a woman's game, Dame Prof Ann Dowling, BBC News, 3 February 2015)

Lord Davies' Report of 2011 provided the impetus for change: from 12.5% women on boards in 2011, there are now (Oct 2015) 26.1% women on boards. There are no FTSE 100 companies has an all-male board, and only 15 all-male boards in the FTSE 250.


"It is a sign of our evolution on Women on Boards that few British business leaders now ask why we need more women at the top, the business case is raised less and less …”

(Women on Boards Davies Review: Five Year Summary, October 2015)

In 2012, of FTSE100 companies in STEM sectors, 13% of Board Directors were female compared to 17% of Board Directors of companies in other sectors.

(The Female FTSE board report 2012, Cranfield University School of Management)

Of the 15 FTSE 250 companies in 2015 with no women on their board, 7 are in STEM sectors.

(Women on Boards Davies Review: Five Year Summary, October 2015)
• But change here has stalled: the FT reports that in 2016 only 29% of new recruits to UK boards were women compared to just over 32% in 2014.
(UK boards stall in recruitment of female directors, February 2017
https://www.ft.com/content/620b634e-ed51-11e6-930f-061b01e23655)

• Companies with more women on their boards were found to outperform their rivals with a 42% higher return in sales, 66% higher return on invested capital and 53% higher return on equity.
(Quoted from Women on Boards, DBIS, February 2011)

• “Innovative engineering is the key to future growth in the UK and we will have to make increasing use of our intellectual abilities and our creative talent if we are to take advantage of this opportunity.”
(Engineering for a successful nation5, RAEng and EPSRC, March 2015
http://www.raeng.org.uk/publications/reports/engineering-for-a-successful-nation)

• “Diversity is a key driver of innovation and is a critical component of being successful on a global scale.” … In a global survey, 85% corporate diversity and talent leaders agreed with statement “A diverse and inclusive workforce is crucial to encouraging different perspectives and ideas that drive innovation”.
(Global Diversity and Inclusion Fostering Innovation Through a Diverse Workforce, Forbes Insights, 2011,

Thank you to all organisations who carry out the research!
Sarah Peers
January 2018

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5 This report from the RAEng unfortunately does not make any reference to diversity as a source of innovation or an area to explore in the state of engineering in the UK.