

# WHERE IS OUR MISSING WORKFORCE?



Meet the companies with a diverse approach to recruitment

International Women in Engineering Day falls on 23 June, and this month marks 50 years of the Pride movement, so it's a good time to discuss the importance of diversity in business and how to support it.

# Editor's Letter

by Dickon Ross



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**BSME Awards 2018**

Shortlisted: Dickon Ross, Editor of the Year (science and technology); John Rooney, Art Director of the Year (B2B), Cover of the Year (B2B); Justin Pollard, Columnist of the Year (B2B)

**BTJA Awards 2018**

Shortlisted: Vitali Vitaliev, Features Journalist of the Year (technology)

**TABBIE Awards 2018**

Gold Award: Front Cover Digital Imagery: 'Data in Danger', April 2017; Gold Award: Special Edition: Censorship special report, November 2017; Silver Award: Best Single Issue: 'Women in Engineering – We Have an Image Problem', July 2017; Silver Award: Regular Column: Vitali Vitaliev's 'After All'

**PPA Awards 2018**

Shortlisted: Clem Chambers, Columnist of the Year, Business Media; Vitali Vitaliev, Columnist of the Year, Business Media; John Rooney, Designer of the Year, Business Media; Tim Fryer, Writer of the Year, Business Media

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Engineering & Technology July 2019 [www.EandTmagazine.com](http://www.EandTmagazine.com)

AT THIS TIME of year, for several years now, we have been running a women in engineering special issue. We get mixed reactions. Most responses are supportive but we also hear the question: "What's all this got to do with engineering?"

Discrimination is rarely overt these days (although we have encountered that too) but more common and more persistent is

subconscious bias. With that comes a systematic bias that's built into processes, procedures and just the way of doing things that everyone in an organisation has got used to and thinks is the thing to do because, well, we've always done it that way and what's wrong with it?

"I don't care what gender, race or sexuality the candidates are," is one argument we occasionally hear from managers in engineering, "because they have nothing to do with engineering. We treat everyone the same and what's unfair about that?"

These are the very people who need to listen more carefully to the experiences of women, LGBT+, disabled and other under-represented groups in engineering. The bias isn't usually personal – it's systematic. There's prejudice in the process – pretty much any process really.

Fairness is more subtle than it first appears; treating everyone the same isn't fair. It won't result in fair outcomes.

Doing the company diversity course might keep you out of legal trouble but it is not enough to radically change a business.

For example, the interview process is fair on the face of it. But what if the way a candidate thinks isn't conducive to bringing out the best in them in a formal interview situation because they are, for example, autistic? That's unfortunate for the candidate, you may think, but isn't it what everyone goes through?

What if the candidate has the technical skills and abilities you need for the role in spades, but performs poorly in a formal interview that's more a test of social skills that they may never actually need in the job? It's one reason that only 16 per cent of autistic people in the UK are in full-time employment. That's a lot of wasted talent, and it's just one group. Women too tend not to interview as well as men, who are

basically better at talking themselves up.

There are many things that businesses take for granted that could be done differently and would improve diversity. Most aren't even very difficult. In this issue, we talk to the organisations who are leading in various aspects of diversity, find out how they do it and what benefits it brings.

Since regularly covering women in engineering, I have noticed a change in the preferred messaging. Conferences on diversity in engineering are moving beyond talking about what is the right thing for business to do, to talking about what is the advantageous thing to do, for the company's performance and the bottom line. Diversity is not just good. It's good for business.

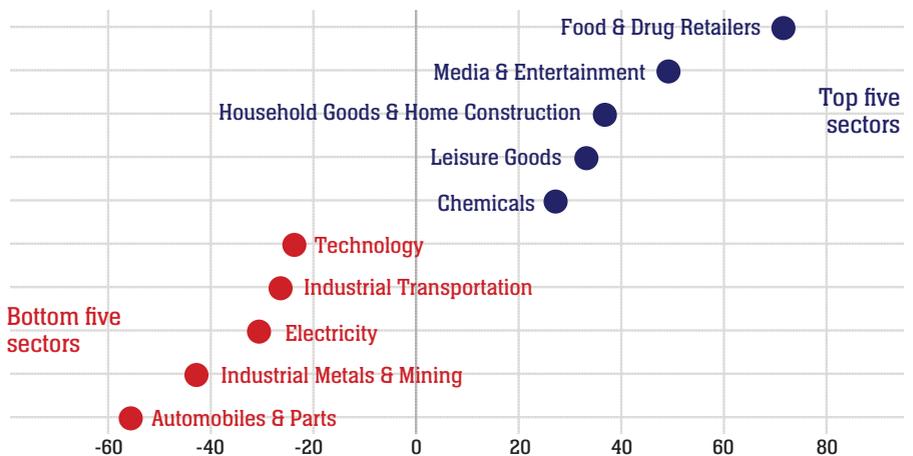


The IET marked LGBT Pride Month in June by flying rainbow flags

## Did you know?...

...The average share of women on boards is lower among engineering firms (FTSE 250)

Deviation from the average share (25%) of women on boards and in leadership for sectors in FTSE 250 firms (top five and bottom five sectors, %)



WOMEN ON BOARDS DATA AS AT OCTOBER 2018, HAMPTON-ALEXANDER REVIEW



# PULLING DIVERSITY TOGETHER

By **Tim Fryer**

Society does not change quickly. Entrenched views can take decades to overturn, sometimes requiring the changing of the guard to a more enlightened generation before true impartiality can be embedded – and even then it is clear that bias has a long and durable tail. But we are heading in the right direction.

Half a century ago ingrained discrimination on gender and ethnic grounds was common. Sadly elements still exist, but progress is undeniable. What is more is the recognition of prejudices that in the past ran so deep they were not even recognised – for example ageism, bias against those with disabilities and against those who can't simply be classified as heterosexual. Now the awareness and the language around such issues means minorities are no longer being ignored or repressed.

Tackling such issues is undeniably 'the right thing to do', but now there is a different imperative driving change. The technology sector is suffering from a skills shortage – often quoted as the most important factor limiting a company's growth. So far from being a discarded or ignored chunk of a potential workforce, this huge swathe of diverse people represents a real opportunity for smart companies to develop the pool of talent they so badly need. Some companies have realised this, developing programmes to create inclusive workforces and discovering that their businesses have become happier, more unified and more successful as a result.

The following pages highlight some technology companies leading the way. They have embraced the theory and practicality of having a diverse workforce, recognising the talents of an individual irrespective of age, sexuality, gender, physical or mental disability, or ethnicity. It is no longer just the right thing to do, it is the smart thing to do.

21.2%

average share of women on boards in the bottom five engineering-related industries on the FTSE 100

SOURCE: HAMPTON-ALEXANDER REVIEW FTSE WOMEN LEADERS 2018



# Skills shortage? The answer's female

A connection between market performance and women in leadership has long been used as a driving argument for gender equality in any sector. For British engineering companies, the reality may be more complicated. Until the sector manages to achieve gender balance, labour shortage could be another reason for alarm.

By **Ben Heubl**

ONE OF THE WORLD'S most powerful people, German Chancellor with a doctorate in quantum chemistry, Angela Merkel once said that "one swallow does not a summer make": she meant that her achievement did not signify the end of the battle to help more women to fulfill their potential.

An *E&T* and EngineeringUK investigation shows that the proportion of white-male workers in Britain's engineering sector is 80 per cent. For comparison, only 75 per cent of US scientists and engineers are white, regardless of gender.

According to the 2018 Hampton Alexander Review, UK engineering sectors within the

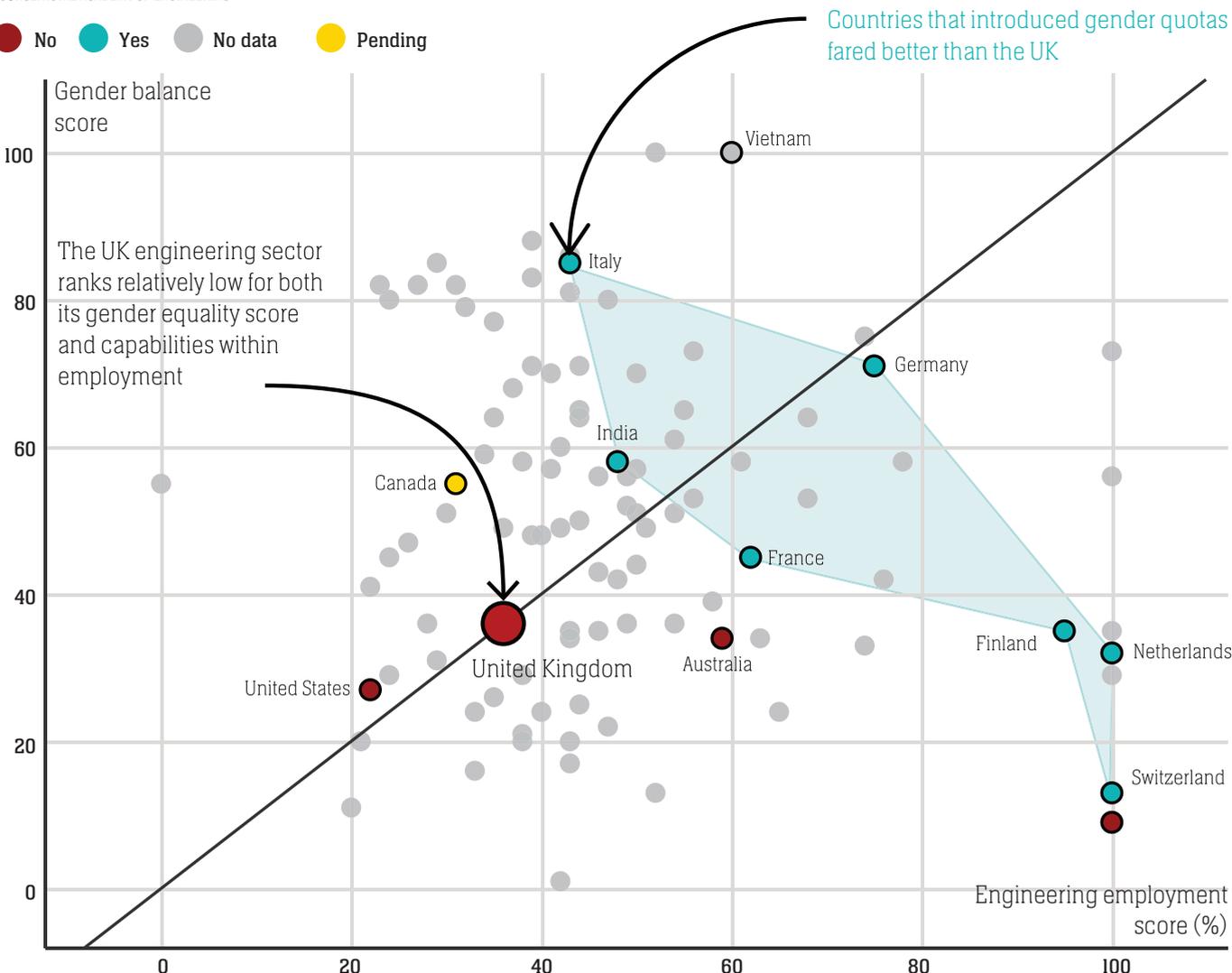
FTSE 250 pool have paltry average shares of women on company boards – with industrial metals and mining and automobiles and parts sector averages well below the 15 per cent mark. RHI Magnesita in industrial engineering has just 7.1 per cent; Energean in the oil and gas business and TI Fluid Systems (automobiles and parts) – hit 11.1 per cent. Firms cannot hide any longer, and face increasing scrutiny. These examples are by no means outliers. Engineering-typical sectors like technology, transportation, electricity, mining and automobile parts all sit well below the pooled average for listed FTSE 250 companies.

# UK Engineering: weak in its workforce and gender balance

Gender quotas for public companies

SOURCE: ROYAL ACADEMY OF ENGINEERING

● No ● Yes ● No data ● Pending



It may not come naturally for a male business leader in engineering to put himself in the shoes of that one woman outnumbered by four white-male colleagues. WISE chief executive Helen Wollaston explains that often business leaders come to terms with gender equality when they are forced to confront the emotional consequences: "When they have a daughter who is about to enter the workplace or is at school, they suddenly get it, because they don't want opportunities denied to them. They get that there is a personal stake in it."

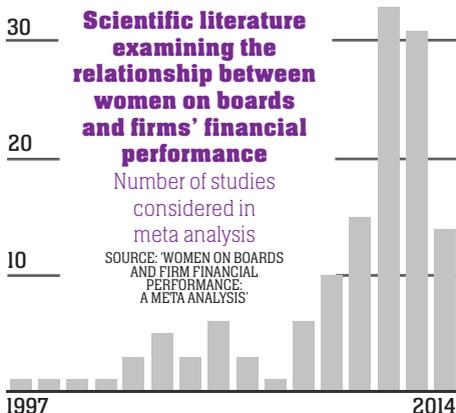
But those seemingly unmoved by the moral and emotional arguments may be persuaded by the business case. McKinsey's report 'Women matter: gender diversity, a corporate performance driver' suggests that the environment for women in senior roles improves once about a third of leaders at that level are female, and that a critical mass of 30 per cent or more women at board level or in senior management would generate the best financial results.

Some experts see a problem in drawing a simple causative connection between market performance and women on boards: "If you think about it, why should three women on a big global board have a direct impact on return on investment or return on equity on that year," says Sue Vinnicombe, professor of women and leadership at Cranfield School of Management.

To establish whether there is a connection

between women on boards and market performance, researchers conduct meta-studies to compare results across the vast landscape of literature on the same subject. With a total 140 studies, the research topic has received much more attention since 2010, but conclusions are mixed.

Evidence for a connection between female board representation and market performance is found to be 'near-zero' – although firms with greater female board representation had higher accounting returns. But the subsequent findings show also that female board representation and market performance is positively linked for firms in countries with greater gender parity.



In short, in countries such as Pakistan, Kuwait and India, the relationship is inconclusive. In Sweden or Norway a relationship does exist.

The meta-analysis could hold lessons for the UK engineering sector, which suffers from notoriously low female representation. According to an evaluation by the Royal Academy of Engineering, both the UK's 'workforce strength' and the sector's gender balance are appalling. Under such circumstances, British engineering may not offer the 'right' gender-parity conditions to realise the rewards in firms' financial performance promised from female board representation

Also, countries that introduced gender quotas for public companies seemingly fared much better in the engineering sector comparison (see scatterplot). Italy, India, France, Finland and the Netherlands, all scored higher than the UK (and US) in either or both of their employment capabilities or their gender balance scoring.

The profit-of-gender-diversity hypothesis remains an irresistible legend. One problem is that it leaves a choice to decision makers: should they jump at the opportunity to harvest returns or not? Surely, not to engage would only mean to be as successful as now? It turns out that it is not so simple. Another, more pressing, factor sounds the alarm.

The elephant in the room is the UK skills >

## Broken pipeline for engineering talent:

Leakage: Where are we losing girls and women along the way?

< shortage. It could soon be unacceptable for firms to fail to hire women and other under-represented groups of people. Apart from a healthy hunt for employees, 2015 figures suggest that more than half of all engineering employers looked for new recruits with engineering and technology skills.

If these firms cannot fill vacancies, they are more likely to have difficulty introducing technological change, to have to outsource work and to lose business or orders to competitors (2015 employer survey).

Under this mounting pressure, British engineering firms may no longer be able to afford to turn a blind eye to the other half of the population, says Wollaston. More than any other reason, firms seek help from WISE because of their inability to recruit enough people: "So they are losing work or opportunities and they can see that there is an obvious solution. Get more women."

### Wanted: skilled workers

For the sector to reduce its talent shortage, the UK needs 186,000 skilled recruits each year until 2024. According to the Women's Engineering Society (WES), only around 20,000 qualified female engineers could be enticed to return to the sector. Still, more than half (56 per cent) of business leaders in engineering believe "enough is done to encourage female engineering talent to enter the industry" – much higher than across all sectors (7 per cent).

Soon, the government may be forced to take more radical steps. The contribution of engineering firms to the economy is substantial: it constitutes one quarter of the UK's gross value added. Nearly 10 per cent is added by the manufacturing sector alone.

According to the British Chambers of Commerce, manufacturers are seeing "the largest shortage of skilled workers since 1989" – a result of record employment levels in Britain and waning numbers of EU27 nationals coming to work in the UK.

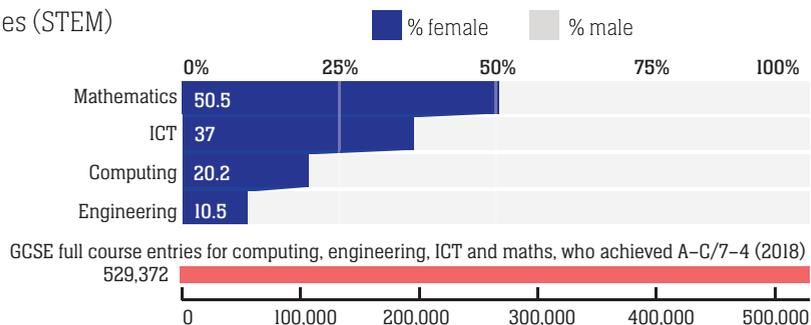
Experts at EngineeringUK agree that the impact of Brexit could exacerbate skills shortages, saying it is vital that "the higher education sector maintains its status as world-class and keeps welcoming talent across the world".

The Royal Academy of Engineering, which has a female CEO, Dr Hayaatun Sillem, has warned that gender disparity in engineering is "the starkest aspect of lack of diversity that needs attention".

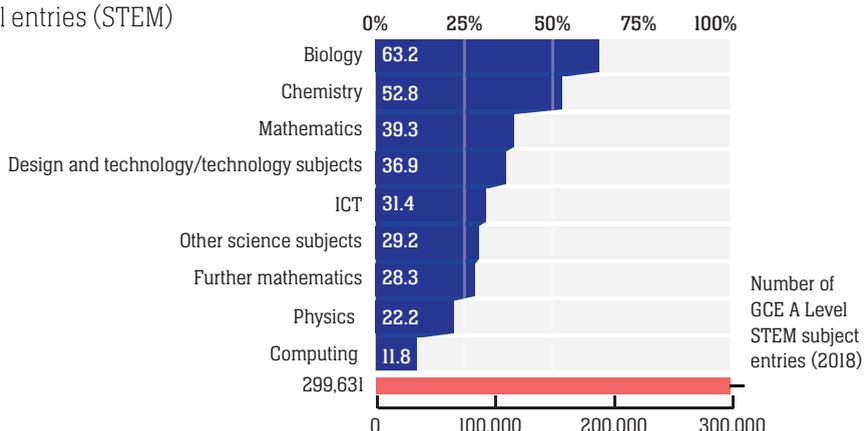
These skill shortages could continue to be a burden long into the future. The UK's female engineering talent pipeline (the path from GCSE to senior leadership positions) appears to be distinctly leaky. Reducing the loss of girls and women at each education and career step (see chart) will be one of the sector's greatest challenges.

Even if more girls can be inspired to study engineering – and recent figures suggest interest is picking up, with 53 per cent of girls now reporting they would consider a career in engineering, up from 34 per cent a year earlier – it will take time until the effects become visible to recruiters and even longer

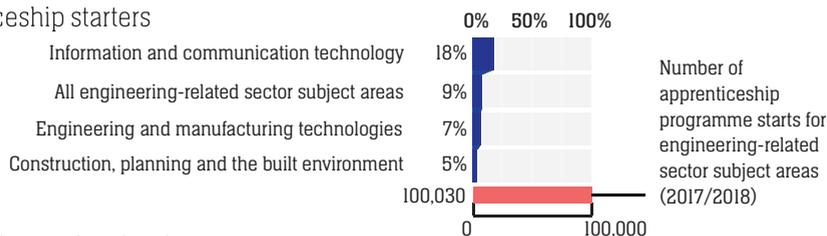
GCSE entries (STEM)



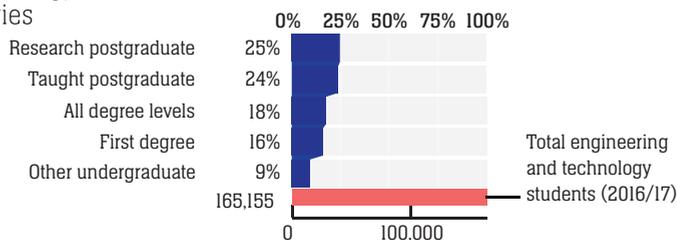
A Level entries (STEM)



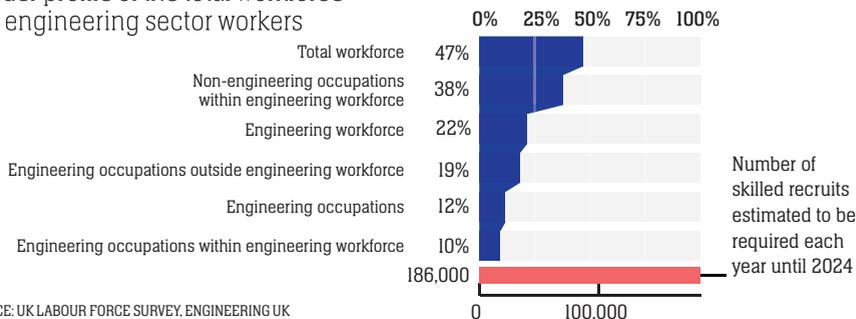
Apprenticeship starters



Engineering and technology University degree entries



Gender profile of the total workforce and engineering sector workers



SOURCE: UK LABOUR FORCE SURVEY, ENGINEERING UK

before gender parity extends to leadership.

Elizabeth Donnelly, WES CEO, explains that it takes years to build a pipeline of women in engineering and we must keep pushing. "When I went to university in the late 1980s, there would be one or two women studying for an engineering degree. These women are just now beginning to take senior roles because it takes up to 30 years to get to the right stage in a career. And if women took career breaks it will take a little longer."

More research to understand progress

might be needed. But this must not come at the cost of inactivity, warns Wollaston from WISE: "I hesitate a bit when we say we need more research because I have seen it as an excuse for not doing anything."

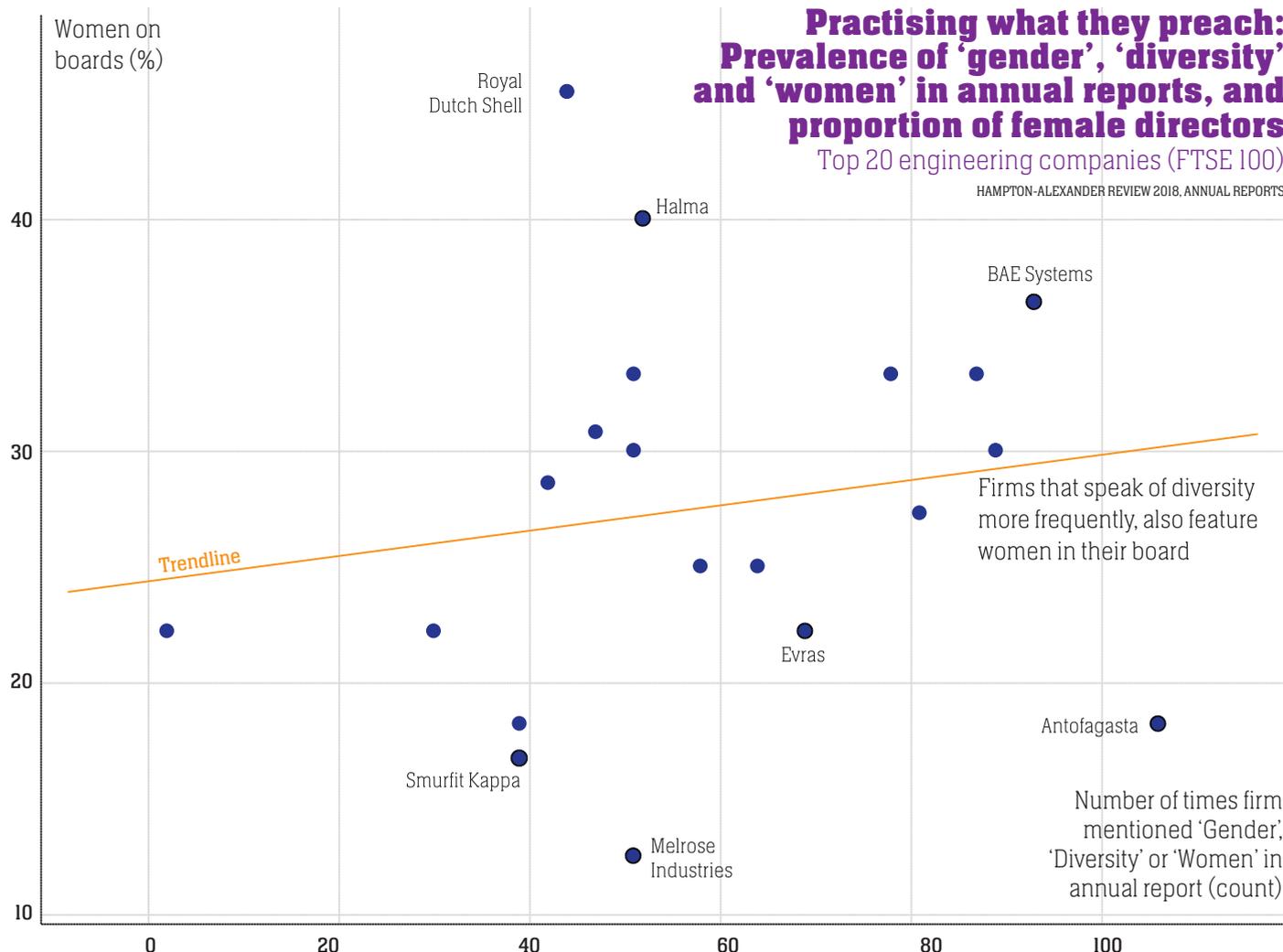
One area that may not require further research to identify problems is the way the engineering sector brands itself. Fixing the message women and girls receive "would be a quick win", says Wollaston.

WES highlights recruitment advertising as an area for attention, offering recruiters a

## Practising what they preach: Prevalence of 'gender', 'diversity' and 'women' in annual reports, and proportion of female directors

Top 20 engineering companies (FTSE 100)

HAMPTON-ALEXANDER REVIEW 2018, ANNUAL REPORTS



'gender decoder tool' that flags up potentially off-putting language.

A positive relationship is also found for companies that talk more about diversity at a corporate level. *E&T* found a positive – though somewhat weak – relationship between the times top FTSE engineering firms mentioned 'gender', 'diversity', and 'women' in their annual reports and the actual representation of women on their boards (see scatterplot).

BAE Systems, a multinational defence, security and aerospace firm, used those terms 93 times in its 2018 report and its board was 36.4 per cent female. In comparison, Smurfit Kappa, a corrugated packaging company, used the terms 51 times and has 12.5 per cent women in the boardroom.

But problems lurk at the career entrance, too. Wollaston says a typical teenage girl might attend an open day at a university: "She walks into the physics or the engineering department. She is the only girl,

all the staff are men, the images around the walls are all male, portrayals of guys plastered all around the building." She gives the example of an Asian girl in an assessment centre: "She was the only one. She sat by herself. Nobody talked to her. The company concluded that she might not fit in. Of course she doesn't. You need to make her feel welcome." These experiences are common. Employers do not 'think through' what it is like to belong to an under-represented group, says Wollaston. "You need to make a special effort to include somebody who is not from the majority group," she says.

*E&T* investigated if branding among the top UK engineering employers is a problem. At least among the largest firms in the sector, employers seemed to be working on their marketing message. Some started to show female employees on the front page of their websites; *E&T* counted how many companies did this and, of the 20 top engineering firms

from the FTSE 100 list, 12 firms did. But is this level of rebranding really enough?

One way to force change at the top of the corporate ladder is through quotas. Finland, France, Germany, India, Italy and the Netherlands have all introduced some form of gender diversity quota for leadership positions in public companies. The evidence speaks for itself; Norway, Iceland, Finland and Sweden – with specific quotas and targets, as well as 'stiff' penalties for firms that fail to meet them – had women occupying around 34 per cent of director positions, nearly double the average rate for other countries. Cross-country regulation, such as that coming from the EU, is found to have strengthened the anti-discrimination protection in both member states and partner countries. As skill-shortage pressure increases on the vast British engineering sector, the government may want to look at other countries and unions for guidance.

Wollaston says that firms that are only after the accreditation for recognising diversity, but lack genuine commitment, may face problems in realising genuine rewards.

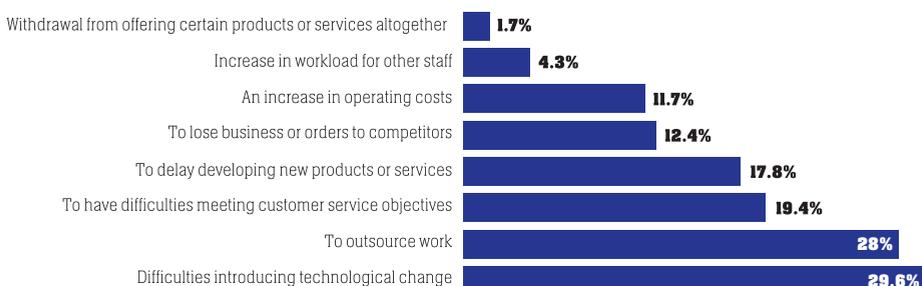
For the executive suite, Professor Vinnicombe comments that financial performance is just one piece of the puzzle: "Actually, having gender-balanced boards is much more about corporate governance as well as reflecting your customer base, as well as being socially more attractive. It is about using your talent base better."

As the discussion proceeds, individuals will cherry-pick their favourite arguments for how diversity pays off. However, given the recruitment pressures they face, business leaders may soon not have a choice. \*

### As a result of hard-to-fill vacancies, UK firms are more likely to experience...

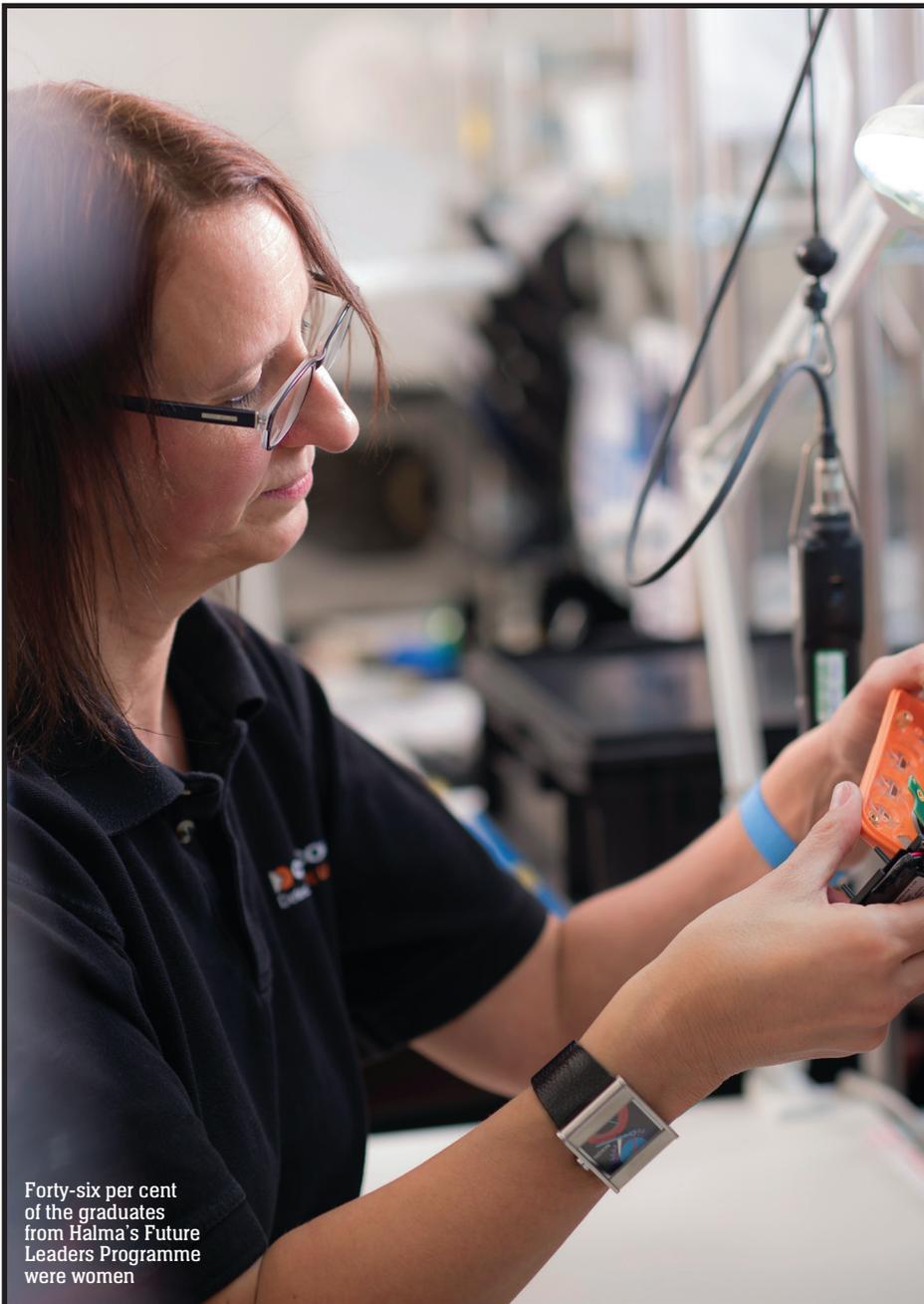
UK engineering enterprises compared with all enterprises (base)

SOURCE: UKCES, EMPLOYER SKILLS SURVEY, 2015



**17.9%**  
median gender  
pay gap  
SOURCE: ONS

# How to pay women engineers more



The gender pay gap in the UK is growing by the year, but a few engineering companies are bucking the trend. By **Crispin Andrews**

LATEST FIGURES, released in April, show that the gender pay gap is actually growing in 45 per cent of the UK's biggest firms.

Despite the general social push for equality and diversity, women continue to be paid less than men in 78 per cent of UK companies with over 250 employees, including those in the engineering and technology sectors. In January, a Tech Talent Charter report found that women held just 18 per cent of technical roles in UK businesses. According to the February 2019 Women in Leadership Survey from Sussex Innovation Centre, working women believe that unconscious bias from management is the main reason there are so few of them in leadership roles. A study released in March 2019 by Booking.com found that 42 per cent of women working in the technology sector feel that gender bias in the industry is worse than they had expected.

"The median pay gap is 12.4 per cent, but that's just within the engineering sector, and there are lots of engineers in the non-engineering sector for whom we don't have figures," says Elizabeth Donnelly, CEO of the Women's Engineering Society.

Donnelly adds that although the pay gap is only 1.1 per cent at graduate level, on postgraduate entry, men are earning on average £36,000 per year to women's £30,000.

There are, however, engineering and technology companies that have managed to keep their pay gap figures below the national average.

At Ferguson Marine Engineering, for example, although the mean hourly wage for women is 7.6 per cent lower than men's, that's still a lot better than the national average – and for median wage the gap is actually 10.1 per cent in favour of women.

Texcom, which makes electronic security products and is part of the Halma group, reported a 12.6 per cent gender pay gap this year, slightly over the industry average, partly because it recruited more women in

Forty-six per cent of the graduates from Halma's Future Leaders Programme were women

entry-level and operator roles. The company says that it promotes flexible working and further flexibility for staff on maternity leave. It also works closely with recruiters to ensure the company runs a diverse application process.

BAE Systems reported a 9 per cent (mean) and 9.6 per cent (median) gender pay gap. In two areas of the business – surface ships and global combat systems munitions – the gaps are 2.3 and 4.2 per cent, respectively.

A company spokesperson told *E&T* that enhanced family leave policies designed to balance the demands of parenting and work, and policies to support female employees when they return to work after parental leave, have contributed to this. And so has evaluating senior leaders' performance in terms of creativity, adaptability, embracing change and adjusting style to a situation. Collaboration with expert organisations such as Business in the Community, the Women's Business Council, WISE and the Royal Academy of Engineering, enables the company to generate and share new ideas about workplace gender equality.

### Equal opportunities

For all these companies and for the industry as a whole, there is still much more to do. For a start, gender equality is as much about equality of opportunity and numbers as it is about pay.

Ferguson Marine CEO Gerry Marshall admits that only 6 per cent of the firm's workforce is female. "Women are particularly under-represented in our higher-paid technical and senior roles, and this heavily influences our gender pay gap," he says. "Our gender pay gap may fluctuate as we address the balance of the workforce. The engineering sector is historically male-dominated and changing that will take time."

Marshall adds that the company hopes to attract more women applicants for its modern apprentice programme. "We have trained employees to be STEM ambassadors, helping us to engage with local primary and secondary schools to inspire young women to take up STEM subject choices and to promote opportunities for women in engineering and technical roles," he says. "We are also offering more work experience, undergraduate and graduate placements. These measures will need a period of time to take effect and have an impact. We will be monitoring progress on a regular basis and reporting on this in future gender pay gap statements."

According to BAE Systems, in 2018 26 per cent of the company's apprentices and 28 per cent of its graduates were female.

In some cases, recruiting more women at entry level and providing better working conditions has actually increased a company's gender pay gap. For instance, Texcom attributes a widening gap from 8 per cent in 2017 to 12.6 per cent in 2018 to successful gender recruitment.

According to Donnelly at WES, discrimination still exists when it comes to promotion middle management and beyond, but it's not necessarily deliberate. "Some



A manufacturing graduate trainee at BAE Systems in Preston

'Keeping the pay gap in focus is the right thing to do so that we continue working to improve the situation. However, I believe we need to be looking at the causes more intently than at the result if we want to make a change.'

**Carolyn Gindein** SPIE UK

recruitment panels might expect a woman to leave to have children, or a woman might be back from a break and slightly behind in her career. Some companies don't know how to bring back returners, or don't know how to accommodate flexible working."

She adds: "Once you have women on the board, you get a board with a wider variety of perspectives who are more likely to implement some of these policies."

Again, some companies are looking at ways of dealing with this issue. The BAE Systems spokesperson told *E&T* that the company's senior leadership recruitment process was designed to draw from diverse candidate lists. Similar targeted development, mentoring and sponsorship programmes are in place to promote a more diverse leadership pipeline. BAE Systems says that it has 15 per cent more female senior executives now than in 2015.

Halma has introduced online affinity groups for working parents and women to

give them a space to engage with each other and the organisation. A spokesperson told *E&T* that 46 per cent of the graduates from Halma's Future Leaders Programme were women. This is an accelerated development programme for new graduates which aims to appoint them to board positions of Halma's 40 companies within five years. The number of women attending Halma's biannual leadership conference has increased from 14 per cent in 2017 to 22 per cent in 2019.

Halma also says that its Diversity and Inclusion Initiative encourages its operating companies to review the diversity of their directors. "Where companies decide that they need greater diversity to enhance their discussions and decision-making, they now invite a member of staff to join board meetings as a co-opted board member."

### Change of attitude is needed

The government target is that by next year, women will make up 33 per cent of the boards at FTSE 350 companies. Carolyn Gindein, So'SPIE Ladies Network representative at SPIE UK, would like to see government do more, though. Particularly when it comes to paternity.

"Culturally, the expectation is largely still that the women will take the career break," she says. "I've spoken to many males who would like to have the opportunity but don't feel it will be viewed well by colleagues or management, or they feel it will impact their career negatively as they've seen that happen to many women."

Gindein believes that although a few companies are leading the way, most often it's the case that they do only what's required to comply rather than make changes that may be culturally difficult and costly. "Keeping the pay gap in focus is the right thing to do so that we continue working to improve the situation," she says. "However, I believe that we need to be looking at the causes more intently than at the results, if we want to make a change."

Donnelly agrees. "The overall industry pay gap will come down over time, but only when there is a change in workplace practices that enables more women to work in engineering and rise to senior levels."

She adds: "If things have worked one way for a long time, and that way is making the company successful, but there's a gender pay gap, people don't always know what to do to put that right." \*

**12.4%**  
median pay gap in  
engineering sector

ELIZABETH DONNELLY, WES

51.7%

of disabled people  
are employed

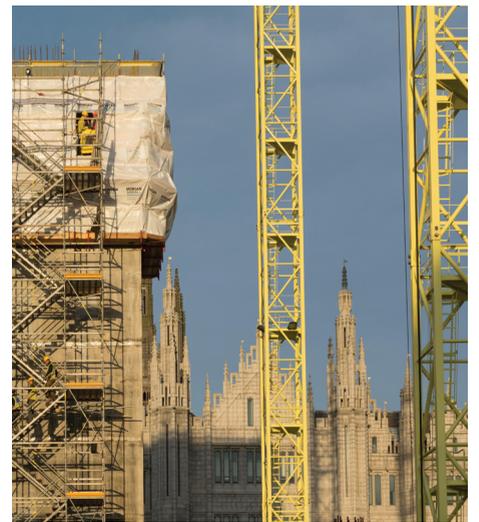
SOURCE: ONS

# Culture of access builds an able workforce



A proactive stance on disability employment has been part of a cultural change at Morgan Sindall Construction & Infrastructure that has benefitted the whole company.

By **Tim Fryer**



By changing traditional mindsets, the construction sites, as with any other workplace, can be designed to be sympathetic to workers with disabilities

“RECRUITING DISABLED talent isn’t an act of charity – it’s what smart employers are doing to get ahead of the competition.” That is the view of the recently installed Minister for Disabled People, Health and Work, Justin Tomlinson. “There are 7.6 million working age people in the UK who have a disability, and many of them are more than able to work.”

Despite there still being those that see disabled people as either an expense or an inconvenience, there is at last growing recognition that having diverse teams is healthy for a business. Diane Lightfoot, CEO of the Business Disability Forum (BDF), comments: “It’s heartening to see an increasing number of companies recognising that they need to attract as wide a talent pool as possible and one that includes disabled people. Disabled people are incredibly talented and incredibly diverse, with a diverse range of strengths just like their non-disabled peers.

“A disabled candidate may need an adjustment in the workplace to do the job to the best of their ability, but those adjustments are usually small and inexpensive and can make the difference between employers getting the best candidate for the job or not.”

One construction company, Morgan Sindall Construction & Infrastructure, started on an inclusion journey four years ago – quite an undertaking for a company in this very traditional sector. Championing this process is Dawn Moore, director of human resources, who stresses that it is an ongoing journey: “You’re not going to change overnight the fact that it’s very male-dominated. Or that ethnic representation hasn’t been great. And you’re not going to change overnight the fact that other under-represented groups, like disabled people, might not necessarily look at construction as a sector that’s easy to get into. But we are determined to change it. And we’ve made some good progress, over the last four years or so, but there’s lots more to do as well.”

### Disability Confident

The idea has been to challenge everyone, at every level, in the company to think and behave differently. Do sites need to be set up in a certain way – the way they always have been – when different approaches could aid inclusivity? And could the channels be broadened, and messages changed, to pull in a wider talent pool during recruitment? Such changes take time, but Morgan Sindall Construction & Infrastructure is hoping that it will take them to ‘Leader’ status in the government’s Disability Confident scheme.

Disability Confident has three levels, with an encouraging 8,300 companies signed up to the ‘Committed’ level, which involves engaging in a programme to recruit and retain disabled people.

The step up from that is ‘Employer’, adopted by a further 3,200 companies, which is where actions have to deliver on the good intentions.

Finally, there are a couple of hundred companies that have attained ‘Leader’ status

Dawn Moore: “Good progress, but lots more to do”



‘I am really impressed by Morgan Sindall’s commitment to setting the standard for disability employment within the sector and their recognition of the benefits, not just for employees with disabilities, but also for the company in reaching the widest possible talent pool.’  
**Diane Lightfoot**  
Business Disability Forum

on account of demonstrating to employees, customers and communities the positive influence of having disabled people as part of its diverse workforce.

None of the Leaders are construction or heavy engineering companies – only a few even have much to do with technology – but it is into this territory that Dawn Moore is leading Morgan Sindall Construction & Infrastructure, hopefully within the next 12 months and with support from the BDF. “We’ve had the Level 2 accreditation from the DWP since 2014 and it’s been great for us, it’s about creating the culture where anybody can thrive,” she explains.

While providing better accessibility options and workplace availability are the obvious physical steps that a company would take to cater for disabled employees, it is as much the clarity and consistency of the core message that has changed the way Morgan Sindall Construction & Infrastructure operates.

Helped by having a member of the senior management team who has a physical disability, the mentality of inclusivity is becoming ingrained throughout all layers of management. Awareness of an individual’s needs, whether disabled or not, are now much better recognised. Flexible working is a particular example which now applies to all employees, and can play an important supportive role for employees who may have changing family or health situations. The benefits are being felt company-wide.

### Improved employee engagement

Moore says: “When we started this journey four years ago, not only was our diversity profile different, our employee engagement wasn’t great. According to our staff survey at the time, we only had 50 per cent of people, for example, who’d recommend us as an employer. When we did the same survey again last year, 95 per cent said they would.”

Further evidence of this change of culture is that 90 per cent of employees feel they are included and respected by their line manager, compared to only one-in-two four years previously. And 99 per cent said they believed that their well-being was the company’s number one priority.

The well-publicised skills shortage should not, therefore, be accepted lying down, according to Moore. “My view on this is there is only a skills shortage if you create one. There are pools of people, like those who are disabled, and it’s just about creating the conditions where they can, and want to, come and work for you and then stay with you. We’ve worked hard on not shutting down this pool of talent. Yes, because it is the right thing to do, but also to encourage the best staff, whoever they are.”

For the government, Tomlinson agrees: “It’s no longer good enough for employers to make excuses. Business can reap the many rewards of being inclusive.”

Rather than being obliged to take action, Morgan Sindall is proving that the consequences of taking a proactive approach have been far-reaching and overwhelmingly positive. \*

**81.7%**  
of non-disabled  
people are employed

SOURCE: ONS

**1.1%**  
Adults on the autism  
spectrum

SOURCE: NHS DIGITAL

# The advantage of thinking differently

Auticon consultant  
James Neely



An IT consultancy in East London is benefitting from the skills that people on the autistic spectrum can bring to problem-solving.

By **Dickon Ross**

“I DIDN’T GET diagnosed until quite late on,” says James Neely, IT consultant. “I was working and it had got quite stressful. We’d moved office a few times and the journey got longer. We got more condensed and it was a lot noisier and the journey wasn’t as manageable anymore, until the point when I actually ended up going off with clinical depression and anxiety. Then out of the treatment for that, it was realised I was autistic.

“I ended up then losing my job because I couldn’t go back into the office and they wanted someone who was on site, and I was out of work for the best part of two years.” Neely’s story is quite common for the under-employed autistic workforce.

“Even when I was really quite young, I always felt a lot different to the other kids around me,” he says. “My interests and things were kind of bizarre, I suppose. I remember in the third or fourth year of primary school a teacher referring to me as eccentric. I can remember things like we were sitting at desks and I’d want to have the blinds down but everyone else was fine with it. I felt it was too bright. It is a spectrum with autism. For me, it’s far more sensory. I prefer much lower-level lighting than most other people. I prefer it to be generally quiet and I tend to tune things out. When I’m speaking to you now I can pick out stuff going on out there, constantly vying for attention as well,” and he gestures not towards the shared office space but to the street outside.

I’m talking to Neely at his workplace, in fashionable shared office space situated between the City of London financial zone and the Shoreditch start-ups scene. Auticon is an IT consultancy staffed by autistic consultants and Neely is just one of them.

Why employ only autistic consultants? “Lots of autistic people have IQs that are above average. Many are gifted or highly gifted and yet only 16 per cent of autistic adults are estimated to be in full-time employment in the UK,” explains Auticon COO Viola Sommer. “It’s pretty obvious to me

that there's a huge pool of untapped potential here."

The skills that autistic people bring are those that tend to be in short supply too. Every autistic person is different, but they tend to think in a different way from most people.

"Being able to process more information not only produces improvements in pattern recognition, it also allows more incredible attention to detail. I see that in a lot of my autistic colleagues," says Sommer.

"Incredible logical analysis, highly fact-based, incredibly good error detection. Another thing that is really striking is sustained concentration: we find that in lots of autistic colleagues, who are able to hyper-focus on one area of interest. Those thinking styles can be incredibly valuable in areas that are systematic, that are structured and logical – like tech. So that's exactly what our service portfolio has been built around; we do quality assurance, we do development, we do data, security and compliance."

"If you talk to anybody within the software engineering field, and I'm sure lots of other areas in engineering, those are extremely valuable cognitive skills," adds Auticon's UK CEO Ray Coyle. "What we are selling our clients is those cognitive skills. They will also have some technical skills, which we quantify and we can explain to our clients, but really what is important about what we are providing is the cognitive aspect."

"Many autistic people approach problems differently from the way neuro-typical people approach them, and a good example of that is top down versus bottom up." Top down, how most people think, means forming an overall impression first and then looking down into the details. This quickly leads to a broad conclusion, but confirmation bias means they don't take in all the details as they should. "Many autistic people take a bottom-up approach, which means taking in all the detail first and only then forming an overall impression." You get a conclusion more slowly, but it produces a less biased analysis.

That approach requires more detailed, more precise and clear instructions. Give a dataset to most people and ask what they think of it and they'll look at it and offer an opinion. Ask an autistic person and they'll say, "well, it's a dataset" because you've not been clear what the question is or what is required. "Many autistic people require clear and detailed instructions," says Coyle.

"When you force managers to think in those logical terms, and force them to prioritise, and you ask people to remove the ambiguity and uncertainty from their instructions, that is when everybody raises their game. It is a massive improvement in communication and clarity within the team communication structure."

The neuro-diversity also adds more choice: sometimes managers might want a creative and quick first impression about some data and in another case a more detailed, precise analysis.

"One of the most prevalent theories of autism is that autistic brains are just more connected than non-autistic brains and that



Auticon UK CEO Ray Coyle

## 20% in tech sector are neuro-diverse in some way

SOURCE: BIMA TECH SECTOR SURVEY

also links in with the fact that the brains of autistic people tend to be slightly heavier than of non-autistic," says Sommer. "So we just think there's more going on and we also think that autistic people are able to perceive and process more information at any point in time than non-autistic people. When you think about that cognitive style, that can bring about these amazing gifts that we see in many autistic people, but it can also be quite disabling in everyday life."

### Preparing the way

Playing to their strengths, Auticon doesn't send the consultants in to negotiate with clients but prepares the way for them. "The first thing that we will do when we start to work with a client is to try and match up their commercial requirement with one of our consultants," says Coyle. "That involves a little bit more probing with the client to understand not just what is the work but how did they want it done? Are they looking for somebody that's detail-oriented? Do they need a creative problem-solver? Once we've done that, we will do a workplace assessment. One of our job coaches will go to the client and will assess the physical environment."

Auticon coach Kirsty Wilson says the most obvious adjustments are environmental, related to the consultant's sensory challenges. That could be the desk's position, lighting or noise, but all the consultants are different. "So, that's environment first of all, and communication adjustment sometimes as well, because it could be in a client space that they communicate quite fluidly and informally just by talking. However, some of our consultants, a lot of them, will like it to be in writing," explains Wilson. "Flexible working is quite common and that may be related to the hours they work or home days, or maybe they travel outside rush hour, if they are particularly susceptible to panic attacks and so on. The adjustments aren't complicated, they aren't hard to do. They are really just small tweaks that make a difference to the consultant's day."

The coach will then provide some autism training to the line manager both in general and more specifically about the consultants that will be working with them. Only after all that will the consultant be introduced to the manager. "At no stage does the client interview the consultant," says Coyle, "because we're not great believers in interviews."

Auticon doesn't interview job candidates either. "You're looking at a group of people who may have challenges in their communication style or social interactions, so standard job interviews might not be the best way because they're just essentially assessments of someone's social skills," says Sommer. "We came up with a different recruitment process that's almost entirely non-verbal, just skills-based, so people just sort of demonstrate their cognitive and technical skills. They obviously have opportunities to ask questions and discuss things, but we don't interview people >

'An interview is a highly stressed, unstructured test of social interaction skills. Frequently, it's not a good way to assess for the role that's being hired for.'

**Ray Coyle**  
Auticon UK



Auticon UK staff line up for a team photo

◀ because we don't find that's a fair assessment for people on the neuro-diversity spectrum."

Auticon recruitment was entirely different from what Neely had encountered before: "When I applied for positions earlier, it was the more usual: you fill out an application, upload your CV, go to your interview dressed up smartly and it's a very formal setting. You might do a test with everyone else. With Auticon it was more just going for a chat and casual. After that there were a couple of test sessions we did in small groups. But it wasn't an exam setting." Auticon gave them puzzles to solve, websites to check and finally a workshop with coaches working on a range of problems, some collaboratively.

"They weren't looking for any one thing. It was more working out where your strengths and weaknesses were rather than a pass or fail situation. When you just look at someone's CV, or you put them in a set interview situation, it puts a lot of pressure on them. They might be the perfect candidate, but they just don't test well, and don't interview well. But it could be that they're absolutely great at what they do."

If a company decides it wants to tap into this under-exploited pool of talent what should it do? "The first step is to look long and hard at your own recruitment processes, right from the point of view of when a job description is written," says Coyle. "The way in which we do pretty much every step of the process works to the detriment of people on the autism spectrum."

First, review the candidate requirements. "Neuro-typical people will generally speaking apply for a job where they do not meet all the criteria of the job description. Many autistic people will not, because they will take it literally," says Coyle. Women also tend to believe they need to meet more job requirements to apply than men do. "If you want to get more women into, particularly senior, positions in organisations, you've got to look harder at how you describe those roles, because as is very well documented men will apply for jobs that they're not qualified for, and women are far less likely to. I would say people on the spectrum are even less likely to."

Next, change how you filter the CVs.



Auticon job coach Antonia Hatzfeldt with consultant Tom Cowley



An Auticon consultant with back-office staff Richmal Maybank and Antonia Hatzfeldt

"Many people on the spectrum have quite chequered career histories and will have periods out of work because the workplace is not set up for them, it's set up for neuro-typical people," says Coyle. "You're going to have to start looking at people who have got gaps in their employment or may have been out of work for a certain amount of time. We have people working for us who may have been out of work for ten years before they came to Auticon." Most businesses wouldn't give such a CV a chance, he says.

### Positive messages

Once employers have a shortlist, they usually start interviewing. But that can be an ordeal for autistic people. "An interview is a highly stressed, unstructured test of social interaction skills," Coyle comments. "That's really not a good way to assess people on the spectrum. Frequently, it's not a good way to assess for the role that's being hired for."

Employers should encourage disclosure too, he says. "If you can send out positive messages about your belief in the benefits of neuro-diversity and mean it, then people would be happy to disclose. We've seen a huge shift in the last decade or so in terms of LGBTQ." Once the positive messages started to come out, so did employees. Some employees say it takes up a lot of energy trying to be someone you're not, even though they don't need any more adjustments than just acceptance. Employees who are autistic need environmental adjustments and acceptance to perform their best.

Auticon wants to spread the word beyond

its own offices, and being an IT consultancy that embeds consultants into clients' businesses, it is in a strong position to do that. "Most of our clients are FTSE100 companies. By changing the way they think, and by changing the way they find their workforce, we can have a massive impact across the UK," says Coyle.

"We want to create high-quality careers for autistic people," he continues. "Not just jobs, but long-term careers with career development, with a clear path, with lots of training, so that people can stay with us for the long term. That's really important and at the core of what we do."

"But we employ 25 autistic consultants. There are 700,000 autistic people in the UK. Only 16 per cent are in full-time employment. So the second part of what we want to do is to send our consultants out to clients' teams because we believe neuro-diverse teams perform better than neuro-typical teams."

"What we want is to allow as many people as possible the opportunity to work alongside someone with autism, to see what they're capable of, to see what they can contribute, so that we overcome people's misconceptions and people's prejudices about autism."

"We think that the more we work with companies, and the more that they see our consultants coming in and performing really well, the more we are shifting those perceptions in wider society, and therefore we would then expect those businesses, having had the experience with Auticon, to have a much more favourable view of their own autistic colleagues." \*

## Engineering live and on-demand

## Upcoming IET events June - October 2019

### iet.tv highlights

#### Arthur C Clarke: Writer, Inventor and Visionary

Clarke was the author of more than 100 books. He was also the co-author with Stanley Kubrick of Kubrick's film version of Clarke's "2001: A Space Odyssey", but he was regarded as far more than a science fiction writer. He was credited with the concept of communications satellites in 1945, decades before they became a reality. Watch iet.tv's mini-documentary on the writer, inventor and visionary; Arthur C Clarke.

[tv.theiet.org/?videoid=13150](http://tv.theiet.org/?videoid=13150)



#### 18th Edition AFDD & SPD Myth busting webinar

There is a lot of confusion and myths regarding the requirements in the 18th Edition of the Wiring Regulations for the installation of surge protective devices (SPDs) and arc fault detection devices (AFDDs). The IET & iet.tv have produced a webinar to dispel the myths regarding the installation of AFDDs and SPDs.

[tv.theiet.org/?videoid=13099](http://tv.theiet.org/?videoid=13099)



#### Ethics in Autonomous Vehicles

iet.tv captured the speakers; ranging from key stakeholder organisations, academia, car manufacturers, software providers and religious thinkers, at the ARTS Technical & Professional Network event - Ethics In Autonomous Vehicles. Catch up now on iet.tv

[tv.theiet.org/?event=4761](http://tv.theiet.org/?event=4761)



### IET events

#### China-Britain AI Summit 2019

21 June 2019, 8:30am - 7pm  
IET London: Savoy Place

This is a unique event bringing together Chinese and British expertise in the field of AI. Attendees will hear keynote talks and panel discussions on the current AI landscape in both countries, the latest technological innovation and its applications, and the ethics surrounding its use.

[events.theiet.org/china-britain-ai-summit](http://events.theiet.org/china-britain-ai-summit)

#### DPSP 2020: Developments in Power System Protection

Call for Papers deadline: 19 July 2019

Share your latest innovations, practical advances and brand-new research at DPSP 2020 – the major meeting point for power protection and control system experts. The main technical themes of the conference are protection of networks, applications, evolving technologies and future networks, so if any of these are your expertise, submit an abstract to raise your profile in the field. Selected papers are also published in IET Inspec, IEEE Xplore and Ei Compendex.



[theiet.org/dpsp](http://theiet.org/dpsp)

#### HVET 2019

7-9 October 2019  
Manchester University Conference Centre

High Voltage Engineering and Testing (HVET) is the only training course of its kind designed to provide information and insightful presentations into the methods, techniques and technologies within the high voltage testing and transmission engineering industry.



[theiet.org/hvet](http://theiet.org/hvet)

#### How to support STEM learning through a balanced curriculum

27 June 2019, 10am - 4pm  
IET London: Savoy Place

The conference will draw on the experience of schools and colleges to show how great STEM education, sitting within a broad and balanced curriculum, supports all young people, including those who will go on to be tomorrow's engineers.

[theiet.org/stem-education](http://theiet.org/stem-education)

#### Satcoms

16-20 September 2019  
99 City Road Conference Centre, London

The industry-standard five day programme is designed to present in-depth treatment of technical topics within the context of a comprehensive overview of satellite communications and applications.



[theiet.org/satcoms](http://theiet.org/satcoms)

#### Railway Earthing and Bonding

1-2 October 2019  
IET London: Savoy Place

Providing a comprehensive overview of the fundamentals of railway earthing and electrical risk management whilst outlining the core design principles for traction supply earthing, electrical supply and critical infrastructure and equipment. Following this, the conference will move more towards earthing in practice, giving practical information and guidance on the key challenges and issues faced with earthing within a fully operational railway environment.



[theiet.org/earthing](http://theiet.org/earthing)

### IET Network events

#### The Tenth International Conference on Computational Electromagnetics (CEM)

19-20 June 2019  
Radisson Blu hotel, Edinburgh

Organised by IET Electromagnetics Network



#### Electric Machine Design for Manufacture

10 July 2019  
IET Birmingham: Austin Court

Organised by IET Power Electronics, Machines and Drives Network



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### Key

On IET.tv	Sector
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	Information and communications
	Transport

**2.6%**  
identify as LGBT+

OFFICE FOR NATIONAL STATISTICS, UK

# Out, proud and at ease in the workplace



Fujitsu's Paul Patterson and Karen Thomson wear rainbow-striped Shine lanyards to support LGBTQ+ colleagues

PHIL ADAMS

The proportion of people identifying as heterosexual in the UK is falling, especially among younger generations, but individuals are still afraid to be 'out' at work. What could organisations do to create inclusive workplaces where LGBTQ+ employees can be completely themselves and thrive? By **Rebecca Northfield**

LGBTQ+ INCLUSION of employees in the workplace is still not a guarantee for every organisation. About one in five LGBT employees have experienced verbal bullying at work because of their sexual orientation, and people keep themselves 'in the closet' because they believe it would be career-limiting to be 'out'.

Companies must strive to do their part and ensure that everyone, no matter their gender or sexuality, feels comfortable, safe, and able to be themselves.

In the UK, a national LGBT survey by the Government Equalities Office revealed that 19 per cent of respondents with a job had not been open about their sexual orientation or gender identity with any colleagues at the same or lower level, while 30 per cent were not open with more senior colleagues.

Furthermore, nearly a quarter of respondents (23 per cent) had experienced a negative or mixed reaction from others in the workplace due to being LGBT, or being thought to be LGBT. Most said they had not reported the most serious incident, mainly because they thought it would not be worth it, or nothing would happen or change.

So what can organisations do to make a positive impact?

Stonewall, a charity working for lesbian, gay, bisexual and transgender rights in the UK, recently completed its Top 100 Employer List for 2019. This considered each organisation's work over the past year to help achieve acceptance without exception for all LGBT people.

The highest placed engineering or tech organisation was Fujitsu at number 34. This

is the fourth consecutive year the Japanese multinational IT equipment and services company has appeared on the list. It climbed 66 places to its highest ever ranking in 2019.

As well as being on the list, Fujitsu is the first Japanese company to publicly express support for the UN's LGBTI (I for intersex) business standards. It also has a zero-tolerance policy on bullying or harassment.

Fujitsu says that to design inclusive technology solutions, it needs to create inclusive workplaces where LGBTQ+ talent can be completely themselves and thrive, and aspires to make inclusive systems so no conscious or unconscious bias is unintentionally embedded into its work.

### What does Fujitsu do differently?

We asked Fujitsu employees who champion LGBTQ+ inclusivity, or who consider themselves part of the community, what they thought set the company apart from the rest.

Karen Thomson, diversity and inclusion lead at Fujitsu UK&I, says what makes it the most LGBTQ+ inclusive tech company is its progression across all areas of employee inclusion. "We have improved the language in our processes, expanded diversity and inclusion training to highlight LGBTQ+ case studies, launched targeted initiatives such as a reverse mentoring scheme, and started collecting data on our trans colleagues," she explains. "We have also engaged colleagues across the whole organisation to embed LGBTQ+ inclusivity, from procurement and HR to sales. All these initiatives ensure we are an LGBTQ+ inclusive organisation."

Mel Woolfenden, senior Oracle customer solutions architect, and a chair of Fujitsu's Shine LGBT+ network, says the reverse mentoring programme involves LGBTQ+ people being paired with a senior leader to share their experiences, including how they have found communications and the culture. "The reverse mentoring initiative has really engaged senior leaders to understand the influence they have over the organisational culture and has given them practical actions they can do to create an inclusive culture for LGBTQ+ talent," she adds.

According to Thomson, 26 per cent of lesbian, gay and bisexual employees in UK workplaces are not open about their sexual orientation. "I have heard of times where LGBTQ+ talent have gone 'back into the closet' when they move roles within an organisation. Fujitsu's diversity and inclusion campaign – #BeCompletelyYou – encourages people of all sexual orientations, gender identities and expressions to be completely themselves at work. It is through this campaign we have supported colleagues to come out in the workplace, transition in the workplace and helped relatives support LGBTQ+ loved ones."

The company's LGBT+ network also created an online monthly meeting called T&Coffee, which supports employees who are transitioning, thinking about transitioning, or are curious about trans people. "This has helped trans employees feel welcome, comfortable and safe being completely who they are at Fujitsu," says Thomson.

### TERMINOLOGY

## WHAT DOES IT STAND FOR?

LGBTQ+ stands for lesbian, gay, bisexual, transgender, queer (or questioning) and 'plus', which represents a wide range of other sexual identities.

The most important thing is to be respectful and use the terms that people prefer.

<b>Lesbian</b>	A female who experiences romantic love or sexual attraction to other females.
<b>Gay</b>	Primarily refers to a homosexual person or being homosexual. Often used to describe homosexual males, but lesbians may be referred to as gay.
<b>Bisexual</b>	Romantic, sexual attraction or behaviour towards both males and females, or romantic or sexual attraction to people of any sex or gender identity; this latter aspect is sometimes termed pansexuality.
<b>Transgender</b>	Umbrella term describing people whose gender identity differs from what is typically associated with the sex they were assigned at birth. Sometimes abbreviated to trans.
<b>Transsexual</b>	Someone who has or wants medical intervention to permanently transition from the gender assigned at birth to the one they identify as.
<b>Queer</b>	Umbrella term for sexual and gender minorities not heterosexual or cisgender. Originally used pejoratively against those with same-sex desires but, beginning in the late-1980s, queer scholars and activists began to reclaim the word.
<b>Questioning</b>	Questioning of one's gender, sexual identity, orientation, or all three by people who may be unsure, exploring, and concerned about applying social labels.
<b>Intersex</b>	Variation in sex characteristics including chromosomes, gonads, or genitals that do not allow an individual to be distinctly identified as male or female.

SOURCES: OK2BME, PINK NEWS

Paul Patterson, SVP, EMEA sales and country leadership (also chair of Fujitsu's Responsible Business Board, which oversees diversity and inclusion initiatives), says the experiences employees have at Fujitsu are important to how engaged they will be, how they will perform "and, ultimately, will determine whether they are proud to work for us. These initiatives allow me to personally make a difference to LGBTQ+ employees' experience, and that is a real motivator."

He says the company listens, which is the most important thing. "Everyone's experience is different, and it is only by truly understanding LGBTQ+ experiences at Fujitsu that we can take the right actions to ensure all our people feel they can be completely themselves and succeed."

According to Patterson, research suggests we require three role models who we identify with to believe it's possible for us to succeed. He says promoting LGBTQ+ role models throughout Fujitsu helps highlight its inclusive culture. "Anyone thinking of joining Fujitsu is given a 'Be Completely You' booklet, highlighting these diverse role models and promoting inclusion events we celebrate. This gives a snapshot into our culture and our approach to diversity and inclusion," he adds.

Patterson recently hosted an LGBTQ+ round-table with senior leaders, where they listened to experiences of LGBTQ+ employees, seeking recommendations to better embed inclusivity. He now wears a rainbow lanyard to signal he is an active ally, and key themes discussed during the event will be implanted into manager training.

Daniel Thomas, an applications architect at Fujitsu, reckons that since the company's LGBTQ+ network has become one of its core communities, exposure of LGBTQ+ conversations has increased. "More people feel confident to be completely themselves. Network members are given a rainbow lanyard to wear. This is a simple but effective way of showing support to LGBTQ+ colleagues and sparking those all-important conversations about what we do and why."

Woolfenden feels it's important that authentic messages from the top down continue to create a respectful culture where everyone is equally valued. "A recent report

# 23%

of LGBT employees report negative or mixed reactions

NATIONAL LGBT SURVEY, GOVERNMENT EQUALITIES OFFICE

found that 28 per cent of LGBTQ+ CEOs in UK organisations had been advised to hide their sexual orientation at work," she says. "I would like to see more visible LGBTQ+ role models in senior positions to reassure LGBTQ+ employees today that being 'out' is not career limiting."

Woolfenden says one of the differences in Fujitsu is that the LGBTQ+ network is integrated into the business. "We support employees and managers, champion LGBTQ+ inclusivity throughout different parts of Fujitsu and actively campaign for change, to make Fujitsu a more diverse and inclusive place to work."

Another initiative is Fujitsu's Diversity Matters town-hall meetings with the CEO and president of Fujitsu EMEA. The town halls move around the country and engage colleagues and allies with the topic of diversity and inclusion. "All these actions help foster an inclusive culture from the top down," says Woolfenden.

Thomas says that from day one, it was clear that it was 'OK to be you' at Fujitsu, and the company understands everyone works best when supported to embrace who they are. "In the various places I have worked in my career, I have never felt as accepted to be completely me as I do here," he adds.

"Fujitsu really does understand that diversity is what makes an organisation stronger. This isn't a superficial campaign or an HR initiative, this change is deeply embedded in how we do business. These are real LGBTQ+ colleagues and allies, using their experience and understanding to make real change." \*

42

average age of workers in  
engineering industries

# Too old to be an engineer?

Facebook CEO Mark Zuckerberg has asserted that younger people are “just smarter” than older ones. We talk to Aviva and other companies about their efforts to challenge ageism.

By **Dea Birkett**

The average age of the UK workforce is 41 – however, with an ageing workforce it is predicted that, by 2025, one in three employees will be aged over 50



IMAGE SOURCE

TRY TO IMAGINE someone working in the tech industry and you'll visualise a man in his late 20s playing ping-pong and wearing designer jeans and sneakers. You wouldn't be wrong. The average age of a Google employee is 29. As Facebook's founder Mark Zuckerberg, now the ripe age of 35, famously said: “Young people are just smarter.”

But are they? Although there are no similar statistics available for the UK industry, it's still clear – age may be the final barrier to be dismantled in the creation of a truly diverse tech workforce. Gareth Jones, an HR and technology consultant and CEO of Headstart, says: “The general narrative in the tech industry is age-biased and the focus is on millennials. The situation is particularly acute on the coding side of things, and there's a general acceptance that you don't need to worry about the fact you're not employing older people as it's not a politically sensitive issue in the same way that things like gender are. So while you've often got older people at the senior levels, when it comes to the more general business layers or hands-on tech world, the age group tends to be younger.”

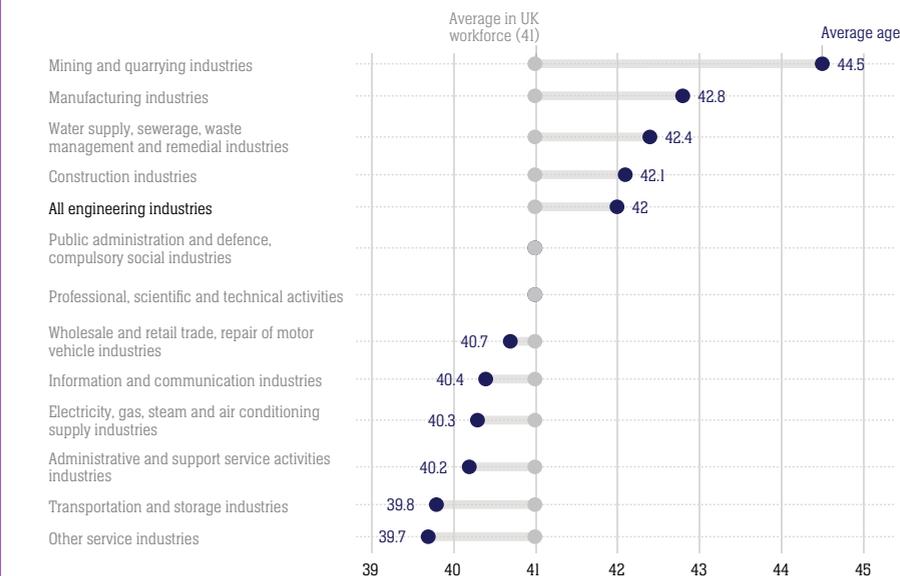
## Discrimination

Paul Owen, director of operations at the Age Diversity Forum, a social enterprise working to enhance age diversity in the workplace, has identified age discrimination as “the biggest area of bias receiving the lowest level of attention”.

The technology industries are beginning to pay attention. They have no choice. Population predictions for the workforce in the UK make it clear that older employees will need to be recruited and retained at a far faster rate. In the next 10 years, eight million young people will leave school and university and enter the workforce. In the same time, 10 million older people will retire. By 2025, it's predicted one in three employees will be aged over 50. By 2030, the over-50s will become the biggest demographic factor in the workforce.

“If IT has a mindset that it's a young person's game, they're in for a big shock,” says Alistair McQueen, head of savings and

## Age in UK engineering sectors



Source: Engineering UK, ONS

retirement at insurance company Aviva.

Aviva has 17,000 staff in offices throughout the UK. “There was an assumption that the fastest-growing sector was younger people – fresh blood and talent. But, in reality, it’s the other end of the age spectrum. We needed to understand their mindset. So we asked them,” says McQueen. Aviva conducted a staff survey, uncovering that one in three of their staff believed age was a barrier to opportunity and identified a glass ceiling once you reached 50. “That’s not what we wanted to hear. We wanted to challenge this.”

The Aviva survey also revealed that the average length of service for this demographic was 17 years – adding up to 85,000 years of corporate memory. “This is a population who knows how to get things done,” says McQueen. “Yet they were leaving the organisation at a faster rate than the younger demographic.”

### A Midlife MOT

With a predicted drop in the younger population to fill their posts, Aviva thought it had to act. “The light bulb with us wasn’t altruism or paternalism, but the commercial risk,” explains McQueen.

John Cridland CBE’s 2017 government report ‘Independent Review of the State Pension Age’ mentioned introducing ‘MOTs’ for older employees. It was a tiny paragraph, but it was the kernel of an idea. “We thought – why don’t we put some meat on those bones?” says McQueen. So last year, Aviva piloted a ‘Midlife MOT’ for 100 members of staff aged 45 and over. It took the form of a three-hour training session on wealth, work and wellbeing particularly targeting the older workforce’s concerns. There was a 94 per cent take-up rate – larger than any other staff initiative they’d previously introduced. “This was telling us that this population was feeling abandoned,” says McQueen. “There was a huge demand. We needed to hug this population closer.”

The results were positive. After running the pilot, there was a 10 per cent increase in confidence, a 10 per cent increase in knowledge of where to go for support, and a 10 per cent increase in positive feeling

towards Aviva as an employer. Since May this year, all 5,000 of Aviva’s 50-plus workforce can access a Midlife MOT. This involves face-to-face seminars, written guides, online resources and a 30-minute consultation with a financial adviser. The aim is to “prompt employees to begin making plans to support the next phase of their work, wealth and wellbeing, and identify practical steps they can take to support a fuller, more rewarding working life”. Aviva’s initiatives led them to win the Ageing Workforce Award for 2018.

But there remain larger challenges. “We want to see the level of attrition slow down but we need to manage our expectations. These bigger trends will take longer to shift,” says McQueen.

### A 65-year-old apprentice

Matthew Southwood, a business intelligence consultant in Aviva’s Sheffield office, was one of the beneficiaries. Aged 52, Southwood works with big data technologies. Ideally, he’d like to retire in five years but thought he wouldn’t be able to. “Before the MOT, I didn’t know you could phase retirement. Rather than cut off from 35 hours to nil, I could do it gradually. I thought I’d have to go to a supermarket and do shelf stacking if I wanted to do that,” he says.

There were additional softer benefits. “Colleagues went on it – people I’d never talked to about pensions and things like that – and we discussed between ourselves and shared ideas. It’s good to feel in similar position to others.”

Southwood is also now doing an apprenticeship in business analytics. Professor Alison Fuller, the Institute of Education’s director of research and development, and the researcher behind Do Adult Apprenticeships Work?, said: “If you ask someone to picture an apprentice they’ll more than likely conjure up an image of a school leaver. It’s a missed opportunity if a large proportion of the workforce’s capacity to learn is underestimated.”

Southwood says: “I felt a bit strange at first saying I’m doing an apprenticeship at my age, but there’s someone else doing it who’s 65!” He’s also learning Qlik in an online

‘continuous classroom’ setting. Aviva gives him time from his regular work to complete these courses.

Aviva has focused on retaining older employees. But for some mid-aged technology experts, the first hurdle is getting through the door. Job postings containing terms like ‘recent graduate’ and ‘digital native’ suggest older applicants aren’t welcome to apply.

At Landmarc, which provides support services to the Ministry of Defence and others, they’re keen to attract applicants of all ages. “We don’t just rely on online job boards,” says Adam Hudson, corporate HR manager. “We try to put up jobs in local pubs and shops. It’s about enabling people to get their CV in front of us. It’s about making the recruitment process accessible to everybody.” Landmarc’s oldest employee is 74.

### The missing millions

The belief is that there’s a workforce ready to take up opportunities and fill skill shortages, if they are properly supported to do so. The Department for Work and Pensions 2017 strategy document ‘Fuller Working Lives’ identified, “almost one million individuals aged 50-64 who are not in employment but state they are willing to or would like to work”. These became known as the ‘missing million’.

Tideway, which is building a 25km ‘Super Sewer’ under the River Thames, introduced a ‘Returner’ programme in 2015, helping professionals to return to work after a long career break. It was the first UK employer to do so outside of banking. The programme allows returners a transition period ‘to get back up to speed’. It’s an opportunity many older workers welcome. Tideway currently has 13 returners working for it.

For Landmarc, age is a key strand in its diversity strategy. Twenty-five per cent of Landmarc’s workforce is aged 55 and over, and this figure is rising. The average age of a Landmarc employee is 51.

Part of the firm’s success in bucking the usual tech statistics lies in proactively targeting men and women who are ex-forces, often with previous engineering and technology experience of benefit to the company. It also positively supports flexible working. “We’re not fixed on a single Monday to Friday contract. We have flexible and part-time opportunities,” says Hudson. Over a quarter of over-65 staff work part-time and over half of staff training is undertaken by over-50s.

Hudson doesn’t view an older workforce as a problem, but an asset. “As an organisation we continually perform well – so age diversity has succeeded,” he says. Landmarc is a finalist in the Business Community’s Age Friendly Team Award 2019.

For Southwood at Aviva, the MOT has led to many benefits beyond better planning for his remaining working life. It has made him feel more connected to his company and colleagues. “It made me realise I’m not alone,” he says. \*

# 8.1%

BME workers in engineering

SOURCE: ENGINEERING UK

# Do you look like an engineer?

Around one-quarter of UK engineering graduates come from black and minority ethnic (BME) backgrounds, yet only around 8 per cent of engineers are non-white. What explains this discrepancy and how can engineering firms go about hiring a workforce that is more representative of society?

By **Len Williams**

Consultancy firm Mott MacDonald uses reverse mentoring schemes where junior BME staff work closely with senior staff to promote understanding



“SOMETIMES YOU DON’T want to go to the pub!” exclaims Dr Nike Folyan, a chartered engineer. However, when advancing in an engineering career still often involves informal bonding over beers, certain employees – most obviously Muslims – often struggle to feel they belong.

Folyan, who is the chair of AFBE, the Association for Black and Minority

Ethnic Engineers, highlights pub visits as just one example of how British engineers who don’t come from a white British background can face challenges in their careers. While overt racism seems to be a relatively uncommon occurrence in the industry today, there’s still a long way to go before British engineering can be considered entirely inclusive.

Take the statistics. AFBE’s research shows just 0.05 per cent of engineering board members are from a non-white background, and the Royal Academy of Engineering recently reported that black and minority ethnic (BME) engineering graduates take significantly longer to get hired than their white peers. What’s more, only 8.1 per cent of engineers are BME – while the 2011 census

Mott Macdonald employs 16,000 people across 150 countries



shows around 14 per cent of Brits aged 16-64 are non-white.

Ken Clark, a social scientist at the University of Manchester, also points to a recent study which suggests that engineers have more unconscious racial bias than other professionals.

That said, while engineering is far from perfect, it is improving – Folayan says numbers of BME engineers have risen since her association launched in 2007. Certain firms – such as Mott MacDonald, which is covered below – are striving to improve diversity in the sector.

### Is engineering missing out?

Besides the obvious ethical reasons for eliminating discrimination in the industry, there's a hard-nosed business case to counter it too. McKinsey, the consultancy, has conducted research showing that diverse companies record higher profits than less diverse firms. The general interpretation of this correlation is that employing people from different backgrounds encourages new perspectives and ideas, and possibly opens up new markets.

Vanessa Burton, an assistant engineer at Mott MacDonald, puts this into context. On a recent project, she says, they had “thirty-three different nationalities and 34 languages spoken across 18 different offices... This diversity led to an increased awareness across the team of our various cultures and backgrounds bringing together different skills and approaches, which overall created an exciting and dynamic team with innovative ideas.”

Should we be actively encouraging BME engineers? The standard argument against any kind of ‘proactive measure’ for hiring people from BME backgrounds – or from any minority group – is that these approaches are not far from quotas and that they undermine meritocracy, while simultaneously patronising ethnic minority engineers.

However, Clark believes these arguments miss the point. Not only might there be various conscious and unconscious biases in the hiring of engineers which undermine genuine meritocracy, but he also points out that actively expanding the potential pool of job candidates is hardly a bad idea.

Without a more proactive approach, many people with the brains for engineering may pass the sector by. For example, Kalita Patel is a chemical engineer who has mainly worked in the food and beverages sector. She explains that “engineering was never advertised to me as a possible career”. If it wasn't for a specific school's outreach programme from the University of Birmingham, she may never have become aware of the possibilities in the sector.

If firms take active steps now, the idea goes that diversity in the industry will eventually become the norm.

### From words to actions

Mott MacDonald is a major employee-owned global consultancy focusing on engineering, management and development. With an HQ

in Croydon, the firm employs some 16,000 people in 150 countries.

In October 2018, it was one of the first companies – and one of few engineering firms – to commit to the Race at Work charter, a campaign by Business in the Community, a charity.

“We were already taking several steps outlined in the charter and we saw this as a great opportunity to publicise our ambitions of creating a workforce which is representative of British society” explains Sophie Lea, an equality, diversity and inclusion (EDI) advisor at Mott MacDonald. The firm has a team of three EDI specialists who introduce actions across the business to encourage inclusivity (these are not just limited to ethnicity).

Lea explains that the EDI team started by looking at the numbers. “Our strategy is data-driven and intelligence-led; we reviewed data from our EDI dashboards on our diversity stats in recruitment, headcount, promotions etc and combined it with information from our internal EDI employee engagement survey.”

From this analysis, team members were able to start developing strategies and techniques that might help address the issue more widely.

Mott MacDonald's initiatives include:

- **Replacing experience-based interviews with a strengths-based approach**

Lea explains that even when interviewing recent graduates, experience is often highly prized in job interviews. The problem is that a white student is more likely to have a relative working in engineering, so might be able to wangle a summer internship at a prestigious firm. This means they'll have an advantage over an equally capable black student who doesn't happen to have that kind of foot up – and therefore lacks that crucial work experience. Strengths-based interviews aim to counter this.

- **Working with AFBE**

Mott MacDonald has worked with AFBE to support BME engineering students to transition into their professional careers (see box on AFBE's programmes).

- **Training on unconscious bias**

Human beings appear to have an unconscious tendency to identify with, and therefore to hire people who look like themselves. Lea explains that Mott MacDonald has introduced training on how to counter this ‘unconscious bias’ with its recruiters.

- **Reverse mentoring schemes**

Mott MacDonald has introduced reverse mentoring schemes where junior BME staff, as well as disabled and LGBT+ engineers, work closely with senior staff in order to promote understanding.

- **Creation of networks for BME staff**

By providing the opportunity for BME staff to meet up, networking groups help provide support.

- **Transparent advertising of all internal job opportunities**

This is intended to help reduce the risk of unconscious bias in internal recruitment.

### CASE STUDY

## AFBE PROGRAMMES TO SUPPORT BME ENGINEERS

AFBE has developed a range of programmes to support BME engineers at different stages of their careers, including:

- Real Projects, which sees students placed on real-world projects including Crossrail
- Transition workshops, where grads undergo mock-up interviews and learn about the hiring process
- Chess club, which supports careers progression through ‘lunch and learn’ sessions to help professionals plan their next steps.

**14%**  
BME people of  
working age

SOURCE: 2011 UK CENSUS

- **The creation of e-learning tools**

The firm has created a variety of online training tools to help train staff about unconscious bias, the benefits and purpose of EDI, and ways of increasing diversity.

- **Opportunities for airing problems**

Mott MacDonald has an anonymous and confidential phone line where staff can report discrimination.

Mott MacDonald's EDI team monitor progress and look at ways to encourage more inclusivity. While Lea stresses that success isn't measured by ‘quotas’, the firm does use data to assess its progress in the number of BME applicants to its graduate schemes, for instance. EDI actions have produced a cultural shift, with 81 per cent of UK staff feeling that their colleagues take EDI seriously, and 72 per cent saying EDI policies are effectively implemented.

### Lots still to learn

Mott MacDonald is leading the way when it comes to increasing ethnic diversity in the industry. The use of a range of tools to tackle this complex issue is a sensible approach.

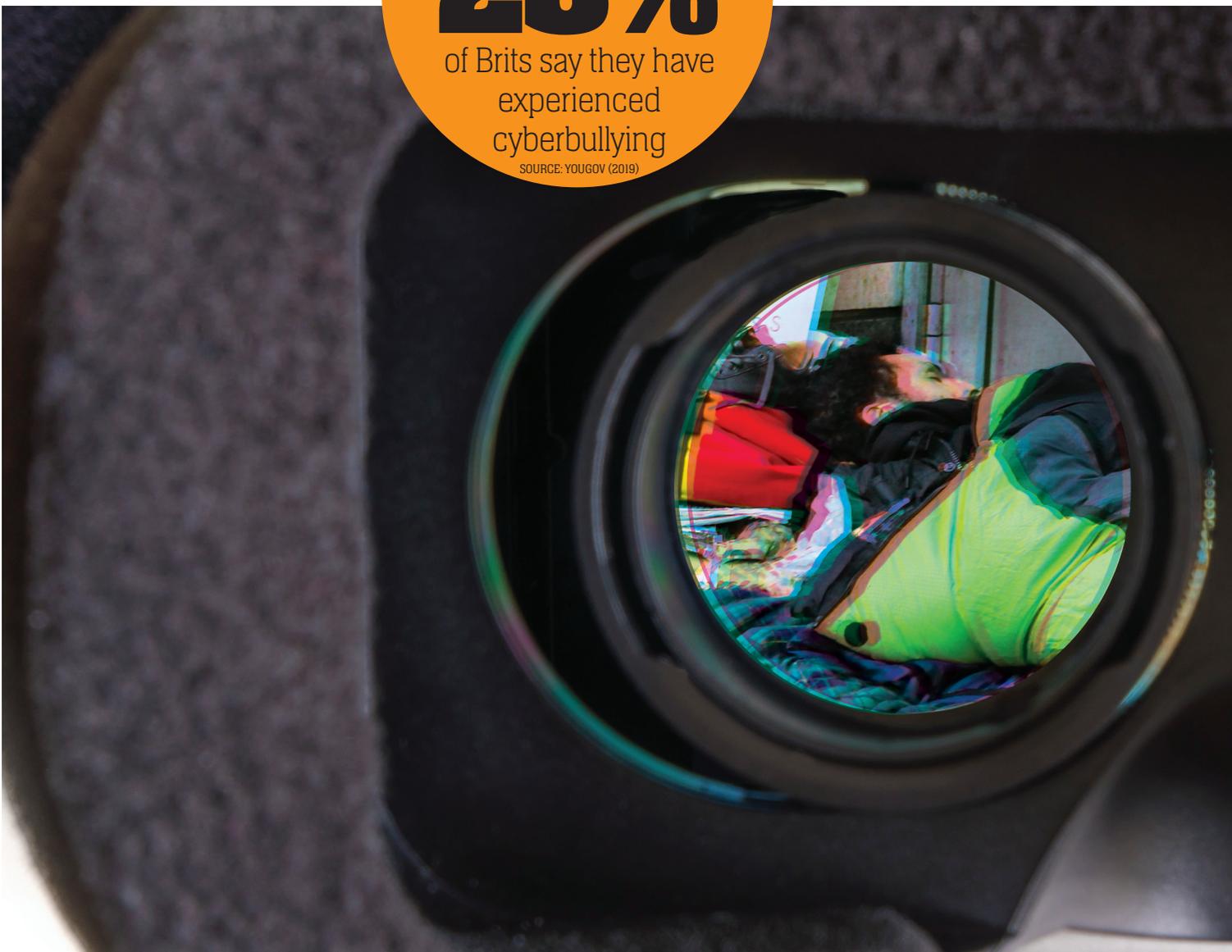
But is this something every engineering firm could replicate? Clark and Folayan agree that for smaller firms, which don't have the same kinds of resources, introducing large-scale new policies of this sort can be a challenge. But, with strong leadership and support from associations like AFBE who can provide advice in this area, there's no reason why they can't start.

While there's a lot of progress still to be made, Mott MacDonald shows that with an action plan and solid leadership, the industry can become more inclusive to BME backgrounds – even if that means swapping the pub for the park from time to time. \*

23%

of Brits say they have experienced cyberbullying

SOURCE: YOUNGOV (2019)



# Through the

In a world driven by social media, with cases of hate crime, can virtual reality and artificial intelligence help people experience life through another person's eyes?

By **Helena Pozniak**

IMAGINE LOOKING DOWN at your body and discovering you're a different gender or race. You're in someone's virtual shoes, experiencing the world as he or she, or even they, sees it – joy, fear, prejudice, and how others perceive you.

Virtual reality (VR), as never before, can help us do this – by widening our horizons, helping us understand what it's like to be someone else. But can VR, artificial intelligence (AI) and other emerging technologies, help make us more empathetic and make the world a kinder place?

Technology means it's never been easier to communicate. Despite this, it's apparently never been harder to empathise. A growing chorus of voices are saying technology is at the root of our lack of empathy.

A brutal millennial cocktail of gaming, social media, reality television and the cult of the individual have left us less likely to empathise, say media reports. A recent UK poll by YouGov found that more than half (51 per cent) of respondents believe empathy levels are falling, while just 12 per cent believe we are growing more empathetic. This echoes US research from 2010 showing a 40 per cent decline in college students' capacity for empathy over two decades.

However, as our ability declines, our interest is rising. Google now houses an 'empathy lab' and, as a term, empathy has been googled in the US more and more since 2004. Furthermore, academic studies around empathy are being published in ever increasing numbers.

## The psychology

Everyone – apart from some psychopaths – can learn to empathise, say neuroscientists. In fact, some primates demonstrate empathy, and even young babies show basic levels of empathy.

But to teach it, we first need to understand what it is, writes Dr Sara Konrath, a Canadian social scientist who has developed an empathy app for young people. One academic identifies at least eight different definitions of empathy.

At the emotional end of the scale, it's about literally 'feeling' what another person experiences. At a cognitive level, it's about perspective – understanding rather than imagining someone's experience, says Elise Ogle, who studied the effects of immersive virtual-reality on empathy at Stanford University's Virtual Human Interaction Lab (VHIL) in the US. "You see or understand something (cognitive empathy), or you feel your own emotions (affective empathy) – or

Researchers at Stanford University's Virtual Human Interaction Lab (VHIL) have created a virtual reality experience that enables users to 'live' as a homeless person



# looking glass

you might have a mix of the two," Ogle says.

This ability can help us respond with appropriate compassion. Empathy is the social glue that holds society together, and the foundation of human relations. But if we 'feel' too much, it might also backfire, making us too upset to engage with another person or respond to hardship.

## Touring through VR

So how do we learn? Traditionally we've learned to put ourselves in others' shoes by face-to-face communication, good parenting, by reading fiction, and, more recently, watching television and films. But are immersive technologies such as virtual reality more powerful and effective?

"Think about it as a spectrum of experience," says Ogle, who now works at Limbix, a US-based company that builds virtual reality to improve mental health treatment. "At one end, there's real life, which is the most powerful experience.

VR is a step down, but closer than print or television."

At Stanford's VHIL, she helped create the experimental first-person content 'Becoming Homeless'. Put on a VR headset and this content transports a user to 'live' the experience of losing a job, a flat, and go to living on the streets and feeling vulnerable – even experiencing gut fear as a threatening figure looms on a night bus.

Or imagine feeling what it's like to meet racism face to face – this is another immersive-reality project from Columbia University developed with Stanford's VHIL. '1000 Cut Journey' allows the viewer to become a black man, encountering the realities of prejudice as a child, adolescent and young adult – an emotional and disturbing experience.

"People have been touched," says Professor Courtney Cogburn, who showcased her content at Tribeca Film Festival in 2018. "They've expressed learning

something new about racism. We've tried to capture subtleties that not everyone picks up as well as the more in-your-face stuff."

Scientists look at "embodiment" in VR, says Ogle, which dictates how immersed a person feels in an experience. "This is about how you take the first-person perspective of another. You look down at your body and see someone else. Body transfer is the psychological feeling you can become someone else," she says.

It's not something you forget easily, the lab's research shows. Stanford psychologists run rigorous studies to differentiate VR experiences and measure the impact of these on people's attitudes and behaviour. Typically, says Ogle, this immersive experience proves more powerful than other media.

Furthermore, VR is an innovative and growing area, says Cogburn. "It will become an important tool to understand experiences that are different from our own in a way >

Limbix builds virtual reality to improve mental health treatment by making it more effective, efficient, and easier to access

< that other kinds of media are incapable of doing.”

But while VR headsets are becoming more affordable and sophisticated, content and graphics have typically been relatively clunky. This also raises the question about whose responsibility it is to craft material that engages and educates.

### Empathy through apps

Dozens of studies show that empathy can be taught and learned, confirms social scientist Konrath. “But many methods are costly and difficult to inject into everyday interactions,” she writes.

To overcome this challenge, she has developed an app, the Random App of Kindness (RAKi), which offers a series of nine mini games designed to sharpen a young person’s empathy skills – give the crying baby what it needs, help granny cross the road or recognise emotions in facial expressions and so on.

Teenagers (10-17-year-olds) who played with the app for two months were more likely to help a person in distress, Konrath’s preliminary research showed. “Technology isn’t going to go away, so we need to find ways to use it in a positive way,” she writes.

To be effective, technology needs to match its users, says former agony aunt Suzi Godson, founder of an award-winning safe social media app that helps teenagers cope with certain issues. With some 7,000 young users, social enterprise MeeTwo runs on empathy. Teenagers post problems anonymously and – crucially – weigh in to support each other, sometimes with advice, but often just with commiseration or understanding. Trained moderators are ready to step in if required.

“It’s better to simplify and do a couple of things really well,” says Godson. Her solution gets around barriers to one-to-one counselling, she says – the cost, the availability and the risk that young people will just say what they think a counsellor wants to hear. Teenagers say they like the lack of hierarchy and the anonymity behind the app.

While MeeTwo currently hooks up real people, Godson’s team is looking to build in AI in order to scale up the app. Apparently knowing that you are communicating with a machine rather than a human doesn’t blunt the benefits of that exchange.

### Integrating artificial intelligence

When a tutor at Plymouth Arts College developed an emotive chatbot designed to detect the mood of its students – many from disadvantaged backgrounds – they took to it like ducks to water. “Students have a more intuitive understanding of the system than the teachers,” says Angus Reith, who’s behind the project. “We’re allowing students to voice their feelings, giving them an opportunity for non-human, non-judgemental conversation.” They know they are talking to a machine, but still find the exchange comforting.

Research shows that the more ‘human’ new information technology appears and



‘Sara’, the ‘Socially Aware Robot Assistant’, is a life-size screen avatar underpinned with some hefty layers of artificial intelligence

sounds, the more honest and dependable people find it. When we communicate with avatars, we like them to look and sound like us, says Professor Justine Cassell, a human-computer interaction expert at Carnegie Mellon University. AI trained to relate to humans can be a powerful tool.

Cassell spent years observing how children interact, and her research has helped computer scientists build ‘virtual children’ – life-size screen avatars underpinned with some hefty layers of artificial intelligence.

One such creation, ‘Alex’, can interact at a naturalistic level with children – but is trained with a deep ability to collaborate and build rapport, thanks to Cassell’s real-life observations. Alex might chit-chat, grin, respond with a “don’t worry, I suck at maths too”, for instance. All while it builds social bonds and gently helps the child learn.

“They know Alex is not a real child,” says Cassell. “They’ll say, ‘oh, Alex crashed’, but that doesn’t stop them from being able to relate to it,” she says. Alex isn’t trained in empathy – but in rapport-building.



Rapport is a reciprocal sense of 'getting on', understanding one another, and has powerful benefits. "Empathy is one-directional – you feel for someone else. Rapport is two-way. And there's a ton of research that shows its positive effects on health, education, ageing, work. It's a really potent phenomenon."

Furthermore, we're mistaken in pursuing autonomous, independent AI systems equipped to act on their own agency, says Cassell. "We are not autonomous, we're interdependent," she adds. "If our holy grail became interdependency, then we'd be less worried about AI taking our jobs because we'd be building systems that worked with us, creating bonds, rather than replacing us."

Leaders at Davos in 2017 were able to experience Cassell's creation first hand. She took 'Sara', the 'Socially Aware Robot Assistant', to the World Economic Forum to help world leaders meet people with similar interests and navigate the conference.

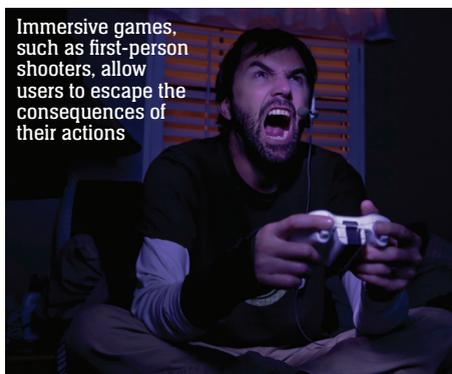
This kind of AI could have huge beneficial roles more widely, Cassell believes. "Data shows after two years in a refugee camp, people turn to crime. In some camps, they simply don't have enough officers to interview and process people," she says. "What if you could create an AI that could build rapport with refugees and conduct that first interview, think how that would help. There's data that rapport leads to honest answers. This has massive potential."

The trouble with technology is that it allows users to escape the consequences of

'Technology isn't going to go away, so we need to find ways to use it in a positive way'

**Dr Sara Konrath**  
social scientist

their actions – this is obvious in the immersive environments of first-person shooter games – which comes back to design. "Gaming leads you to believe there are no consequences to social interactions, but obviously in the real world there are," says Jamie Callis, a self-confessed former games addict from Wales who sought counselling when his addiction became out of control.



Immersive games, such as first-person shooters, allow users to escape the consequences of their actions

Social media also skews our empathetic responses, says Priya Lakhani, founder and CEO of Century Tech, which uses cognitive neuroscience to help teachers. "When you are mean to someone online, you don't have to witness how he or she reacts to that nasty message. Face to face, you'd immediately learn how that other person was feeling – they'd cry or become upset. Technology helps you avoid that, so it could easily drive a lack of empathy. When building an application, companies need to be very aware of potential negatives."

Furthermore, the growing presence of persuasive technology, designed to influence and sometimes reinforce consumer choices, can have a reductive effect. "When AI is programmed, it has a goal in mind," says Lakhani, "and a lot of AI is designed to drive patterns. If you rely too much on AI to give you information, or social prompts, it risks reinforcing your beliefs. That's dangerous. Empathy is about understanding the feelings and viewpoints of others. AI can remove that serendipity and just feed you with what you like." In an ideal world, says Lakhani, AI would be designed with empathy and social and moral values in mind.

### Emotional intelligence

Currently, technology is tone deaf, says Danielle Krettek, founder and principal of Google's Empathy Lab, which is housed within the company design group. Her team's research feeds into the design of Google's AI Assistant, and how smart technology interacts with real people. While we might swipe our phones thousands of times a day, our devices don't know how we feel, she says. This is a design flaw. "Technology has always been about designing for the cognitive layer of experience," she told a San Francisco technology conference. "Now with paradigms of assistants (such as Google Assistant, Alexa, Siri etc), how do we design for the invisible, emotional layer?"

Humans are emotional, messy beings, Krettek says. An AI can't feel emotions such as joy. "The most human things are really hard for machines." Emotional intelligence is, she says, the ability to recognise an emotion in yourself, and recognise it in someone else. "So an empathetic moment requires that both beings are feeling things. That's not possible for a machine."

This shouldn't stop technology being designed with humanity in mind, equipped to make what she calls an empathetic leap. "We're entering a different paradigm, make no mistake. We're learning from lessons of the past. The next ten years are going to be very different." She looks to a future where humans have a "harmonious connection" with technology "that feels almost human in next-level intuitiveness, versus something that is trying to be like us and never will be".

If technology is part of the cause of the decline in empathy, it can become part of the solution, say social scientists. However, it can also manipulate and exaggerate anti-social and polarised positions. Ultimately, it's only as good as the human creators behind it. And they need to be empathetic. \*

**81%**  
of UK VC deals go  
to male teams

BRITISH BUSINESS BANK

# Why it pays to be a male tech entrepreneur

Engineering and tech start-ups might be at the cutting-edge of technology, but when it comes to raising money, the situation is far from modern if you're female.

By **Sarah Griffiths**



JUST TWO PER CENT of venture capital (VC) money went to all-female founding teams in Europe in 2018, according to Atomico's State of European Tech report, while in the UK, for every £1 of VC investment, all-female founder teams get less than 1p, a British Business Bank report has revealed.

Why is the gender investment gap so bad?

"The biggest reason so few women-led companies receive investment is because they are only a small minority to begin with," says Professor Simonetta Manfredi from the Centre for Diversity Research Policy and Practice (CDPRP) at Oxford Brookes University. "We need to see more women entrepreneurs to normalise the presence of women in these male-dominated spaces."

Another reason may be that the majority of venture capitalists are male, with females making up just 13 per cent of VC decision-makers in the UK, and they hold unconscious biases.

Researchers at Lulea University of Technology (LTU) found financiers leading funding decisions for 125 venture applications unwittingly used different language to describe male and female entrepreneurs, revealing stereotypical views of women as having qualities undesirable in an entrepreneur, arguably echoing Facebook COO Sheryl Sandberg's comments that: "If you're a forthright leader, you are seen as aggressive; if you're smiley and happy, you're then seen as not being serious enough."

For example, the researchers found that while financiers saw male entrepreneurs as 'young and promising', they perceived female founders to be 'young and inexperienced'.

Manfredi says: "The characteristics of what makes a successful entrepreneur are traits more associated with men which may put women at a disadvantage when it comes to attracting investment."

The LTU study also found female founders were awarded an average of 25 per cent of what they asked for, while men were given 52 per cent, and that women were more often turned down for financing than men.

### What can be done to tackle biases?

The World Economic Forum (WEF) believes there should be more diversity, including women in senior roles, within VC firms. Currently just 13 per cent of senior people on UK venture capital investment teams are women and 48 per cent of investment teams have zero women, according to the British Business Bank.

"With a more balanced VC management team, much of the unconscious bias that has impacted the industry will disappear on its own," says the WEF, which also advocates dedicated funds for women and other under-represented entrepreneurs.

Merian Ventures is one example of a US and UK VC firm that funds female-led artificial intelligence and consumer-facing technology companies. Its founder, Alexis de Raadt St James, believes VC firms and investors have a role to play in levelling the playing field, and it's beneficial to everyone.



### INVESTMENT MIND THE FINANCIAL GENDER GAP

The British Business Bank's UK VC & Female Founders report broke down how venture capital (VC) money is distributed in the UK. It found that:

- For every £1 of VC investment in the UK, all-female founder teams get less than 1p.
- In contrast, all-male founder teams get 89p and mixed-gender teams pull in 10p

"VCs have fallen into a pattern of recognition: men = success, and they keep on repeating that," she says, explaining her firm targets the best opportunities, not simply someone who fits the mould of recent successful tech billionaires. But of course, there are other routes to raising money too.

Angel investors – high net-worth individuals who back small start-ups or entrepreneurs – are one alternative to approaching VCs. It worked for Kike Oniwinde, CEO and founder of BYP Network App – a networking app for black young professionals – but she believes that challenges remain. "When it comes to securing venture capital money... You have to know the right people or build relationships over time. The [investment gap] statistics show that there need to be more networks to allow women and those from BAME backgrounds to build these relationships to ensure that they can secure this funding."

Crowd-funding has become a fundraising phenomenon and, in theory, doesn't rely on connections. Priya Guha, venture partner at Merian Ventures, says she has seen it used "very effectively" to get traction in a large market by publicity, while other options available to entrepreneurial students are university incubators or commercial firms with links to universities.

While many are successful, Manfredi says women represent just 11 per cent of active spin-out company founders in the UK, while on average women make up only 13 per cent of the senior executive roles in these IP-driven companies, meaning they are

**4%**  
of UK VC deals go to  
all-female teams

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'vastly underrepresented' in decision-making positions.

The CDPRP at Oxford Brookes is leading a project to understand the causes of under-representation of women scientists, engineers and mathematicians as founders of spin-outs. "Initial findings suggest that women founders feel there is a lack of relatable mentors, that well-connected networks are significant," says Manfredi. The project aims to develop interventions to support women on the 'entrepreneurial pathway'.

While the statistics show the odds are stacked against female founders, Guha says VCs and other financiers who don't look for women-led start-ups are simply missing out.

A First Round Capital study of its own investments showed that companies with a female founder performed 63 per cent better than investments with all-male founding teams, while another by Boston Consulting Group showed that, over a five-year period, for every dollar of venture capital invested, female-led or female-cofounded start-ups generated 78 cents of revenue, while male-led start-ups only generated 31 cents. While these are small sample sizes, there is a growing recognition among VCs that diversity is good for business.

### Is the future bright?

The WEF estimates it will take 217 years for the gender pay gap to close, but with growing awareness of the problem, as well as the benefits of backing female leaders, and with more routes than ever to secure investment for female founders, it's hoped the funding gap will close considerably sooner. \*

269%

raised suicide risk for low-skilled  
male construction workers  
(above UK average)

SOURCE: ONS (2011-2015)



# AI-powered therapy sets minds at rest

Online and virtual therapists that use artificial intelligence to inform digital patient engagement could help remediate some everyday mental health challenges.

By **James Hayes**

IT MADE HEADLINE news when the leader of the UK's biggest relationship support charity revealed the organisation was considering the possibility of deploying chatbots using artificial intelligence (AI) for live chat counselling services. The chief executive of Relate, Aidan Jones, told an interviewer that he was looking at the potential of "non-human intervention" in 2019 to assist his 1,500 online counsellors, as they were becoming stretched by demands made on the service.

AI can "learn as it interacts with different clients", Jones says. "We know that some clients prefer the relative anonymity of Live Chat services, as it makes them feel more comfortable opening up about their problems, so this is an area where AI could have potential. The use of AI in the therapeutic process is being looked at internationally – and we're watching with interest."

As Jones notes, developments in the potential of digital assistive technology to help treat a range of mental health issues are growing, and AI is proving a foundation technology for bots designed for 'human-like' interaction with individuals. Their proponents say that these 'virtual therapists'

can help with disorders from low-level depression to social anxiety. They can also play a part in destigmatising mental health monitoring in homes and workplaces.

NHS reports indicate that only around one in eight adults with a mental health problem receive treatment; a shortage of mental health professionals in some areas probably contributes to this relatively low figure. Medication is reported as the most common type of treatment for a mental health problem, but given the rising scale of awareness, and the popularity of lifelogging, some experts believe digitalised mental healthcare could bring lasting benefits to a wide range of people who might otherwise go untreated.

"Traditionally, mental health treatment has only been available to those who are 'diagnosed' and hasn't been measured in any standardised way to ensure quality care and efficacy," says Alex Boisvert, CTO at Ginger, a company founded on the idea that data from people's interactions with mobile phones provides insights into their emotional health. Ginger has collected billions of data points to inform a behavioural health system that supports its teams of coaches, therapists and psychiatrists.

## Incorporating AI in treatment

It's fair to observe that across a range of applications, the term AI – and its subsidiary technology, machine learning (ML) – can be applied without specific elucidation of the part it plays in core functionality behind some 'AI-powered' chatbot platforms. It's also fair to note that as AI has been applied to different application areas, the term has been used as a conceptual approach as much as a technological descriptor. At the same time, the AI component of any solution is likely to be its exponent's most valuable intellectual property, an asset it is reluctant to discuss in detail.

Broadly, AI-enabled mental health applications can be deployed in three ways: as decision-support tools for mental health practitioners; to customise the digital patient interface with human therapist intervention for one-to-one counselling; and to steer patient interaction (via remote devices) with semi-autonomous 'virtual therapists', again digitally.

Many of the applications that have emerged set out to provide first-line assistance to human therapists as growing awareness of mental wellbeing places greater demands on health resources.



AI also holds the promise of making healthcare support available to people who have difficulty with initial human interaction when it forms part of their treatment, but who would feel more comfortable talking to a non-human therapist.

None of the AI-based systems now prototyped or deployed are totally devoid of human involvement. The human therapists are never far away; indeed, it's they who are the ghosts in the machine learning, who correct AI/ML's tendency to issue inadvertently biased guidance based (for example) on age, ethnicity or gender.

The use of advanced digital technology for mental health support has, however, been relatively slow in coming, says Valentin Tablan, senior vice president for AI at Ieso Digital Health, a provider of evidence-based online cognitive behavioural therapy (CBT) for people experiencing common mental health issues. "There has been a technological revolution in physical health over the last 50 years which can be seen, for example, in CAT and MRI scanners, but this has not been matched when it comes to mental health," Tablan points out. "One possible reason for that, in the field of

talking therapy in particular, is that most clinically relevant information is contained in patient and therapist language, for which standardised analysis techniques are not as well established as for blood chemistry, for instance."

One technique suitable for the analysis of language, Tablan says, is natural language processing (NLP), a sub-area of AI concerned with the interactions between computers and human (natural) languages, in particular how to program computers to process and analyse large sets of natural language data. "There is a significant body of academic and industrial research in NLP, and these techniques have been deployed in applications, including mainstream apps like Apple Siri, Amazon Alexa, or Google Assistant," adds Tablan. "Like many areas of AI, NLP has also benefitted from the recent development of 'deep learning', which has led to significantly more accurate language understanding models."

Question-answering digital therapists have, in fact, been practising since 2014, with the arrival of Ellie, an embodied avatar who is the computer-generated interface of an ongoing project from the University of Southern California's Institute for Creative

Technologies. The system was developed with the US military, which wanted support tools to help it with service people stricken by post-traumatic stress disorder. For many affected by this, the most difficult stage in recovery is to start to talk with another person about their experiences.

The system is built on two software components, Multisense and SimSensei. Using video monitoring, Multisense tracks and analyses, in real time, a patient's multimodal signals: facial expressions, body posture, acoustic features, linguistic patterns and higher-level behaviour descriptors (e.g. attention and fidgeting). Multisense infers from these signals and behaviours indications of psychological distress that directly inform SimSensei, the AI-integrated software that humanises Ellie. This can sense audio-visual signals captured by Multisense and engage in face-to-face interaction: Ellie instantaneously reacts to the perceived user state and intent, through her own speech and animation. So when Ellie appears to the patient on a screen, she responds to the perceived user state and intent with her own computer-generated speech and gestures.

The system's early identification of a patient's distress level can generate the appropriate information to help a clinician diagnose a potential disorder. User-state sensing can also be used to create patient profiles that help to assess behaviour change over time. However, Ellie is programmed only to encourage people to talk about their feelings, not to offer advice.

### No substitute for experience

AI-founded virtual therapy platforms aim to minimise direct one-to-one interaction with therapists, so that expertise can be pooled into creating collective support, and that the system backends, where possible, draw on the newest digitally available professional guidance and research.

Some systems (such as Vancouver-based company AI-Therapy's Overcome Social Anxiety) have machine-learning functionality that applies progressive elements learned with one patient to another, where human therapists deem it appropriate.

Ieso Digital Health is another provider that owns a large dataset of therapy-related data, which it's using to develop a machine-accessible understanding of therapy, offering a data-supported model of therapeutic practice. "This model underlies the NLP-based tools under development to support Ieso therapists in their clinical work," explains Tablan. "The application of NLP and deep learning to mental health data has great promise of closing the technology gap between physical and mental health. Like most applications of AI, and especially deep learning, this requires large amounts of high-quality data."

Ieso data scientists have used AI to analyse more than 90,000 hours of therapy sessions and learn which treatment protocols have been effective. This data will be used to advise therapists about the best way to treat a patient, based on the information provided >