The Institution of Engineering and Technology

Skills & Demand in Industry

2017 Survey

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Contents

Foreword

Welcome to the 12th Engineering and Technology Skills and Demand in Industry report produced by the Institution of Engineering and Technology (IET) – our review of the challenges facing UK employers of engineering and IT staff, based on the results of our annual Skills Survey.

This year's report has been written and published against the backdrop of unprecedented change in the UK's economic landscape and further challenges ahead.

Chief among these is the decision to leave the European Union (EU), which will not only alter our trading relationships with the rest of Europe, but will also have an impact on the flow of engineering talent into the UK.

However, while Brexit appears to garner the majority of attention in the day-to-day national debate, it is not the only issue occupying the minds of employers of engineers and technicians.

The digital transformation of production and supply chains in our sector means businesses must think hard about the impact it will have on the kind of jobs and skills they need for the future.

Meanwhile, organisations continue to grapple with the challenge of finding and retaining the right people, with the right skills, to ensure they take advantage of the robust demand for their products and services.

This report looks in depth at employers' attitudes and responses to these and other challenges.

As you will see, it shows a sector which is optimistic about its ability to thrive in the future but deeply concerned about the continuing shortage of people with the right skills and capability to do the jobs which are being created.

With the concern around skills supply showing no signs of going away, it is critical that as a sector we commit to taking steps which will avoid this becoming an intractable problem.

For this reason, our recommendations in this edition of our Skills Survey focus entirely on the actions that we believe employers, educators and government must take to develop and attract more diverse applicants and help prepare young people for the demands of working life.

Nigel Fine
Chief Executive and Secretary, IET

Executive summary

The IET carries out an annual survey of UK engineering employers to gauge the state of skills in the engineering and technology sector. The survey covers:

- Current and planned levels of engineering recruitment.
- Difficulties in recruiting engineers.
- Employer perceptions of the engineering skills gaps.

This year we have collated our research findings around four emerging themes relating to:

- The potential impact of Brexit on skills.
- The rise of digitisation and advanced automation.
- Employer responses to the skills challenge.
- Progress around diversity.

This report is based on quantitative research commissioned by the IET and conducted by market research agency BMG Research. Please see the methodology (page 7) for further detail.

The main findings presented in this report are:

Brexit: Potential impact on skills

1. Engineering skills gaps and shortages continue to be a huge problem for employers, which may be compounded by the UK leaving the European Union.
2. Some 61% of employers ranked the recruitment of engineering staff with the right skills top of a list of challenges (most frequently selected) in achieving their business objectives in the next three years.
3. Although the exact nature of a Brexit settlement is unclear, the IET Skills Survey shows employers continue to take action on recruitment, training and wider organisational initiatives to deal with skills shortages.

The rise of digitisation and advanced automation

1. The rapid advance of digital technologies and automation in UK engineering and technology sectors over the next 5-10 years is recognised by the majority of employers (78%). This is despite the fact that few businesses (7%) are aware of the term Industry 4.0, which is commonly used to describe some of the latest advancements in this area.
2. Only 30% have firm plans to introduce or extend their use of digital technologies in the next three years.
3. However, where businesses do plan to increase digitisation of their processes, there is wide acceptance, by 85% of businesses, that they will have to recruit people with new skills, up-skill their present staff, or do both. These businesses are optimistic that advanced automation will create engineering jobs and only a negligible proportion believe it would lead to a decrease in jobs.
4. Although employers recognise that increased digitisation and automation will have an impact on the way they work, employers are not ready for the skills challenges which will emerge. They do, however, recognise the need to learn about what digitisation means for them and the need to take action.

The skills challenge

1. Across industry, employment of engineering professionals is buoyant: some 39% of employers say their engineering and technical workforces have increased over the last three years, almost four times as many as those who report a reduction (11%). Looking forward (over the next three years), 51% of businesses expect to employ more engineering and technical staff than at present, while only 4% say they will reduce numbers.
2. Skills supply remains a leading concern for employers: almost half (46%) report difficulties in the skills supply in the external labour market when recruiting and a quarter (25%) report skills gaps or limitations in their existing workforces. What's more, the recruitment of engineering and technical staff with the right skills is identified as a barrier to achieving business objectives over the next three years by 61%.
3. A concern for 70% of employers reporting a lack of skills in the external market is the supply or quality of young people entering or seeking to enter the industry to pursue engineering or technical careers.

The skills gap: employer response

1. Some 59% of businesses have arranged or funded technical or job-specific training for their engineering or technical workforces over the past 12 months. A total of 31% of businesses surveyed had engineering or technical apprentices at the time of the survey. The interviews showed that 43% (including the 31% currently with apprentices) had had one or more apprentices in the last year.
2. Businesses widely support skills retention internally by offering good career paths and encouraging older staff members to keep working. Proactive measures to increase wider skills supply, such as offering work experience placements to young people at school, college or university, are less-widely reported.
3. Overall, just a fifth of employers (21%) would like to become involved or more involved with actions to improve skills supply. This is despite a vast majority of those surveyed (84%) saying they thought businesses should accept responsibility for helping the transition from education and training to the workplace in order to get people with the right skills. Similarly, 81% agree that more employers need to provide work experience for those in education or training. Some 75% believe that tackling the skills problem is fundamental to making the Government's industrial strategy viable.

Diversity and managing the talent pool

1. The 2017 Skills Survey estimates that 11% of the UK engineering and technical workforce is female (however, please note there are differences in methodology year on year – see page 7).
2. Employers say they are taking action to support more women in their organisations by offering terms and conditions which are attractive to women: focused on equal and transparent pay policies, flexible and part-time working, open and structured career paths and maternity provision.
3. They are less likely to be involved in ambassadorial and campaigning activity designed particularly to change the image of industry amongst women and particularly young women.
4. The survey also shows that fewer than one in ten businesses (9%) take particular actions to increase the Black, Asian & Minority Ethnic (BAME) and Lesbian, Gay, Bisexual, and Transgender (LGBT) diversity of their workforces.
5. A total of 21% of those employers taking particular actions to increase the BAME and LGBT diversity of their workforces said that they aim to attract/recruit applicants from all backgrounds. A mere 9% of those businesses who have sought to increase the number of BAME and LGBT staff in their engineering workforce run specific campaigns to encourage diverse groups into the workforce.

Methodology

This report is based on quantitative research commissioned by the IET and conducted by market research agency BMG Research.

The insight for this report was gathered from telephone interviews with 800 UK employers of engineering and technology staff, representing a range of engineering sectors and sizes and drawn from across the UK in May and June 2017. In previous years between 400 and 450 businesses have been interviewed for the IET Skills Survey.

The research is supplemented by 11 in-depth interviews with individual organisations of different sizes undertaken in September 2017.

The telephone interviews included businesses ranging in size from those with five employees (as a minimum) to major employers with many hundreds of staff. Businesses were identified using standard industrial classifications (see Appendix for the SIC definitions used).

The doubling of the sample size and identification of businesses by SIC code represents a significant change to the methodology of the annual IET Skills Survey. Although the changes provide greater accuracy and more reliable results, they do limit the ability to compare with previous IET Skills Surveys. This report therefore looks at broad historical trends (where applicable) rather than directly comparing historical results.

SOME 59% OF BUSINESSES HAVE ARRANGED OR FUNDED TECHNICAL OR JOB-SPECIFIC TRAINING FOR THEIR ENGINEERING OR TECHNICAL WORKFORCES OVER THE PAST 12 MONTHS.

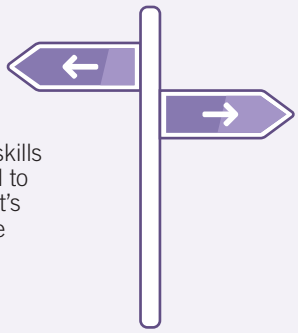
What employers are reporting

Facts and figures about engineering employers in the UK

Skills and Industrial Strategy

61% consider the recruitment of engineering and technical staff with the right skills as a barrier to achieving business objectives over the next three years

75% agree that tackling the skills problem is fundamental to making the Government's industrial strategy viable



Readiness for advanced automation

75% of those that plan to introduce / increase use of digital technologies need to develop new skills in their existing workforce

30% have firm plans to introduce or extend their current use of digital technologies in the next three years

Job growth and skills supply

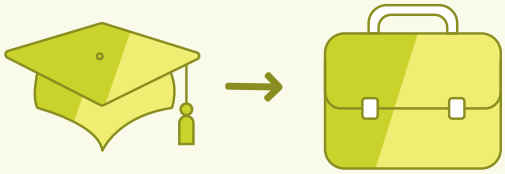
39% reported an increase in their engineering and technical workforce over the last three years

46% face difficulties in the availability of people in the external labour market with the right skills when they try to recruit

51% expect to employ more engineering and technical staff over the next three years

Training and skills development

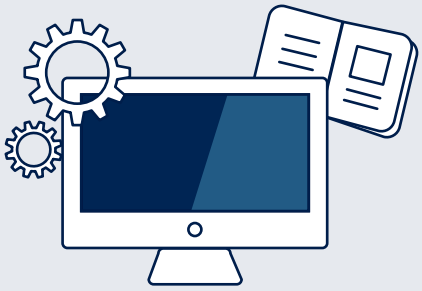
31% currently count at least one engineering or technical apprentice among their workforce – an increase from previous IET Skills Surveys



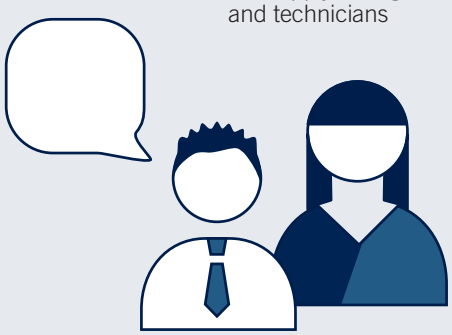
59% have arranged or funded technical or job-specific training for engineering or technical staff over the last 12 months

Work-readiness

30% of all employers acknowledge that it is their responsibility to invest in the necessary training to meet the skills challenges posed by increased digitisation and automation



81% agree that more employers need to provide work experience for those in education or training to help improve the supply of engineers and technicians



Diversity in the workplace

87% don't have LGBT/BAME diversity initiatives in place*

*3% don't know/refused

11% of the UK engineering and technical workforce is female

15% make particular efforts to attract and retain women in engineering and technical roles (beyond observing statutory equality requirements)*

*4% don't know/refused

1

Ellie Wilson, a finalist in the IET Young Woman Engineer of the Year Awards 2017

Brexit: potential impact on skills

IN THIS SECTION WE EXPLORE:

- HOW THE UK'S DECISION TO LEAVE THE EUROPEAN UNION COMPARES TO SKILLS SHORTAGES AS A FUTURE BARRIER TO BUSINESS SUCCESS
- VIEWS OF UK EMPLOYERS ON THE IMPACT OF BREXIT ON ENGINEERING SKILLS AND JOBS

1.1 Is Brexit a barrier to success?

In the time between our 2016 and 2017 Skills Surveys, the impact of the vote to leave the EU has become a significant issue for every employer to consider.

Despite the uncertainty around the final Brexit deal at the time of writing this report, our 2017 survey found that only a minority of employers saw it as an obstacle to achieving their business objectives in the next three years (29%).

This number is relatively consistent across all sizes of businesses, although noticeably smaller in businesses with more than 250 employees (22%), indicating a confidence among larger organisations that they will be able to navigate their way through the UK's departure from the EU.

Engineering skills gaps and shortages are a huge problem for employers, representing a more profound challenge than the UK leaving the European Union.

Proportion of employers which consider the UK's exit from the EU as an obstacle to business success over the next three years compared to the proportion which consider recruiting engineering and technical staff with the right skills an obstacle to success:

	UK exit from the EU	Recruiting engineering and technical staff with the right skills
All businesses (800)	29%	61%
5-9 employees (129)	29%	58%
10-24 employees (285)	28%	65%
25-99 employees (268)	31%	62%
100-249 employees (88)	31%	66%
250+ employees (30)	22%	**84%**

Q: Thinking about obstacles or difficulties that your business might face in achieving your business objectives over the next three years, which of the following would you say are obstacles to the success of your business? Prompted, multiple response.

Unweighted bases in brackets. Figures in bold are statistically significantly higher than average based on a 95% confidence level.

1.2 Potential impact of Brexit on jobs and skills

In our supplementary qualitative interviews, employers voiced a range of concerns about the decision to leave the EU with relation to the potential future supply of skills.

Jackie Hopkins, HR Manager at Magal Cables Ltd, is concerned that the leave vote might have a negative impact on their future workforce:

"We have a lot of semi-skilled workers from Eastern Europe and we hope that doesn't change. That seems to be where we find our shop floor workers. Some of our skilled workers have also come from the EU because it is hard to find home-bred design engineers. This way of sourcing the people we need works well in a tight market for engineering skills."

Edward Brown, Project Manager for a control systems business in the North West, agrees that a deal which removes the ability to recruit from the EU could potentially change where his industry locates jobs in the future:

"We already struggle to recruit from the pool here in the UK, so future skills supply is a concern for us. We need people with high-level skills and we have had to assume that because we need them, we will have to keep them. The alternative for an industry like ours – and the economy as a whole – is if we can't get the right people here in the UK, the work will go elsewhere. It's very different to the low skills work which gets talked about."

Valerie Todd CBE, Talent & Resources Director for the Crossrail infrastructure project, says that in the transport sector, Brexit represents a significant challenge: "The top three concerns are our reliance on large numbers of EU workers in our ancillary services; the number of people who have worked here a long time and whose talent, expertise and skills we don't want to lose; and that in any organisation, you deliver more succinctly, more efficiently and more productively when you have certainty. There is a risk of a long period of uncertainty having a corrosive effect on productivity."

However, not every business sees the impact of Brexit in the same way.

Stewart Evans, Operations Manager for engineering business Ilec-Imec Building Services feels confident about his company's ability to find the people they need: "I can't say that (the) Brexit (vote) has had a big impact on us as a business. In general, we get the people we need and find people when we need them. We have a full order book already for 2018, so there isn't even much in terms of uncertainty. The bigger issue for us is the wages, which larger infrastructure projects like the Hinckley power station can pay, and our ability to compete for the best people."

Jason Phin, Training Solutions Business Manager at Siemens says that Brexit brings into sharper focus the need to find solutions to perennial skills challenges in the UK and, for instance, promote engineering careers and STEM subjects at UK schools:

"When we consider the restrictions on free movement that Brexit could cause, we need to actively promote interest in STEM subjects and activities to ensure we can recruit the talent that UK industry will need in the future. This provides us with a great opportunity to reframe the importance of studying subjects that can lead to successful engineering careers and focus on supporting home-grown talent."

1.3 In summary

Both the survey and additional qualitative interviews acknowledge that Brexit may compound the skills crisis that employers are facing.

Looking back – views on Brexit one year ago

For the 2016 Skills Survey, the IET was able to get an early reading on the impact of Brexit on recruitment.

- Just over four in ten (42%) of employers surveyed before the EU referendum were concerned about the negative impact of Brexit on their recruitment over the next four to five years.

  Based on those responding to the question 'If the UK ended up leaving the EU, do you think this would have a positive or negative impact on your recruitment over the next four to five years?' asked before the EU referendum (sample = 293)

- Overall, just 35% of respondents surveyed post-referendum expected their recruitment to be negatively impacted over the next four to five years following the referendum outcome. This compared to 36% who were unsure and 23% of respondents who foresaw no impact.

- Only 5% of those surveyed following the referendum felt that their recruitment would be impacted positively over the next four to five years as a result of the UK's decision to leave the EU.

  Based on those responding to the question 'Do you think the UK leaving the EU will have a positive or negative impact on your recruitment over the next four to five years?' following the result of the EU referendum (sample = 110)

2

Larissa Romualdo Suzuki, a finalist in the IET Young Woman Engineer of the Year Awards 2017

The rise of digitisation and advanced automation

IN THIS SECTION WE EXPLORE:

- CURRENT AWARENESS AND USE OF DIGITAL TECHNOLOGIES BY UK EMPLOYERS
- FUTURE PLANS FOR DIGITISATION AND ADVANCED AUTOMATION
- IMPACT OF DIGITAL TECHNOLOGIES ON RECRUITMENT AND SKILLS

2.1 Current use of digital technologies

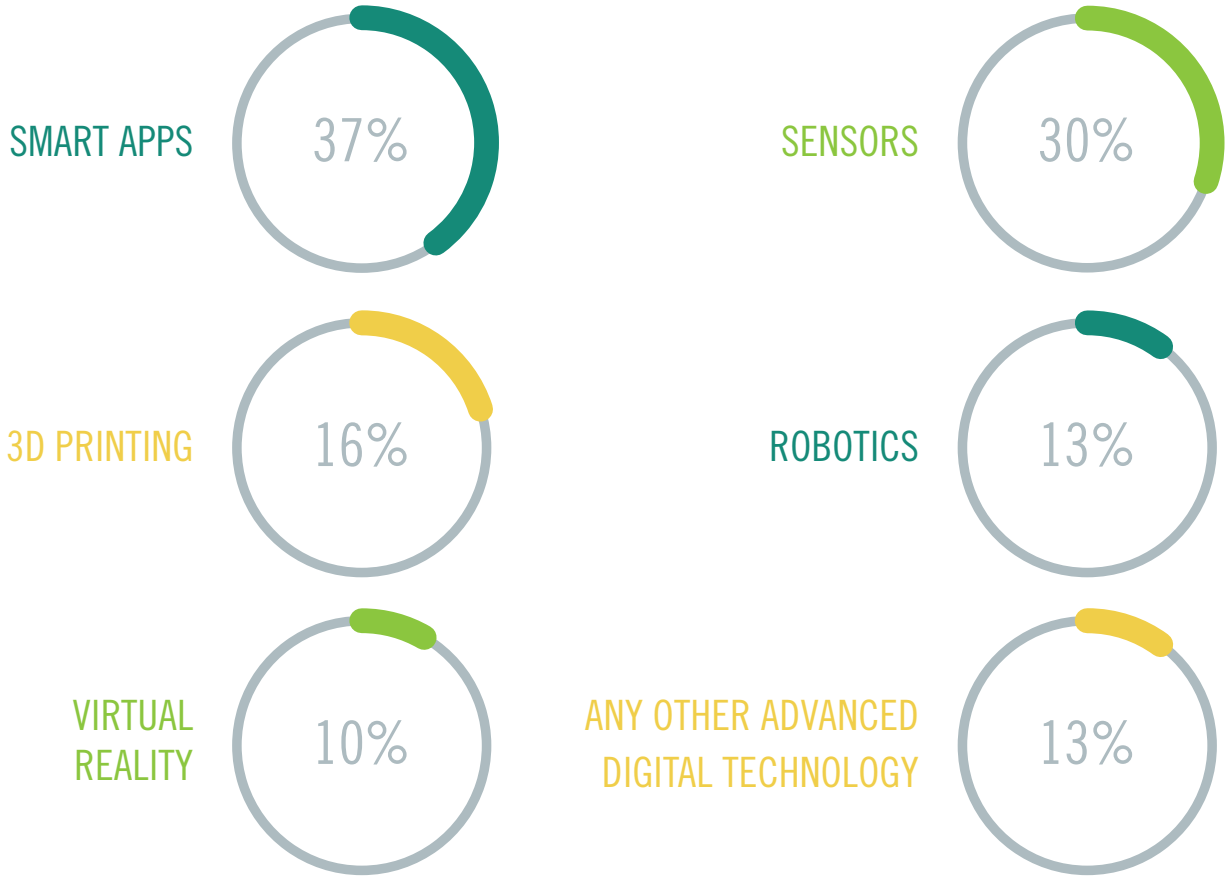
The growing role for digital technology in design, process control and production and the implementation of big data, cyber-physical systems and the Internet of Things – often referred to as Industry 4.0 or the Fourth Industrial Revolution – represents a significant opportunity for engineering businesses to evolve and compete in the future.

Almost eight in ten businesses (78%) think that digital technologies and automation in UK engineering and technology sectors will advance rapidly in the next ten years.

In terms of current adoption of digital technology, the survey found that a broad spectrum of different technologies is in use across the industry with smart apps and sensors leading in penetration.

Use of new technologies varies significantly by size of business and sector, with some obvious correlations between discipline and technology. Employers in the IT and communications sector are frequent users of smart apps (65%), for example, and employers in the built environment sector use virtual reality more (18%) than other sectors (10% overall average).

Proportion of businesses using specified advanced digital technologies



Q: At present, does your establishment use any of the following advanced digital technologies? Unweighted base = 800. Prompted, multiple response.

Businesses were also asked if they used the 'internet of Things', to which 61% of respondents said they did. This figure is out of scale with responses on the other technologies used and probably indicates frequent confusion of the term with general Internet use.

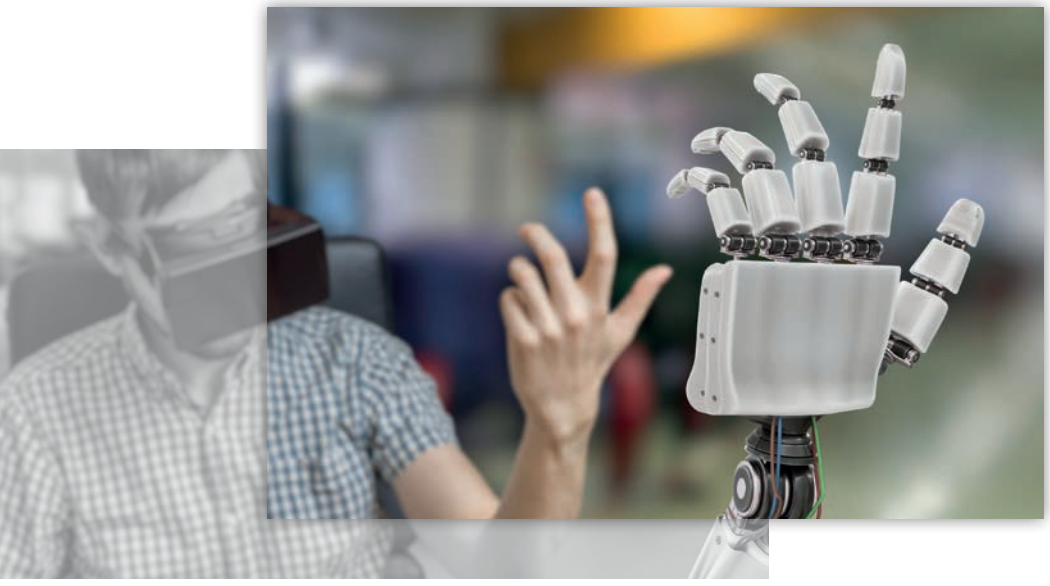
Use of technology by sector

Technology	High user groups
Smart Apps (average 37%)	IT and communications sector (65%)
3D printing (average 16%)	250+ employee firms (37%) Electrical and electronics sector (23%) Aerospace/defence (30%)*
Sensors (average 30%)	250+ employee firms (54%) 100-249 employee firms (46%) Other engineering sector (52%) Electrical/electronics sector (45%)
Robotics (average 13%)	250+ employee firms (63%) 100-249 employee firms (21%) Transport (inc. vehicle manufacture) (21%) Manufacture non-metals (18%)
Virtual reality (average 10%)	Built environment (18%)

Q: At present, does your establishment use any of the following advanced digital technologies? Unweighted base = 800. Prompted, multiple response.

*Not statistically significantly higher than average (sample size = 27).

Despite the use of technology associated with automation and digital production, there appears to be a widespread lack of recognition of some of the terminology associated with digitisation, with fewer than one in ten respondents (7%) having heard of the term 'Industry 4.0'.



Proportion of businesses that are aware of Industry 4.0 and that believe that the use of digital technologies in UK engineering and technology sectors will advance rapidly in the next 5-10 years

	Awareness of Industry 4.0	Belief that the use of digital technologies and automation will advance rapidly in the next 5-10 years
All businesses (800)	7%	78%
Size		
5-9 employees (129)	7%	75%
10-24 employees (285)	5%	78%
25-99 employees (268)	10%	**84%**
100-249 employees (88)	**13%**	79%
250+ employees (30)	**16%**	86%
Sector		
Other engineering related (36)	**15%**	81%
Transport (59)	**14%**	**89%**
Aerospace/defence (27)	12%	83%
IT and communications (115)	9%	**93%**
Electrical/electronic (95)	9%	78%
Non-metals manufacturing (150)	7%	74%
All manufacturing (320)	7%	73%
Energy (30)	6%	84%
Metals manufacturing (170)	6%	72%
Built environment (118)	1%	70%

Q: Turning to technology issues, have you heard of Industry 4.0?

Q: Do you believe that the use of digital technologies and automation in UK engineering and technology sectors will advance rapidly in the next 5 – 10 years?

Unweighted bases in brackets. Figures in bold are statistically significantly higher than average based on a 95% confidence level.

Although awareness of Industry 4.0 is very limited, there is recognition of the impact new technologies such as big data, cyber-physical systems and the Internet of Things will have on industry and a belief that digital technologies will rapidly advance is widely shared across all sizes and sectors of business.

2.2 Future plans for digitisation and advanced automation

In total, 30% of employers said they had firm plans to introduce or extend their current use of digital technologies in the next three years. These plans are more prevalent in medium-sized firms, with between 25 and 249 employees, and in businesses in the energy, IT and communications and metals manufacturing sectors:

Future plans to embrace digitisation

	Intend to introduce/extend digital technologies %
All businesses (800)	30%
Size	
5-9 employees (129)	26%
10-24 employees (285)	31%
25-99 employees (268)	**38%**
100-249 employees (88)	35%
250+ employees (30)	23%
Sector	
IT & communications (115)	**49%**
Energy (30)	42%
Metals manufacturing (170)	34%
Electrical/electronic (95)	32%
Aerospace/defence (27)	31%
Transport (59)	30%
All manufacturing (320)	28%
Built environment (118)	24%
Non-metals manufacturing (150)	21%
Other engineering related (36)	12%

Q: Do you have firm plans to introduce or extend your use of any digital technologies in the next three years?

Unweighted bases in brackets. Figures in bold are statistically significantly higher than average based on a 95% confidence level.

2.3 The impact of digitisation on recruitment and skills

Our 2017 research provides evidence that the rise of digitisation and automation is likely to create demand for new kinds of skills among engineering and technical employers.

Of the 30% of businesses which plan to introduce or extend use of digital technologies, the majority (75%) say they will need to develop new skills in their existing workforce and 44% said they would need to recruit new skills.

Edward Brown, Project Manager for a control systems business in the North West, is one who recognises the commercial opportunity and skills challenge arising from the advent of new technologies:

"Our business is focused on automation software, so digitisation and Industry 4.0 or IOT is a growth area for us. There is a big push from the vendors who provide the hardware and we are seeing more people needing remote access or less operator input or remote monitoring in what we deliver.

"Given what we do, we're very much at the heart of making everything work together. We are trying to automate our tasks where possible, as we are aware of having to compete with places like India for offshoring.

"Overall, we're very positive about automation and it's an opportunity, because it pushes us up the value chain and increases our differentiation.

"Despite that, we continue to find recruitment very difficult and with new technologies it will be even harder to find people."

In terms of readiness for the skills challenge presented by increased digitisation and automation, only a quarter of businesses claim to be fully prepared, with the largest proportion (39%) feeling partly prepared.

Of the businesses which recognise that they may be affected by increased digitisation and automation,* around two thirds do not feel wholly prepared to meet the skills challenge potentially posed by those developments.

This is the case even among those businesses which had firm plans to introduce or extend their use of digital technologies in the next three years, with 33% feeling fully prepared, 61% partly prepared and only 5% wholly unprepared.*

*Excludes those businesses which don't know how prepared they are and those which don't expect to be affected by increasing digitisation and automation.

Organisational readiness to meet skills challenges presented by increased digitisation and automation

Fully prepared	25%
Partly prepared	39%
Not at all prepared	4%
Not prepared but don't expect to be affected by increased digitisation and advanced automation	27%
Don't know	4%

Q: Generally, how well prepared do you feel your organisation is to meet skills challenges presented by increased digitisation and automation of engineering and other manufacturing processes? Unweighted base = 800.

"THE MACHINES WE BUY, NO MATTER HOW SOPHISTICATED THEY ARE, STILL NEED A PERSON TO PROGRAMME AND OPERATE THEM AND WILL DO FOR THE FORESEEABLE FUTURE."

Tim Squires, Commercial Director, Squires Gear and Engineering Ltd

Extent to which businesses feel prepared to meet the skills challenges presented by increased digitisation and automation, by size and sector

	Fully prepared	Partly prepared	Not at all prepared	Not prepared but don't expect to be affected
All businesses (800)	25%	39%	4%	27%
Size				
5-9 employees (129)	22%	38%	6%	28%
10-24 employees (285)	28%	35%	3%	30%
25-99 employees (268)	**30%**	42%	2%	21%
100-249 employees (88)	26%	44%	3%	21%
250+ employees (30)	24%	54%	3%	6%
Sector				
IT & communications (115)	**40%**	37%	3%	18%
Transport (59)	34%	38%	7%	19%
Electrical/electronic (95)	31%	42%	7%	18%
Aerospace/defence (27)	31%	40%	7%	18%
Other engineering-related (36)	30%	35%	4%	28%
Built environment (118)	23%	39%	*%	34%
Non-metals manufacturing (150)	19%	31%	3%	**37%**
Energy (30)	18%	49%	7%	26%
All manufacturing (320)	17%	38%	5%	**31%**
Metals manufacturing (170)	15%	45%	6%	26%

Q17: Generally, how well prepared do you feel your organisation is to meet skills challenges presented by increased digitisation and automation of engineering and other manufacturing processes?

Unweighted bases in brackets. Figures in bold are statistically significantly higher than average based on a 95% confidence level
*% denotes less than 0.5%. The small percentages of 'don't knows' are not shown.

Organisations that are unprepared, or only partly prepared to meet the challenge of Industry 4.0 appear ready to take a wide range of steps to get ready for the increase in digitisation and advanced automation. The main areas of focus are investment in training (71%) and building knowledge from industry associations and institutions (69%) or support from manufacturers or suppliers of digital equipment or software (67%).

Actions, support and intervention that businesses believe would be helpful to increase their preparedness to meet skills challenges presented by increased digitisation and automation of engineering and other manufacturing processes by size of organisation

	Businesses that are not at all or partly prepared to meet the skills challenges presented by increased digitisation and automation (349)
Investment in training by the business itself	71%
Advice from industry associations and institutions	69%
Support from manufacturers or suppliers of digital equipment or software systems	67%
The output of better-prepared graduates from universities	52%
Engagement with universities or research establishments	47%
Advice from private technical or engineering consultants	45%
A government advisory service on digital adaption	43%
Ability to recruit specialist skills from overseas	32%
None of these	6%

Q: Would any of the following be helpful to you to increase your preparedness? Businesses that are not at all or partly prepared to meet the skills challenges presented by increased digitisation and automation.

Unweighted base = 349 (where only partly prepared). Prompted, multiple response.

As a manufacturer of components for the automotive industry, Commercial Director **Tim Squires** says his company Squires Gear and Engineering Ltd doesn't have any specific development plans in place for the advent of new technologies:

"The machines we buy, no matter how sophisticated they are, still need a person to programme and operate them and will do for the foreseeable future.

"In terms of maintaining the skills of our workforce to cope with the progress in new technologies, when we replace machines or equipment, our workforce is up-skilled on an incremental basis as and when required."

However, **Jackie Hopkins**, HR Manager at Magal Cables Ltd suggests that further down the line, the rise of advanced automation may create a new skills shortage:

"The impact of automation on our jobs currently is negligible. The issue I could see in the future is finding the skills we need to programme the robots on our lines. Currently we have to outsource that which is expensive. We don't have the skills internally and they are likely to be harder to find in the future."

2.4 The impact of advanced automation on jobs

Apart from creating demand for new skills, one impact of digitisation and advanced automation will be the extent to which jobs are created or replaced.

Encouragingly, almost half (49%) of businesses that plan to introduce/increase use of digital technologies feel it would increase employment and of the other half, the greatest proportion (44%) believe that it would have no impact either way on job numbers.

Jason Phin, Training Solutions Business Manager for Siemens says that the main challenge of digitisation will be to ensure that skills development in the existing workforce keeps pace with digitisation:

"Our strategy for digitisation is to develop these skills from our existing workforce. In that sense we will always have a skills gap between what need and what we have now. The main challenge that I see is one of agility: we have to move at least at the same speed as the technology and maintain that agility in our workforce."

Impact of digitisation on demand for engineering and technical staff

Businesses planning to introduce/increase digital technologies (269)		5-9 employees (34)	10-24 employees (89)	25-99 employees (108)	100-249 employees (31)	250+ employees (7)
Will lead to an increase in the number of engineering and technical staff	49%	57%	47%	43%	34%	15%
Will lead to a decrease in the number of engineering and technical staff	2%	1%	2%	2%	**7%**	0%
No change in the number of engineering and technical staff	44%	33%	49%	**53%**	57%	85%
Don't know	5%	8%	2%	2%	3%	0%

Q: Will increased digitisation in your establishment be likely to lead to...? Where businesses have firm plans to introduce or extend use of any digital technologies in the next three years.

Unweighted bases in brackets. Figures in bold are statistically significantly higher than average based on a 95% confidence level.

2.5 In summary

- A greater majority of businesses (78%) believe that digital technologies and automation will advance rapidly in the next five to ten years, although current use of digital technologies is not extensive and varies greatly by sector.
- Some 30% of employers have firm plans to introduce or extend their use of digital technologies in the next three years. The majority of these businesses recognise that this will require them to increase the skills of their existing workforce or recruit new skills.
- The majority of employers who feel not at all or partly prepared to meet the skills challenges presented by increased digitisation and automation accept that the onus is on them to invest in the necessary training to assist the adoption of digital technologies (71%).
- Encouragingly, half of the businesses (49%) planning to introduce/increase their use of digital technologies expect this to increase their employment of engineering and technical staff. Most of the remainder, particularly larger firms, expect no impact on their levels of employment.

"OVERALL WE'RE VERY POSITIVE ABOUT AUTOMATION AND IT'S AN OPPORTUNITY BECAUSE IT PUSHES US UP THE VALUE CHAIN AND INCREASES OUR DIFFERENTIATION. DESPITE THAT, WE CONTINUE TO FIND RECRUITMENT VERY DIFFICULT AND WITH NEW TECHNOLOGIES IT WILL BE EVEN HARDER TO FIND PEOPLE."

Edward Brown, Project Manager for a control systems business

3

Jamie D'Ath, a finalist in the IET Young Woman Engineer of the Year Awards 2017

The skills challenge

IN THIS SECTION WE EXPLORE:

- THE MAKE-UP OF THE EXISTING WORKFORCE IN THE ENGINEERING SECTOR
- DEMAND FOR ENGINEERING AND TECHNICAL STAFF AMONG UK EMPLOYERS
- INTERNAL SKILLS GAPS AND EXTERNAL SKILLS SHORTAGES
- THE CHALLENGE OF RECRUITING ENGINEERING AND TECHNICAL STAFF WITH THE RIGHT SKILLS
- THE RELATIVE COMMERCIAL CHALLENGE IN RECRUITING PEOPLE WITH ADEQUATE ENGINEERING SKILLS COMPARED TO OTHER BARRIERS FACING UK BUSINESSES

3.1 Employment trends in engineering

The 2017 Skills Survey found substantial demand for engineering and technical skills in the industry and buoyancy of employment across most sectors.

Some 39% of all businesses reported an increase in their engineering and technical workforce over the last three years, while only 11% reported a decrease.

The most significant growth occurred in the IT and communications sector (55%) and the aerospace and defence sector (49%). Only the energy sector reported a larger decrease than increase, with a net decrease of 30%.

Snapshot of businesses reporting a rise, fall or stability in employment for their engineering and technical workforce over the last three years

	All businesses (800)	5-9 employees (129)	10-24 employees (285)	2-99 employees (268)	100-249 employees (88)	250+ employees (30)
Increased	39%	33%	41%	**48%**	**53%**	48%
Stayed the same	49%	52%	49%	44%	34%	34%
Decreased	11%	14%	10%	7%	12%	7%
Not known	*%	**0%**	*%	1%	1%	**11%**
Net increase	+28%	+19%	+31%	+41%	+41%	+41%

*Less than 0.5%.

Q: Over the last three years, has the engineering and technical workforce at your establishment …?

Unweighted bases in brackets. Figures in bold are statistically significantly higher than average based on a 95% confidence level.

Proportion of businesses reporting an increase or decrease in their engineering and technical workforce over the last three years and the net increase (% increase minus % decrease), by sector

	Increased %	Decreased %	Net increase: % increase minus % decrease
All businesses (800)	39%	11%	+28%
Other engineering-related (36)	54%	7%	+47%
IT and communications (115)	**55%**	12%	+43%
Aerospace/defence (27)	49%	11%	+38%
Electrical/electronic (95)	42%	10%	+32%
Non-metal manufacturing (150)	38%	8%	+30%
All manufacturing (320)	40%	11%	+29%
Metals manufacturing (170)	41%	14%	+27%
Built environment (118)	29%	11%	+18%
Transport (59)	29%	12%	+17%
Energy (30)	20%	**50%**	-30%

Q: Over the last three years, has the engineering and technology workforce at your establishment...?

Unweighted bases in brackets. Figures in bold are statistically significantly higher than average based on a 95% confidence level.

Percentages of businesses expecting increase, stability, or decrease in their engineering or technical workforce over the next three years by size of employer

	All businesses (800)	5-9 employees (129)	1-24 employees (285)	25-99 employees (268)	100-249 employees (88)	250+ employees (30)
Increase	51%	49%	51%	**60%**	49%	42%
Stay the same	40%	41%	41%	37%	49%	43%
Decrease	4%	5%	3%	1%	2%	9%
Not known	5%	5%	6%	2%	0%	**7%**
Net increase: % increase minus % decrease	+47%	+44%	+48%	+59%	+47%	+33%

Q: Over the next three years, do you expect the engineering and technology workforce at your establishment to...?

Unweighted bases in brackets. Figures in bold are statistically significantly higher than average based on a 95% confidence level.

Looking to the future, more businesses (51%) expect to grow their engineering and technical workforce over the next three years than reported growth in that workforce over the last three years (39%).

Very few businesses reported that their engineering and technical workforces will reduce over the next three years.

There is particular confidence of growth among small and medium-sized businesses in the IT and communications sector (77%) and notably in energy (59%), the only sector to have reported a net decrease over the past three years.

Proportion of businesses expecting an increase or decrease in their engineering and technical workforce over the next three years and the net increase by sector

	Increase	Decrease	Net increase: % increase minus % decrease
All businesses (800)	51%	4%	+47%
IT and communications (115)	**77%**	1%	+76%
Energy (30)	59%	1%	+58%
Metals manufacturing (170)	**59%**	2%	+57%
Electrical/electronic (95)	55%	4%	+51%
All manufacturing (320)	51%	3%	+48%
Aerospace/defence (27)	46%	4%	+42%
Transport (59)	40%	1%	+39%
Non-metals manufacturing (150)	42%	4%	+38%
Built environment (118)	42%	**9%**	+33%
Other engineering-related (36)	40%	7%	+33%

Q: Over the next three years, do you expect the engineering and technology workforce at your establishment...?

Unweighted bases in brackets. Figures in bold are statistically significantly higher than average based on a 95% confidence level.

3.2 Skills gaps in the existing workforce

Proportion of businesses reporting current skills shortages in the external labour market and skills gaps in their internal workforces

	Skills available in the external labour market	Skills gaps within the internal workforce
All businesses (800)	46%	25%
Size		
5-9 employees (129)	39%	26%
10-24 employees (285)	**51%**	23%
25-99 employees (268)	**51%**	23%
100-249 employees (88)	**58%**	29%
250+ employees (30)	**64%**	**57%**
Sector		
Metals manufacturing (170)	**63%**	22%
Electrical/electronic (95)	53%	22%
All manufacturing (320)	**53%**	23%
Energy (30)	52%	35%
Aerospace/defence (27)	51%	25%
Built environment (118)	45%	30%
Non-metals manufacturing (150)	43%	24%
Transport (59)	40%	20%
IT and communications (115)	33%	27%
Other engineering-related (36)	30%	21%

Q: Do you have any difficulties in respect of...? The skills available to you in the external labour market when you try to recruit.

Q: Do you have any difficulties in respect of...? Skills gaps or limitations within your internal workforce.

Unweighted bases in brackets. Figures in bold are statistically significantly higher than average based on a 95% confidence level.

Just under half (46%) of all businesses are affected by skills shortages in the external labour market. By contrast, 25% of businesses are currently impacted by the skills gaps within their existing internal workforce. These figures are significantly higher (64% and 57% respectively) for businesses with over 250 employees.

The data also shows some association between external skills shortages and internal skills gaps, as 42% of those experiencing skills shortages in the labour market report also having skill gaps in their existing workforce, compared with just 10% of those that have not experienced skills shortages.

Edward Brown, Project Manager for a control systems business, says a flexible approach to recruitment and investment in training has been key to filling skills gaps in the organisation:

"We are trying to recruit at senior or competent levels and the most likely candidates have come at entry level. We've started to find that an approach which is focused on recruiting the right sort of person, with the right aptitude and then train them on, is what works.

"The people we recruit will still have an engineering background but we are being flexible about the sector. People will probably have some sort of engineering background because we tend to find the people who do well are interested in that."

3.3 Recruiting staff with the right skills

In the 2016 IET Skills Survey, 57% of UK employers cited the recruitment of senior engineers with 5-10 years' experience as the greatest recruitment challenge that they faced, which was down from 68% in 2015.

This has remained fairly stable in the past 12 months, with 55% of organisations that have experienced a lack of skills in the external market citing the shortage of engineering and technical skills at a professional level as a key challenge. Although this represents progress from two years ago, there is still a substantial difficulty in this area.

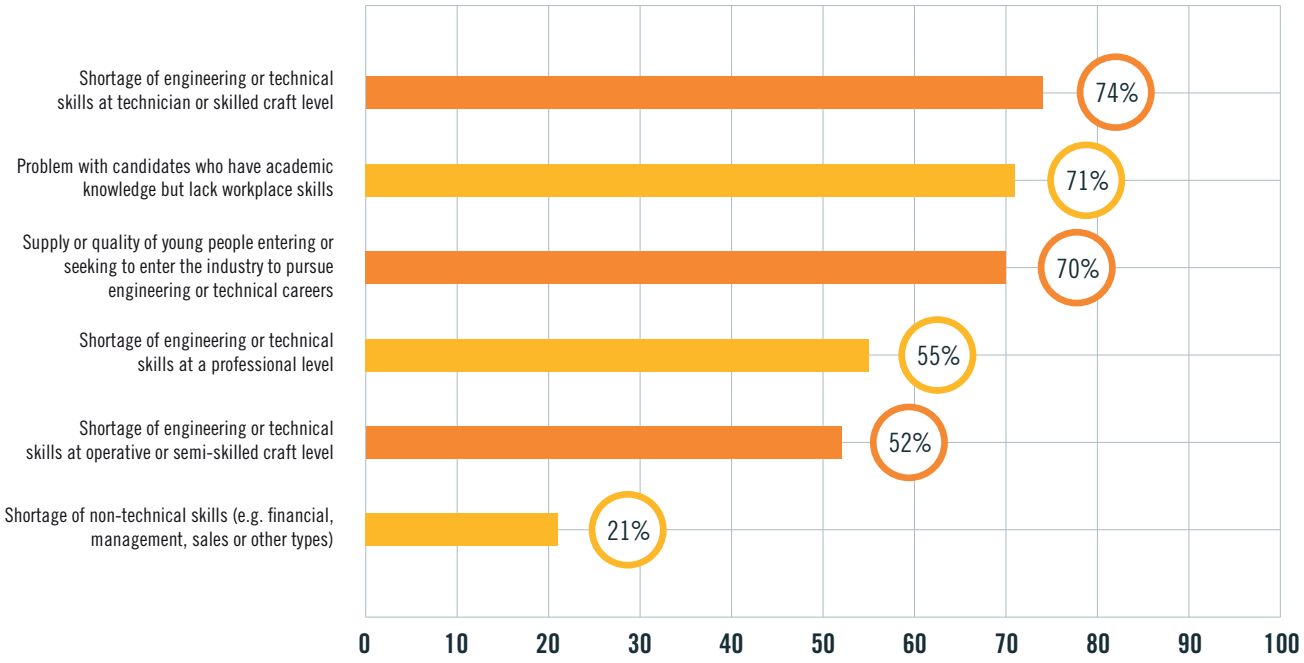
Tim Squires, Commercial Director at Squires Gear and Engineering Ltd, says one factor not represented in the survey which has a bearing on skills supply is the pay expectations of employees:

"In terms of our senior engineers, the skills gap isn't an issue as such. The people we need, at any level, are available. We can get them because we are located in the right place and specialist agencies are good at filling recruitment gaps which existed until seven years ago. A bigger issue than the availability of skills is their pay expectations, especially in a very competitive marketplace like ours where we are a small business in a large sector."

The biggest challenge across all sectors is a shortage of engineering or technical skills at a technician or skilled craft level, with 74% of UK employers that have experienced a lack of skills in the external market reporting this area of recruitment as a key issue. A similar number (71%) of this group say they face a problem with candidates for jobs who have academic knowledge but not the skills which are needed in the workplace. Again, some 70% are concerned with the supply or quality of young people entering or seeking to enter the industry to pursue engineering or technical careers.

As in previous years, this points to a problem in the education system and its failure to generate vocational skills and adequate work-readiness alongside the necessary academic knowledge required for these roles. This is not an issue confined to the supply of people into the engineering sector.

Skills or groups of potential workers cited in external skills shortages (where businesses have experienced lack of skills in the external market)



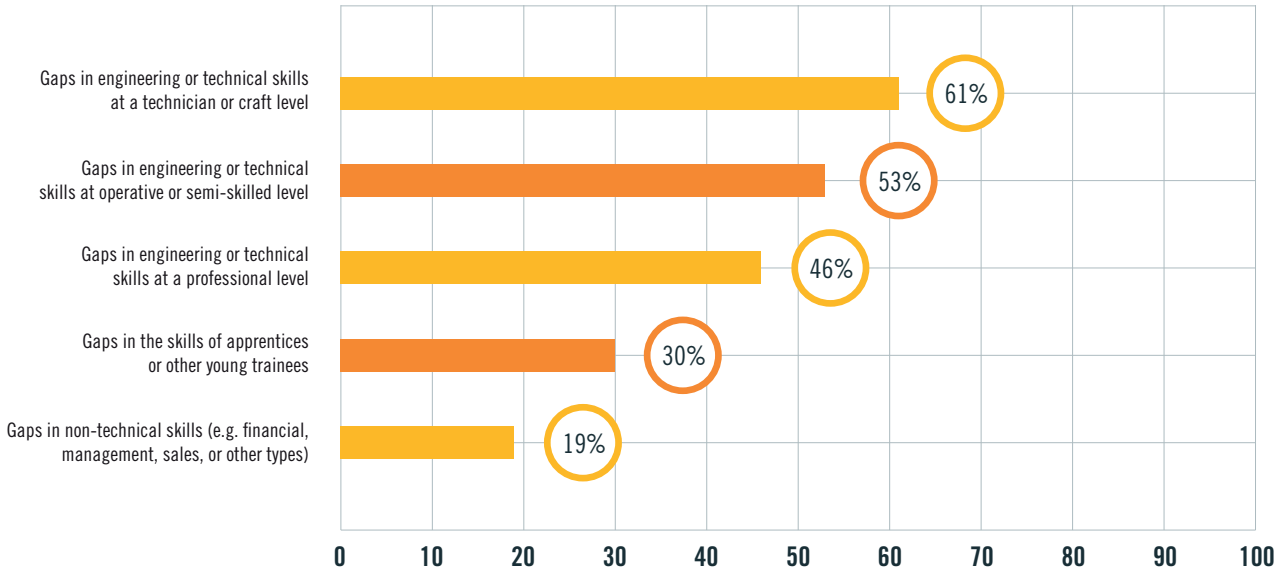
Q: Does shortage of skills in the external labour market concern your business particularly in respect of...? (Where businesses have experienced lack of skills in the external market). Unweighted base = 407. Prompted, multiple response.

To a great extent, the skills gaps present in the existing workforce mirror the pattern of external skills shortages, with the most common concern among 61% of businesses that have skills gaps in their workforce relating to existing staff at technical and skilled craft level, and 46% citing gaps in engineering and technical skills at professional level as a key issue.

"A BIGGER ISSUE THAN THE AVAILABILITY OF SKILLS IS THEIR PAY EXPECTATIONS, ESPECIALLY IN A VERY COMPETITIVE MARKETPLACE LIKE OURS WHERE WE ARE A SMALL BUSINESS IN A LARGE SECTOR."

Tim Squires, Commercial Director at Squires Gear and Engineering Ltd

Types of skill or groups of potential workers subject to skill gaps within existing workforces (where businesses have skill gaps)

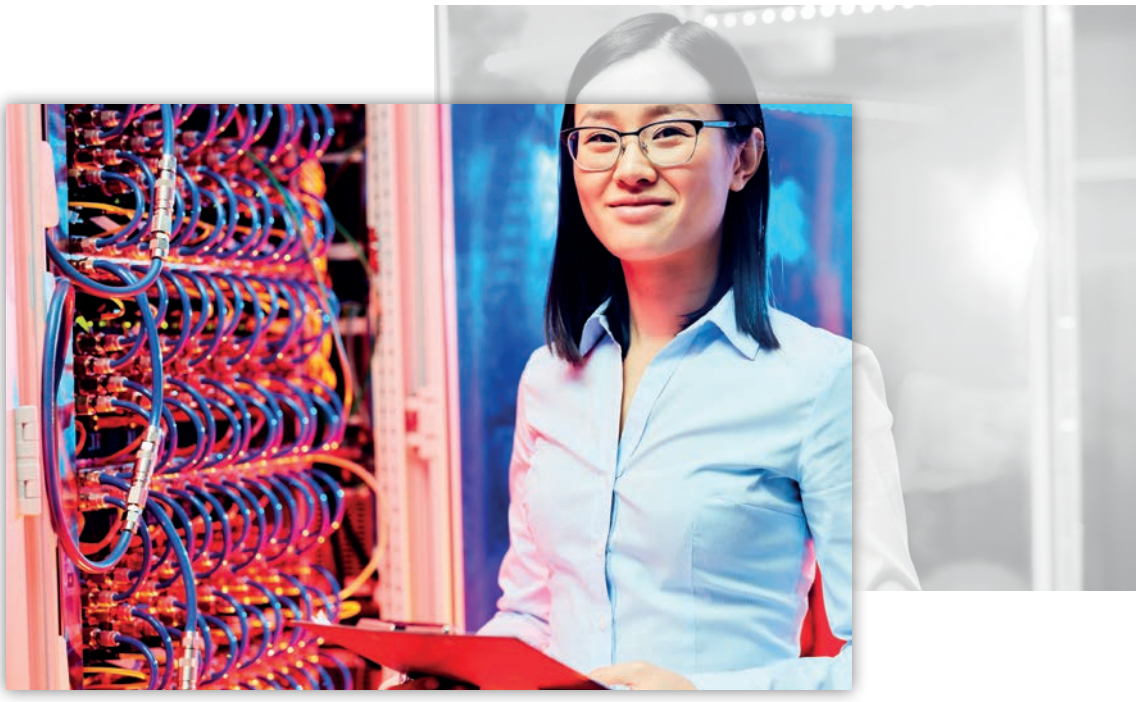


Q: Do gaps in skills within your existing workforce concern... Where businesses have skill gaps. Unweighted base = 201. Prompted, multiple response.

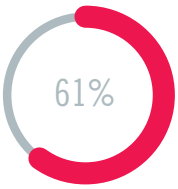
3.4 The role of skills in meeting business objectives

Concerns about skills shortages have been consistently reported in past editions of our Skills Survey.

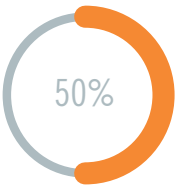
To establish the relative importance of skills supply against other barriers to commercial success, we asked employers to say which factor they considered barriers to achieving business objectives over the next three years.



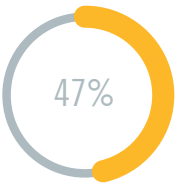
Barriers to business objectives that businesses might face over the next three years



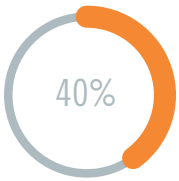
RECRUITING ENGINEERING AND TECHNICAL STAFF WITH THE RIGHT SKILLS



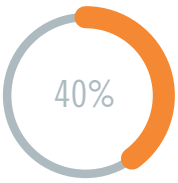
COMPETITION IN THE MARKET



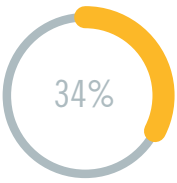
LATE PAYMENT BY CUSTOMERS



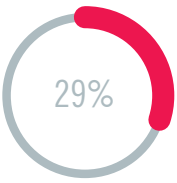
REGULATIONS/RED TAPE



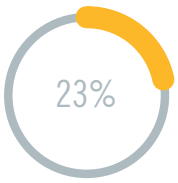
TAXATION (VAT, PAYE, NI, BUSINESS RATES)



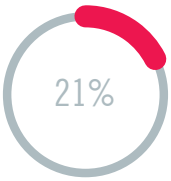
SKILLS GAPS IN YOUR EXISTING ENGINEERING AND TECHNICAL WORKFORCE



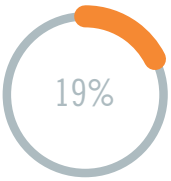
UK EXIT FROM THE EU



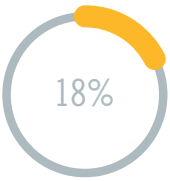
NATIONAL LIVING WAGE



AVAILABILITY/COST OF SUITABLE PREMISES



OBTAINING FINANCE



WORKPLACE PENSIONS

Q: Thinking about obstacles or difficulties that your business might face in achieving your business objectives over the next three years, which of the following would you say are obstacles to the success of your business? Unweighted base = 800. Prompted, multiple response.

The importance of recruiting people with the right skills rises with the size of business. It is particularly high (84%) for large companies with more than 250 employees and 62% of businesses with 25 – 99 employees cite it as an obstacle.

Crossrail Infrastructure Project: filling skills gaps in the transport sector

A proactive approach to training and bringing new people into the sector is critical to solving skills gaps says Valerie Todd CBE, Talent & Resources Director for the Crossrail infrastructure project:

"WHEN I STARTED AT CROSSRAIL, ONE OF MY FIRST JOBS WAS TO CARRY OUT A SKILLS ANALYSIS – LOOKING AT THE LABOUR MARKET, THE SKILLS BASE AND THE SKILLS DATA AVAILABLE – TO UNDERSTAND IF THE SKILLS REQUIRED TO DELIVER THE PROJECT WOULD BE AVAILABLE TO US AND HOW WE WOULD RESOURCE THE PROJECT. THIS DID NOT JUST FOCUS ON CROSSRAIL BUT ALSO THROUGHOUT OUR SUPPLY CHAIN SO WE COULD UNDERSTAND WHAT CHALLENGES OUR CONTRACTORS AND SUPPLIERS MIGHT FACE."

"Having identified the skills shortages, we created a number of initiatives to deal with them.

"One measure we took was to build up the local skills base by offering unskilled and unemployed people who lived within a certain distance of the route the opportunity to join Crossrail. They got the training and support they needed and we were able to revitalise a skills base that we knew had some significant gaps in it.

"We also focused on ensuring those skills were sustainable, transferable and, where possible, aligned to the use of new technologies. We did this by building our own academy to deliver the required training, which included some state-of-the-art technology, but also focused on the more basic practical skills required for these roles. We're proud that the training they received at Crossrail will take them into any workplace within the sector.

"For our skilled engineering workforce, the big challenge was to attract the electrical, mechanical, environmental and systems and civil engineers we needed. For this group, the emphasis on development and standards of employment played an important part in attracting good people: they could see they would benefit from working with us.

"We also influenced skills development through the contractors we used on the project. They had to commit to specific targets such as taking on a certain number of apprentices, or up-skilling a certain percentage of their existing workforce through training initiatives, or employing more talent at entry-level.

"As a result, throughout the project there was a steady focus on ensuring we grew our own talent and created a positive balance between what the labour market could provide and what we could develop in terms of skills and talent ourselves."

CASE STUDY

Obstacles or difficulties that businesses might face in achieving their business objectives over the next three years, by size of establishment

	All businesses (800)	5-9 employees (129)	10-24 employees (285)	25-99 employees (268)	100-249 employees (88)	250+ employees (30)
Recruiting engineering and technical staff with the right skills	61%	58%	65%	62%	66%	**84%**
Competition in the market	50%	42%	52%	**61%**	56%	**72%**
Late payment by customers	47%	52%	48%	41%	32%	21%
Regulations/red tape	40%	39%	43%	41%	26%	34%
Taxation, VAT, PAYE, National Insurance, business rates	40%	44%	43%	30%	22%	21%
Skills gap in your existing engineering and technical workforce	34%	31%	36%	37%	39%	**65%**
UK exit from the EU	29%	29%	28%	31%	31%	22%
National living wage	23%	22%	25%	21%	20%	20%
Availability/cost of suitable premises	21%	25%	22%	15%	6%	10%
Obtaining finance	19%	25%	16%	15%	9%	17%
Workplace pensions	18%	21%	19%	10%	8%	13%
Any other major issues or obstacles	8%	6%	9%	13%	7%	7%
None of these	8%	9%	6%	7%	5%	6%

Q: Thinking about obstacles or difficulties that your business might face in achieving your business objectives over the next three years, which of the following would you say are obstacles to the success of your business?

Unweighted bases in brackets. Figures in bold are statistically significantly higher than average based on a 95% confidence level. Prompted, multiple response.

Proportion of businesses identifying 'recruiting engineering and technical staff with the right skills' or 'skills gaps in existing engineering and technical workforce' as barriers to the achievement of their business objectives over the next three years, by sector

	Recruiting engineering and technical staff with the right skills	Skills gaps in existing engineering and technical workforce
All businesses (800)	61%	34%
Metals manufacturing (170)	**74%**	**41%**
Energy (30)	66%	44%
All manufacturing (320)	65%	37%
IT and communications (115)	64%	33%
Transport (59)	63%	40%
Electrical/electronic (95)	63%	24%
Aerospace/defence (27)	60%	46%
Non-metals manufacturing (150)	56%	33%
Built environment (118)	54%	33%
Other engineering-related (36)	50%	22%

Q: Thinking about obstacles or difficulties that your business might face in achieving your business objectives over the next three years, which of the following would you say are obstacles to the success of your business?

Unweighted bases in brackets. Figures in bold are statistically significantly higher than average based on a 95% confidence level. Prompted, multiple response.

The research showed little variation by sector in these figures, demonstrating that the challenges of the anticipated skills shortage both in recruitment and in the existing workforce are an issue regardless of which area of the engineering sector employers operate.

Looking back

The concern around work-readiness of younger people expressed in this year's Skills Survey mirrors the trend identified in previous years, where there has been a growing concern around the quality of school leavers, apprentices and graduates to meet reasonable expectations of employers. The 2016 IET Skills Survey identified that 62% of employers were concerned about graduate skills (see tables below).

Proportion of businesses stating that typical recruits meet their expectations (from 2016 IET Skills Survey)

	2016	2015	2014	2013	2012
New experienced staff	39%	54%	39%	41%	40%
Postgraduates	45%	43%	37%	35%	33%
Graduates	62%	61%	54%	54%	48%
School leavers/apprentices	53%	52%	44%	38%	33%
All engineering, IT and technical recruits	50%	53%	44%	42%	39%

Q: Do you find that the typical new… recruit to an engineering, IT or technical role does not meet your reasonable expectations in any of the following particular skill areas? (2016 base 403). From 2016 IET Skills Survey.

The shortage of non-technical skills in the external labour market reported in this year's survey (21%) [of the unweighted base of 407] is broadly consistent with shortcomings in areas such as practical experience, leadership and management, and communication skills reported in previous years (see table below).

Skills gaps in recruits – school leavers/apprentices (from 2016 IET Skills Survey)

	2016	2015	2014	2013	2012
Practical experience	33%	32%	30%	23%	22%
Leadership and management skills	33%	31%	23%	19%	18%
Ability to work on own initiative	23%	29%	22%	18%	16%
Communication skills	23%	27%	22%	18%	14%

Q: Do you find that the typical new… recruit to an engineering, IT or technical role does not meet your reasonable expectations in any of the following particular skill areas? Selected answer alternatives included. (2016 base 403; prompted). From 2016 IET Skills Survey.

3.5 In summary

- The number of businesses reporting growth in their engineering and technical workforce over the last three years remains robust and looks set to stay intact, with a greater proportion of businesses expecting growth in their engineering and technical workforces over the next three years.
- The figures suggest that engineering and technical staff are a substantial and significant element in the productive capacity of the sector, and that this workforce has grown in recent years and will continue to grow in the immediate future.
- These conditions are likely to put pressure on the skills supply for businesses that rely on engineering and technical skills where there are already signs of skills shortages in the existing workforce and from external sources.
- In terms of the skills challenge, recruitment of engineering and technical staff with the right skills is more frequently seen by businesses as a barrier to future business performance than any other barrier.
- Employers who report skills shortages in the external labour market say concerns most frequently relate to recruitment at technician or craft level (74%), the supply and calibre of young entrants to engineering and technical jobs (70%) and the work-readiness of young candidates (71%).

4

Esu Ozak, a finalist in the IET Young Woman Engineer of the Year Awards 2017

The skills gap: employer response

IN THIS SECTION WE EXPLORE:

- WHAT EMPLOYERS ARE DOING TO ADDRESS THE SKILLS GAP IN THEIR EXISTING WORKFORCE
- IMPROVING THE SKILLS SUPPLY AND WORK-READINESS AMONG SCHOOL LEAVERS AND APPRENTICES
- EMPLOYER ATTITUDES TO THE SKILLS ISSUE

4.1 Training the existing workforce

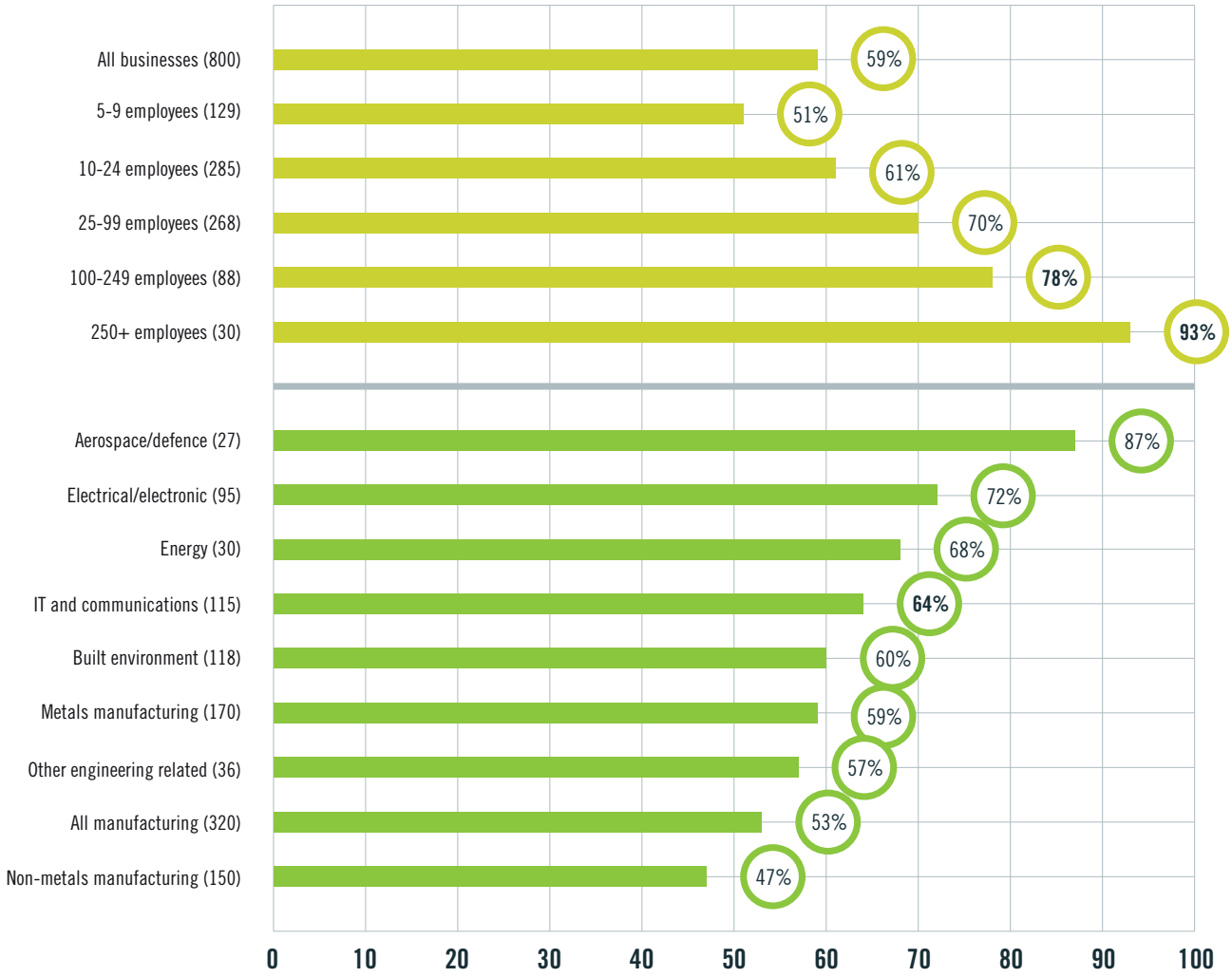
More than half (59%) of the businesses surveyed have arranged or funded any technical or job-specific training for their engineering or technical staff in the past 12 months. This figure was the highest by far (93%) in larger companies with 250+ employees and reduced incrementally to 51% of small businesses with five to nine employees.

While there is no huge variation by sector, training was notably more common in the aerospace/defence (87%) and electrical/electronic sectors (72%), and low in non-metals manufacturing (47%).

Looking across the survey results, training was more frequent among firms:

- Whose engineering and technical workforces had increased in the last three years (69%) than amongst those where the workforce had decreased (48%).
- Which expected to increase their engineering and technical workforce in the next three years (66%) than among those that expected it to decrease (40%).
- Reporting external skills shortages (66%) than those not reporting shortages (53%).
- Reporting skills gaps (67%) in their existing workforce than amongst those not reporting gaps (57%).
- Which have plans to increase their use of digital technologies in the next three years (74%) than among those which do not have such plans (51%).

Proportion of businesses that supplied technical training to their engineering and technical staff in last 12 months, by size and sector



Q: Turning to training, over the last 12 months, has your establishment arranged or funded any technical or job specific training for engineering or technical staff at any level? Unweighted bases in brackets. Figures in bold are statistically significantly higher than average based on a 95% confidence level.

4.2 Encouraging the supply of skills

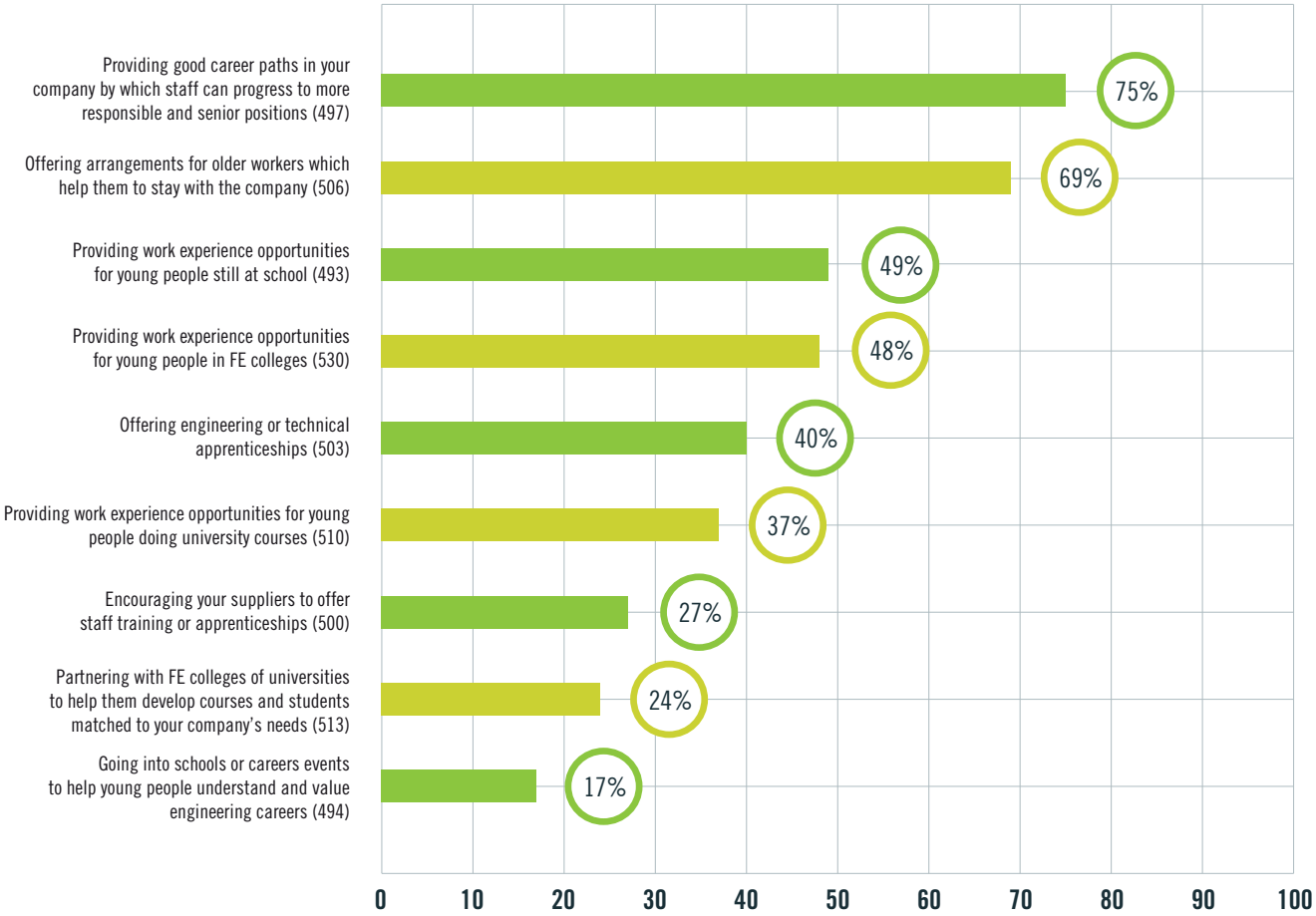
Businesses are also deploying a range of other strategies to increase the skills supply into their business, although these efforts vary considerably between the largest and smallest organisations.

The two most common approaches for organisations focus on retaining talent by providing good career paths (75% of businesses), or keeping more mature employees in work (69%).

To address skills needs among younger people, between one third and one half of employers provide work experience opportunities for those still at school (49%), in Further Education colleges (48%) or at university (37%), while 40% are proactive in offering engineering apprenticeships in their businesses.

While this paints a reasonably optimistic picture of employers recognising the importance of their role in engaging and encouraging young engineering talent into industry, it's clear that more could be done – yet only 21% of businesses currently intend to increase their involvement in these proactive measures.

Activities businesses are involved in to increase skills supply into or within the business or into industry more generally



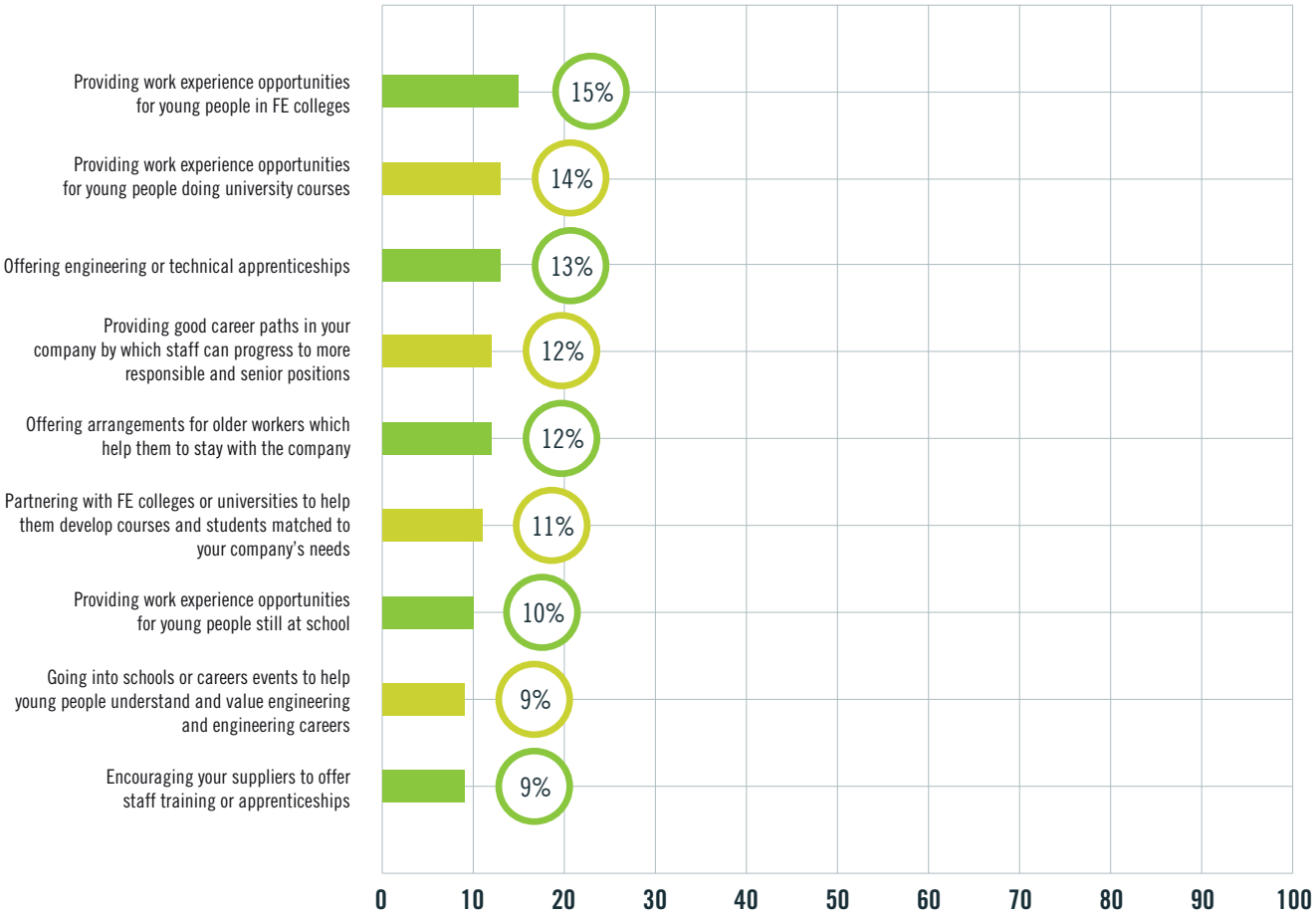
Q: There are a number of other ways in which companies can increase skills supply either within the company or into the industry as a whole, could you say which your establishment is involved in? Prompted, multiple response (all respondents asked).

To ease burdens on respondents, each was asked about only five (randomly allocated) of the approaches. Hence, bases in brackets vary slightly between approaches and do not correspond with the total number of businesses which took part in the survey.

Only a minority of employers (17%) are currently involved in going into schools or attending careers events to help young people understand the appeal and value of engineering careers.

This demonstrates a lack of understanding among employers of the benefits this type of proactive engagement with schools can bring, which is further reflected by the fact that only 9% of businesses overall would like greater involvement in this specific type of promotional activity.

Activities in which businesses would like greater involvement to increase or improve skills supply into industry



Q: Which of these would you like to become involved or more involved with? Based on where businesses want to be (more) involved. Unweighted base = 800. Re-based on all respondents.

Each figure has been recalculated as a percentage of all respondents. Prompted, multiple response.

Josh Barber, the 2016 IET Apprentice of the Year and Tendering Engineer at ABB, a global industrial engineering business, considers work experience as critical to encouraging the skills supply among young engineers:

"It is my opinion that work experience is key to inspiring the next generation of engineers. I was fortunate enough to spend time with an engineering business that provided me with a valuable insight into the business, as well as the industry, at a time when the world of work seemed so far away.

"It is at this time that experiences you create stay with you, and there is nothing better than being able to make an informed decision about your future by experiencing the industry you wish to pursue."

Stewart Evans from Ilec-Imec Building Services, agrees that employers who are proactive about supporting younger people can benefit:

"One problem we still see among younger people is a misunderstanding of what engineering actually is as a profession.

"Many people still think it is all about hi-vis jackets and manual jobs. They don't understand all of the other work that goes on. It isn't good enough for employers or individuals to sit there complaining. You have to do something yourself and you have to get your company to help. I have had a very good career and I think it is important to give something back.

"I'm involved with the trade body going into colleges, doing talks, giving mock interviews and mentoring people. All of that plays a part in getting the right people for our company and our industry."

Coventry-based **Tim Squires** echoes this view and says a combination of work experience and employer support provides the foundation for a career in engineering:

"As a business, I would much prefer to work with someone who has received some solid work experience in a related field and whom we can help to shape and mould further to suit our needs, rather than someone who has left university and is demanding a large salary, but has nothing meaningful to offer.

"Some employers say that although they recognise the importance of supporting those at the beginning of their career, they have been disappointed with the calibre of ambition and commitment of those they have tried to support."

Jackie Hopkins of Magal Cables Ltd recounts that her experience echoes the others we spoke to for this report:

"We have tried in the past to do work experience and we have tried to help non-academic young people into the workplace by being involved with various programmes. We have found it very unsatisfactory.

"Our experience is they are unprepared for the workplace and not prepared to learn.

"Even where we have offered people jobs, basics like time-keeping and absence have been an issue.

"Because of that, we don't offer work experience at the moment. We have jobs and are prepared to do the training, but what we find is the level of applicants isn't what you would hope for. They are unprepared for interviews and just want any old job. We can't expect schools to do everything, but employers do need a base to work with. Young people do need to take some initiative and find out about the work they want to do."

Caterpillar Peterlee

Greg Robson, Learning & Development Manager at Caterpillar Peterlee, says links between industry and schools are key to their future talent pipeline. That includes students and teachers:

"It's clear that there is a skills issue in our sector which comes from a combination of an ageing workforce and competition for engineering talent where we are located.

"As a global organisation, we have the option to source the engineering talent we need from abroad but at our facility in Peterlee we are keen to keep it local.

"Our priority is to build a strong pipeline of engineering talent for the future.

"OUR WORK WITH SCHOOLS FOCUSES ON GETTING THE NEXT GENERATION ENGAGED, EXCITED AND INSPIRED ABOUT ENGINEERING. TO SHOW THEM THE POTENTIAL CAREERS AND OPPORTUNITY OPEN TO THEM, WE INVITE PUPILS IN FOR EXPERIENCE DAYS, WHERE WE HAVE BUSINESS AMBASSADORS WITHIN THE WORKFORCE WHO ARE TRAINED TO PUT ON EVENTS AND MENTOR THE YOUNG PEOPLE ATTENDING. WE ALSO HAVE A SIMULATED WORKPLACE, WHERE PUPILS CAN ACTUALLY TRY THEIR HAND AT THE JOBS AND FIND OUT WHAT THE DAILY REALITY OF A ROLE IN MANUFACTURING REALLY MEANS."

"Some work experience weeks and tour days can include simulated interviews and assessments to get them used to the processes in a comfortable and safe environment. Our business ambassadors use the opportunity to assess the individuals involved, which includes their general attitude, their behaviour and their skills as potential apprentices. We track the students in this way throughout the process and get them back in to discuss their options if we feel they are suited to working here at Caterpillar.

"Our schools initiative also extends to STEM teachers, where we encourage those who've never had much actual work experience to come in and try out our simulated workplace for a day. This allows them to experience industry and bring it alive to their pupils.

"Our view is that we have the right kind of talented people available, we just need to find them, take them on and support them with the learning they need so we can create the next generation of engineers."

CASE STUDY

4.3 The value of apprenticeships

In our 2016 Skills Survey, we found employers were making efforts to look beyond experienced staff, with 13% of new engineering and technology recruits to the workforce expected to be school leavers/apprentices over the following 12 months, reflecting the findings in previous years.

The appetite for apprentices is a marked finding in this year's survey. Encouragingly, 43% of this year's respondents reported that they had had one or more engineering or technical apprentices in the last year, including the 31% of businesses who had at least one engineering or technical apprentice in place at the time of the survey.

Last year, within the 2016 IET Skills Survey, before the introduction of the Apprenticeship Levy in April 2017, just over half (53%) of employers didn't know what benefits it could bring them. This year, we have a clearer idea of its impact. While around a quarter of employers (27%), where liable to pay the levy, say they will increase the number of engineering or technical apprentices they take on, more than half (53%) of employers say the levy will not increase the number and 20% are unsure of the impact on their apprenticeship provision.

At Siemens, **Jason Phin** is clear that the levy presents an opportunity for the industry to up its game with regard to apprenticeships but that it is not just about young people or new employees but across the workforce:

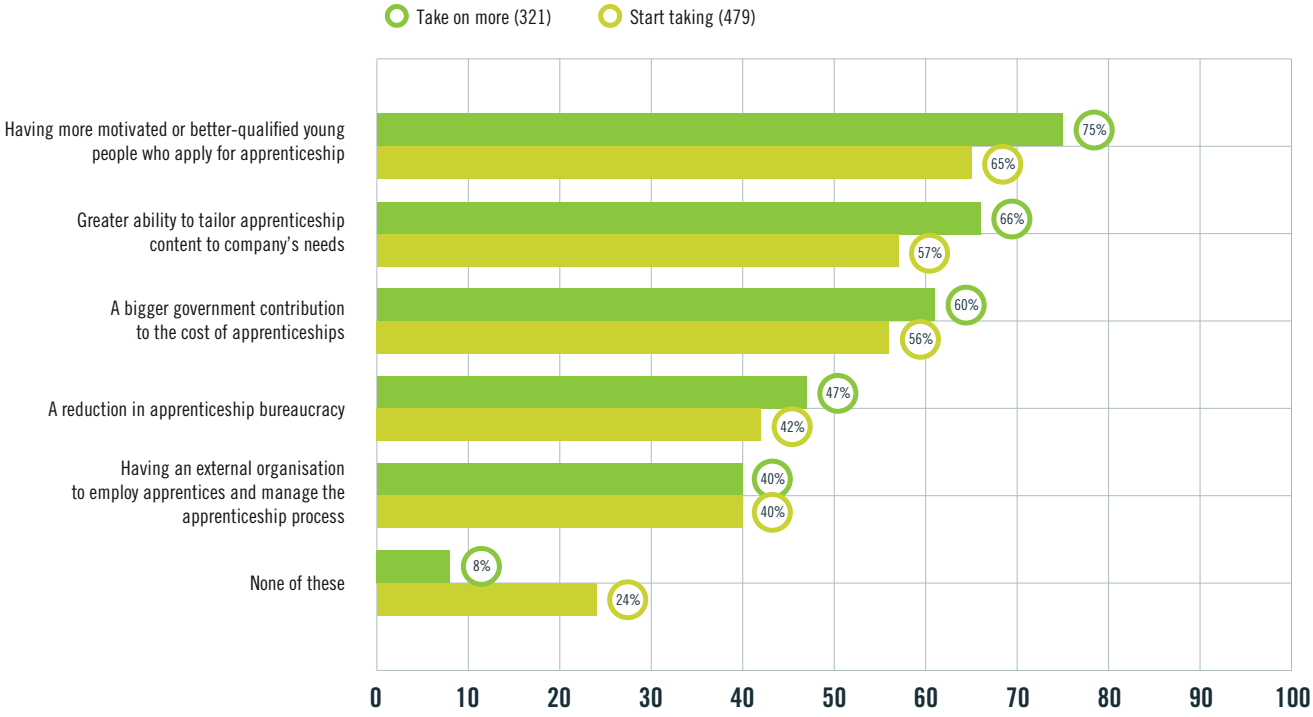
"As a company, we are proactively looking at maximising the levy – but simply taking on more apprentices isn't the only answer.

"We're also looking at ways in which we can use the levy to re-skill members of our existing workforce – where opportunities allow for example – as part of our graduate engineering development programme and how it can make use of the new Level Seven standards to get people to the equivalent of a Masters degree.

"We are asking ourselves where in our existing workforce do we need to update skills and can we use the levy and apprenticeship standards to meet those skills needs."

Aside from the Apprenticeship Levy, as the graph below shows, there are many wider factors that would encourage employers to take on more apprentices or start taking them on:

Actions or support that would encourage businesses to take on more or start taking on apprentices



Q: Which of the following would encourage you to take on more engineering or technical apprentices than at present? Where employ engineering or technical apprentices. Prompted, multiple response.

Q: Which of the following would encourage you to start taking on engineering or technical apprentices? Where do not employ engineering or technical apprentices. Unweighted bases in brackets. Prompted, multiple response.

While there is widespread support for apprenticeships in supporting skills shortages, 65% of those not employing apprentices would be encouraged to take on an apprentice if the young people applying were more motivated or better qualified.

In addition, 57% would be encouraged to take on apprentices if the content of the training could be tailored to the specific needs of the employer.

While the different factors didn't vary significantly across sizes and sectors of business, it was noticeable that small organisations have the greatest concern about the suitability of young applicants. A significant 80% of businesses, with between five and 24 employees already with apprentices, said improvement in the suitability of applicants would encourage them to take on more, while only 56% of businesses with more than 100 employees said the same.

At Ilec-Imec Building Services, **Stewart Evans** says his experience mirrors the findings of the research:

"We have employed two or three apprentices in the past year.

"We look to the local college for support and despite the cuts to the Further Education sector, I think they are doing a good job of bringing the right people forward with the right skills.

"I go to our local college and sit in the classes to see what they are being taught, so we can ensure that what we need to do in the workplace is being reflected.

"Sometimes there is a gap but it means I can have a conversation with them.

"My one complaint is that we really need block release for students from college to fit with the way we work. If our work is a long way from the college, it becomes difficult to make the logistics work between the student and the job that we have on. For us that is a real problem."

Viewpoint

Tim Squires of Squires Gear and Engineering Ltd says more young people should understand that there are opportunities abound for individuals who are prepared to go into the workforce and commit to training with their employer to grow their career:

"Our approach to recruitment is to employ someone with limited engineering experience and train them internally to ensure they have the exact skills we need in our own business.

"Our company is involved in a local Engineering Academy where we teach real-life situations. The pupils there get their normal GCSE qualifications, but they are taught in a way that reflects the real world of work and come out with added skills such as problem-solving. That way, they are trained according to our own standards and expectations.

"The shortage of the right young people coming to companies like ours is certainly down to a gap between education and industry.

"One side of this is the ongoing emphasis on university education. For the majority of areas where skills gaps are most pressing, you don't need a degree. Yet our impression is that young people aren't aware of viable careers and vocational routes into industry.

"Separately there is a lack of awareness that there are opportunities outside of the big employers which people already know about and who already engage with schools and young people.

"My experience is that there are plenty of smaller companies which offer good wages and career prospects but younger people have never heard of them.

"The result of this isn't just that we don't get the people we need but that opportunities for work experience aren't maximised.

"Industry and young people need each other and we need to close the gap between education and employers – for the health of our sector, both sides have a role to play."

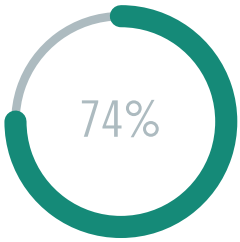
4.4 Employer engagement in skills policy

Going forward, in general, more businesses are optimistic (33%) about the supply of engineering and technical skills into industry over the next three to five years than are pessimistic (23%). Perhaps most tellingly, the majority (38%) think it will stay about the same.

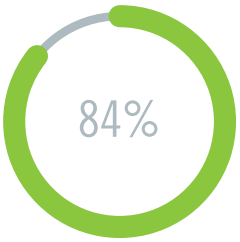
The majority of businesses consider the key action by government as being the improvement to the education and training system, promotion of industrial careers, better advice and guidance to young people and expansion of work experience components of educational courses.

Similarly, they believe industry should focus on improving the training on offer, and that employers should do more to promote careers in engineering and increase the number and quality of apprenticeship and work experience opportunities.

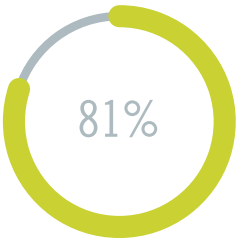
Employer attitudes to the skills challenge and skills policy in numbers



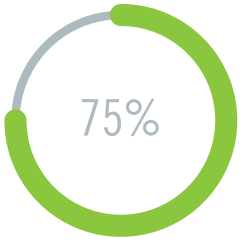
SAY IT'S UNREALISTIC TO EXPECT THE EDUCATION AND TRAINING SYSTEM ALONE TO PRODUCE JOB-READY EMPLOYEES



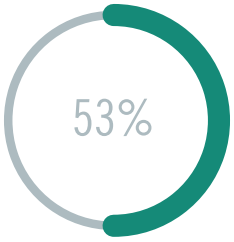
BELIEVE THAT TO GET THE RIGHT SKILLS, EMPLOYERS SHOULD ACCEPT THEY HAVE A RESPONSIBILITY TO HELP THE TRANSITION FROM EDUCTION AND TRAINING TO THE WORKPLACE



SAY MORE EMPLOYERS SHOULD PROVIDE WORK EXPERIENCE FOR THOSE IN EDUCATION, OR TRAINING, IN ORDER TO IMPROVE THE SUPPLY OF ENGINEERS AND TECHNICIANS



AGREE THAT TACKLING THE SKILLS PROBLEM IS FUNDAMENTAL TO MAKING THE GOVERNMENT'S INDUSTRIAL STRATEGY VIABLE



SAY THEIR ORGANISATION TAKES STEPS TO INFLUENCE THE CONTENT OF DEGREES AND THE TECHNICAL TRAINING UNDERTAKEN BY ENGINEERS

Q: Do you agree with the following statements or not?

Note: to ease the burden on respondents, each respondent was asked a randomly selected 7 statements (out of the 13 in total in this question).

Unweighted bases for each item therefore vary between 475 and 514 cases.

4.5 In summary

- In order to get the right skills they needed over the last year, employers have focused on measures which have either improved skills of existing engineering or technical staff, or helped to retain them.
- Efforts to attract younger people into the workforce are less prevalent than investment in existing employees. Only one third to a half of employers provided work experience to those in education.
- Some 43% of employers that have funded/arranged any technical or job-specific training in the last 12 months offered apprenticeship training in engineering or technical disciplines. Just under 3 in 10 respondents (27%) who are liable to pay the Apprenticeship Levy said they would increase the number of engineering or technical apprentices they took on.
- There are widely held concerns that work-readiness of young people is a barrier to employing young people but there is a consensus that employers must take some role in helping to resolve this issue.

"AS A COMPANY, WE ARE PROACTIVELY LOOKING AT MAXIMISING THE LEVY – BUT SIMPLY TAKING ON MORE APPRENTICES ISN'T THE ONLY ANSWER. WE'RE ALSO LOOKING AT WAYS IN WHICH WE CAN USE THE LEVY TO RE-SKILL MEMBERS OF OUR EXISTING WORKFORCE – WHERE OPPORTUNITIES ALLOW FOR EXAMPLE – AS PART OF OUR GRADUATE ENGINEERING DEVELOPMENT PROGRAMME AND HOW IT CAN MAKE USE OF THE NEW LEVEL SEVEN STANDARDS TO GET PEOPLE TO THE EQUIVALENT OF A MASTERS DEGREE."

Jason Phin, Training Solutions Business Manager, Siemens

Looking back: taking action to increase work experience

The 2016 edition of the Skills Survey identified a significant gap between the number of businesses who believed that it was their role to help in the transition from training and education to the workplace with an overwhelming 97% agreeing this was the case.

A similar number (91%) agreed that to improve the supply of engineers and technicians, more employers need to provide work experience for those in education or training.

The gap between these figures and the 78% who said they offered work experience to future engineers and students looking to enter or advance in the industry led to the creation of a new IET campaign Engineering Work Experience For All, which aims to get universities and employers to offer quality work experience. The initiative launched in October 2017 and you can find out more at: **https://workexperience.theiet.org**

5

Sophie Caffrey, a finalist in the IET Young Woman Engineer of the Year Awards 2017

Improving workforce diversity

IN THIS SECTION WE EXPLORE:

- THE POTENTIAL OF IMPROVING DIVERSITY TO INCREASE THE SKILLS SUPPLY
- ATTRACTING AND RETAINING WOMEN ENGINEERS AND TECHNICIANS
- INITIATIVES IN PLACE TO SUPPORT WIDER WORKPLACE DIVERSITY

5.1 Female recruitment and support

Last year's survey of the industry by the IET estimated that 9% of engineering and technology staff working in the UK were female. This year's survey estimates that 11% of the UK engineering and technical workforce is female. However, given differences in the methodology year on year, this difference may or may not represent a true increase – please see the methodology (page 7).

Even if there has been growth in female representation, which is hard to track this year because of the change in survey methodology, it is worth reflecting that at this rate of change, it would take decades to approach anywhere close to gender parity in the engineering workforce.

Even in reading the figures which show a higher number of female staff in small organisations (13.3%), we must remember that the inclusion of just one or two women in the workforce will represent a significant proportion of all engineering staff.

Average proportion of women in the engineering and technical workforce, by size and sector (where a response was provided)

	Average female %
All businesses (800)	11.2%
Size	
5-9 employees (129)	13.3%
10-24 employees (285)	9.1%
25-99 employees (268)	9.4%
100-249 employees (88)	11.6%
250+ employees (30)	9.9%
Sector	
Energy (30)	14.1%
IT and communications (115)	14.1%
Transport (59)	3.5%
Built environment (118)	19.7%
Electrical/electronic (95)	9.6%
Aerospace/defence (27)	6.0%
All manufacturing (320)	8.8%
Non-metals manufacturing (150)	12.2%
Metals manufacturing (170)	5.5%
Other engineering-related (36)	7.1%

Q: Overall, what percentage of your total engineering and technical staff, at any grade, is female? Unweighted bases in brackets.

The scale of the challenge is shown by the fact that only 15% of businesses said that they made particular efforts to attract and retain women in engineering and technical roles (beyond observing statutory equality requirements), compared to 34% in 2016.* However, certain sectors are faring much better in their efforts to improve the gender mix of their workforce, as demonstrated by IT and communications (28%) and aerospace/defence (51%).

Marguerite Ulrich, Chief Human Resources Officer for Veolia UK & Ireland, is determined to increase the 11%figure across the industry:

"As a business, we want to do something proactive about the fact that the UK has the lowest number of female engineers of pretty much any European country.

"We are committed to promoting STEM careers to female students in at least 20 universities and have pledged to further increase the percentage of women at all levels across the business through genuine engagement with organisations such as the Employers Network for Equality and Inclusion, the Women in Business Club at London Business School and the Inspiring Women Campaign."

Helen Hopper, HR Manager for Caterpillar Peterlee, is another organisation taking proactive measures around diversity, driven by a new Diversity Council set up in 2015:

"The way we are approaching diversity is two-fold: on the manufacturing and production side, we are ensuring that all our recruitment collateral depicts female and ethnic minority employees. We also promote the fact that Caterpillar is a good place to work with flexible, family-friendly hours and policies. This has certainly encouraged more female applicants to entry-level, unskilled roles on the shop floor.

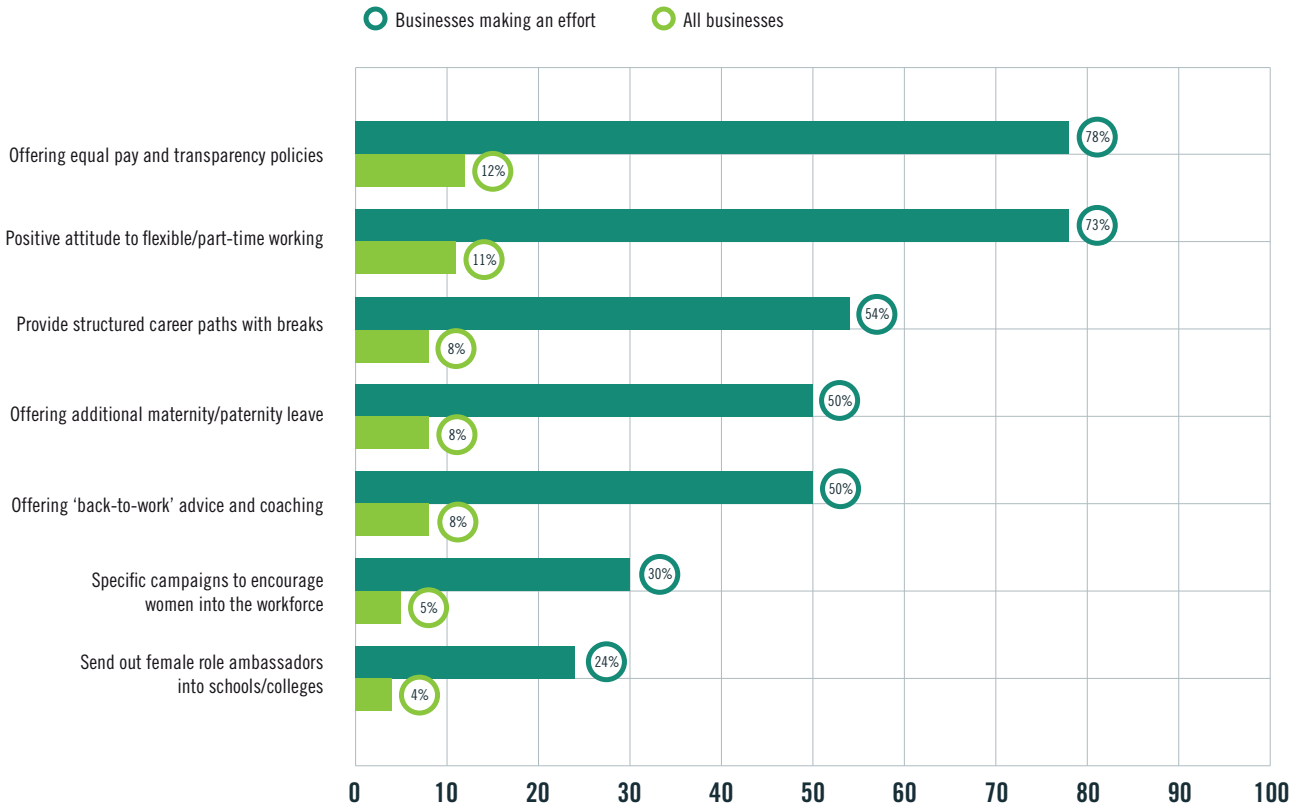
"On the professional side we are doing the same by ensuring we include women and diverse groups of people of all different ages on our recruitment material, which is further supported by employee stories and case studies on sites such as LinkedIn.

"We focus an element of our work with local schools on the recruitment of girls into our talent pipeline.

"We put on a 'Women in Engineering Day' recently, where young girls were invited in with their parents to experience a day at our facility and find out more about the different types of careers available at Caterpillar. Thanks to our strong network with the local schools and our business ambassador programme, we can pinpoint the students with the most potential and fast-track them through the business as apprentices if they're interested in a career with Caterpillar."

*Q: Are you undertaking anything to improve the gender diversity of your engineering, IT and technical workforce? Base 403. From 2016 Skills Survey.

Ways in which businesses sought to retain and attract female members of their engineering and technical staff – prompted, multiple response (where efforts are made to attract/retain female staff)



Q: Which of the following actions has your organisation undertaken to increase the gender diversity of your engineering, IT and technical workforce? Unweighted bases: businesses making efforts = 158; figures also rebased on all businesses = 800. Prompted, multiple response.

Within this year's survey, of the businesses who are proactively engaged in efforts to attract and retain women into the engineering workforce, the majority are focusing on offering equal pay and transparency policies (78%) and a positive attitude to flexible/part-time working (73%).

Where the problem is still acute, and more so than last year, is the lack of effort by UK employers to run specific campaigns to encourage women into the workforce: only 30% of businesses that undertake actions to attract and retain women in engineering and technical roles (beyond observing statutory equality requirements) do this. Equally, deploying female ambassadors as role models in schools and colleges is something that only 24% of businesses are proactively engaged in, representing the lowest level out of all the initiatives.

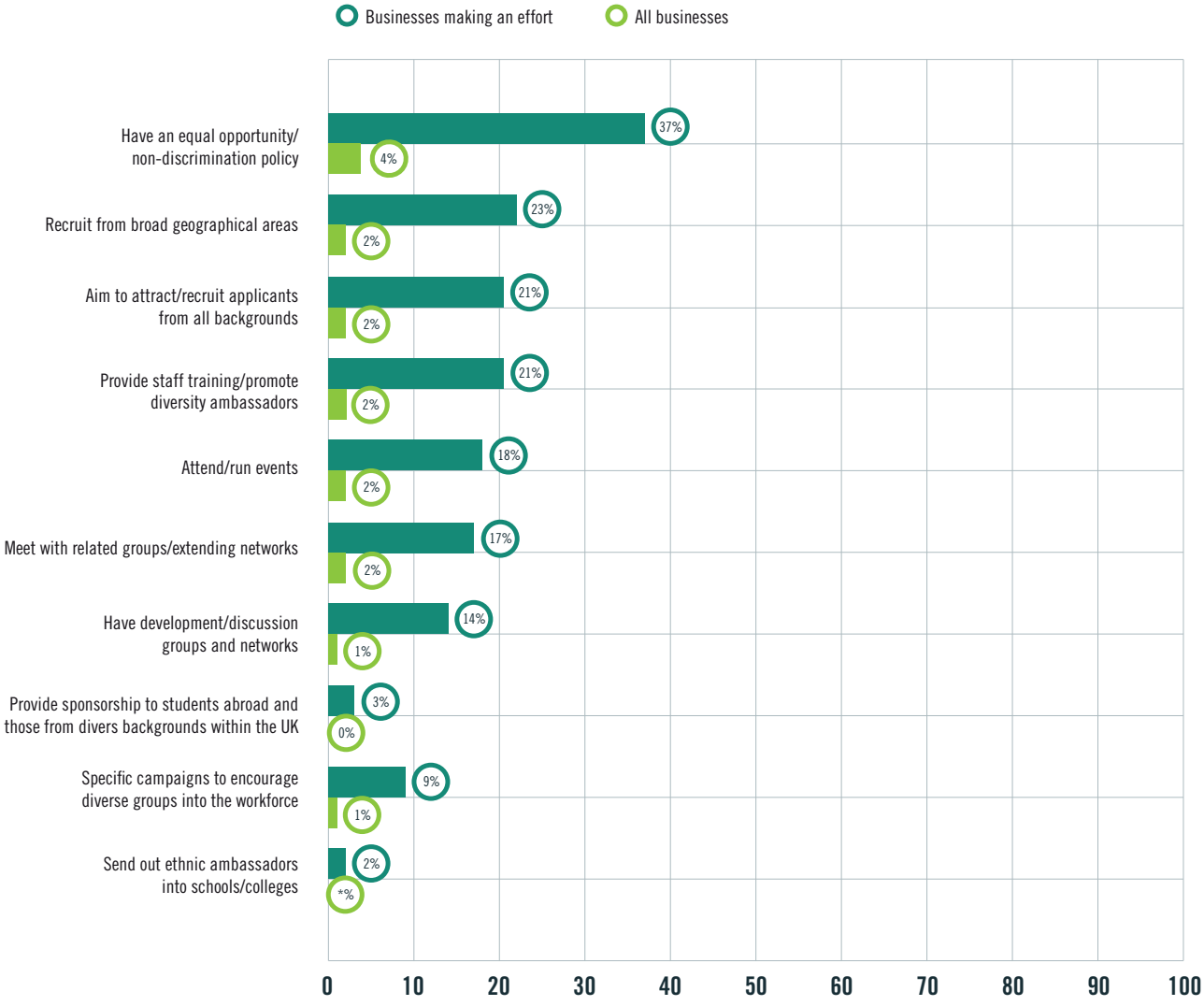
5.2 Wider diversity initiatives

In 2016, 22% of firms surveyed had LGBT or ethnic diversity initiatives in place. The majority – nearly three-quarters (73%) – said they didn't.*

Within this years survey, of the businesses who sought to increase the number of BAME and LGBT staff in their engineering workforce (9% of all employers), only 9% run specific campaigns to encourage diverse groups into the workforce, and only 2% send out ethnic minority ambassadors to schools and colleges.

*__Q:__ Are you undertaking anything to improve the diversity of your engineering, IT and technical workforce? We are now talking about ethnicity and LGBT (lesbian, gay, bi-sexual and transgender) topics. Base 403. From 2016 Skills Survey.

Ways in which businesses have sought to increase the number of BAME and LGBT staff in their engineering and technical workforces – prompted, multiple response (where efforts are made to attract/retain BAME and LGBT staff)



Q: Which of the following actions has your organisation undertaken to increase the diversity of your engineering, IT and technical workforce in terms of the ethnicity and LGBT status of the workforce? Prompted, multiple response.

Unweighted bases: businesses making efforts = 75; figures also rebased on all businesses = 800 *% denotes less than 0.5%

Maguerite Ulrich of Veolia UK & Ireland believes that diversity on all levels – not just gender – isn't just the right thing to do but that it drives business success:

"In a recent global survey, 85% of corporate diversity and talent leaders agreed that a diverse and inclusive workforce is crucial to encouraging different perspectives and ideas that drive innovation."

At Siemens, **Jason Phin** says employers have to be proactive in order to increase diversity:

"There are a lot of entrenched attitudes in engineering, both regarding women and other groups in society.

"Employers have to be proactive and visible in changing representation in the workplace.

"We became involved with the WISE (Women in Science and Engineering) organisation several years ago and we used their expertise to look at our advertising material for our apprenticeship scheme and help us with content and presentation of information that would make our opportunities more attractive to female applicants.

"In the last four years of our apprenticeship scheme, we have increased the number of female engineers at entry level, making our ratio of female engineers at our Manchester site 23% – well above the national average of 9%."

But as **Tim Squires** of Squires Gear and Engineering Ltd says, a lack of diversity can also be driven by entrenched social attitudes outside of the workplace:

"We are an equal opportunities employer but I can honestly say that I have never had a female applicant for a job on the shop floor. This may be because our particular roles here are very physically demanding but if you look at other areas of our supply chain there are more women than ever filling key engineering roles.

"Again, young people at school are often led to believe that factory work is dirty and only for unskilled, unqualified men when in reality any decent engineering company will provide excellent conditions and equal opportunities, with some incredible starting salaries, career prospects and transferable skills.

"The issue is that we need more collaboration between education and industry to inform young people of the opportunities available."

5.3 In summary

- Diversity remains an issue within the engineering and technical workforce and only a minority of businesses say they take proactive measures to change the make-up of their workforce.
- This is not limited to the number of women in the UK engineering and technical workforce, which stands at 11%.
- Only 15% of businesses make specific efforts to attract and retain female staff and fewer still (9%) take actions to increase the BAME and LGBT diversity of their engineering and technical workforce.

"IN A RECENT GLOBAL SURVEY, 85% OF CORPORATE DIVERSITY AND TALENT LEADERS AGREED THAT A DIVERSE AND INCLUSIVE WORKFORCE IS CRUCIAL TO ENCOURAGING DIFFERENT PERSPECTIVES AND IDEAS THAT DRIVE INNOVATION."

Marguerite Ulrich, Veolia UK & Ireland

Conclusion

The 2017 Skills Survey presents a mixed picture of the talent supply to our profession

From a positive perspective, it is clear that employers are not only aware of the skills challenges they face, but are taking action to solve them through a range of measures.

They are training and up-skilling existing workers, attracting new employees through apprenticeships, providing work experience and building partnerships with all parts of the education sector.

Encouragingly, employers are not only focused on the challenges of today but those on the horizon presented by the so-called 'rise of the robots'. Rather than seeing advanced automation and digitisation as a threat, employers see opportunities for commercial and jobs growth.

What is worrying in this year's findings is the enduring lack of people with skills to fill the jobs that employers are creating and need to fill. It is a problem which extends across employers of engineers and technicians.

The ongoing inability for employers to find younger people with the right skills, knowledge and critically, attitude to work is one we cannot allow to continue if we are to have a healthy engineering profession in the future. Ultimately, the Government's Industrial Strategy to boost UK productivity will not succeed if we do not resolve these skills challenges.

For this reason our recommendations this year focus solely on the actions we believe employers, educators and government must take in order to help fix this problem.

Recommendations

Foster home-grown talent while retaining existing skills

Recommendation for: Government

Now that the UK is in the process of leaving the EU, it is critical that government works more closely with educators and industry on a long-term plan. This should focus on developing UK engineering expertise, while retaining non-UK workers who have the skills needed by engineering businesses as Brexit comes into effect.

There is also a need to make the apprenticeship levy guidelines clearer so employers can use it effectively to develop training.

Build a flexible and agile workforce through CPD and work experience

Recommendation for: employers and educators

Businesses recognise the impact that digitisation and advanced automation will have in the near term but many are not fully prepared.

To ensure the current and future workforce has the right skills and capability, establishing and maintaining a solid Continuing Professional Development (CPD) framework must now be a top priority for employers.

Furthermore, to improve work-readiness in new recruits, we urge employers to work together with schools and colleges to provide more work experience opportunities for young people.

Make engineering accessible to everyone

Recommendation for: employers

The vast majority of employers surveyed this year have not introduced gender/BAME/LGBT initiatives. Companies need to increase their efforts to encourage people from diverse backgrounds into the profession. For example, providing regular unconscious bias awareness training would help eliminate barriers into the profession and retain those already in it.

IET The Institution of Engineering and Technology

How we can help?

It is widely acknowledged that there is a skills shortage in the UK, and a lot of businesses recognise that they need to do more to boost engineering skills and promote diversity, but not all are aware of the best approach. This is where the IET can offer assistance with our CPD resources, Work Experience for All campaign and Women's Network, for example. See **https://workexperience.theiet.org** and **https://www.theiet.org/women**.

"THE SKILLS CRISIS CANNOT BE SOLVED BY GOVERNMENT ALONE. WE NEED TO WORK TOGETHER COLLECTIVELY AS A PROFESSION TO ENSURE THE UK IS EQUIPPED TO MEET THE INCREASING SKILLS DEMANDS AND FUTURE NEEDS OF THE INDUSTRY."

Stephanie Baxter, Skills and Education Lead, IET

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Appendix:

Standard Industrial Classification (SIC 2007) codes used to define engineering enterprises.

Specific sectors for this research include:

1. Energy

06100 Extraction of crude petroleum

06200 Extraction of natural gas

09100 Support activities for petroleum and natural gas mining

05101 Deep coal mines

05102 Open cast coal working

35110 Production of electricity

35120 Transmission of electricity

35130 Distribution of electricity

35210 Manufacture of gas

35220 Distribution of gaseous fuels through mains

35300 Steam and air conditioning supply

2. IT and communications

18201 Reproduction of sound recording

18202 Reproduction of video recording

18203 Reproduction of computer media

58210 Publishing of computer games

58290 Other software publishing

59111 Motion picture production activities

59112 Video production activities

59113 Television programme production activities

59120 Motion picture, video and television programme post-production activities

59200 Sound recording and music publishing activities

61100 Wired telecommunications activities

61200 Wireless telecommunications activities

61300 Satellite telecommunications activities

61900 Other telecommunications activities

62011 Ready-made interactive leisure and entertainment software development

62012 Business and domestic software development

62020 Computer consultancy activities

62030 Computer facilities management activities

62090 Other information technology and computer service activities

63110 Data processing, hosting and related activities

63120 Web portals

95110 Repair of computers and peripheral equipment

95120 Repair of communication equipment

3. Transport

28301 Manufacture of agricultural tractors

29100 Manufacture of motor vehicles

29201 Manufacture of bodies (coachwork) for motor vehicles (except caravans)

29202 Manufacture of trailers and semi-trailers

29203 Manufacture of caravans

29310 Manufacture of electrical and electronic equipment for motor vehicles

29320 Manufacture of other parts and accessories for motor vehicles and their engines

30110 Building of ships and floating structures

30120 Building of pleasure and sporting boats

30200 Manufacture of railway locomotives and rolling stock

30910 Manufacture of motorcycles

30920 Manufacture of bicycles and invalid carriages

30990 Manufacture of other transport equipment n.e.c.

51220 Space transport

33150 Repair and maintenance of ships and boats

33170 Repair and maintenance of other transport equipment n.e.c.

45200 Maintenance and repair of motor vehicles

4. Built environment

41201 Construction of commercial buildings

41202 Construction of domestic buildings

42110 Construction of roads and motorways

42120 Construction of railways and underground railways

42130 Construction of bridges and tunnels

42210 Construction of utility projects for fluids

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Appendix:

42220 Construction of utility projects for electricity and telecommunications

42910 Construction of water projects

42990 Construction of other civil engineering projects n.e.c.

43110 Demolition

43120 Site preparation

43130 Test drilling and boring

43220 Plumbing, heat and air-conditioning installation

43290 Other construction installation

43999 Other specialised construction activities n.e.c.

71111 Architectural activities

71112 Urban planning and landscape architectural activities

74901 Environmental consulting activities

74902 Quantity surveying activities

5. Electrical and electronics

26110 Manufacture of electronic components

26120 Manufacture of loaded electronic boards

26200 Manufacture of computers and peripheral equipment

26301 Manufacture of telegraph and telephone apparatus and equipment

26309 Manufacture of communication equipment other than telegraph, and telephone apparatus and equipment

26400 Manufacture of consumer electronics

26511 Manufacture of electronic instruments and appliances for measuring, checking, testing, navigation and other purposes, except industrial process control equipment

26512 Manufacture of electronic industrial process control equipment

26513 Manufacture of non-electronic instruments and appliances for measuring, checking, testing, navigation and other purposes, except process control equipment

26514 Manufacture of non-electronic industrial process control equipment

26520 Manufacture of watches and clocks

26600 Manufacture of irradiation, electromedical and electrotherapeutic equipment

26701 Manufacture of optical precision instruments

26702 Manufacture of photographic and cinematographic equipment

26800 Manufacture of magnetic and optical media

27110 Manufacture of electric motors, generators and transformers

27120 Manufacture of electricity distribution and control apparatus

27200 Manufacture of batteries and accumulators

27310 Manufacture of fibre optic cables

27320 Manufacture of other electronic and electric wires and cables

27330 Manufacture of wiring devices

27400 Manufacture of electric lighting equipment

27510 Manufacture of electric domestic appliances

27520 Manufacture of non-electric domestic appliances

27900 Manufacture of other electrical equipment

33130 Repair of electronic and optical equipment

33140 Repair of electrical equipment

43210 Electrical installation

95210 Repair of consumer electronics

6. Aerospace

30300 Manufacture of air and spacecraft and related machinery

33160 Repair and maintenance of aircraft and spacecraft

7. Defence

84220 Defence activities

30400 Manufacture of military fighting vehicles

25400 Manufacture of weapons and ammunition

8. Manufacturing (all)

10130 Production of meat and poultry meat products

10200 Processing and preserving of fish, crustaceans and molluscs

10310 Processing and preserving of potatoes

10320 Manufacture of fruit and vegetable juice

10390 Other processing and preserving of fruit and vegetables

10410 Manufacture of oils and fats

10420 Manufacture of margarine and similar edible fats
10511 Liquid milk and cream production
10512 Butter and cheese production
10519 Manufacture of other milk products
10520 Manufacture of ice cream
10611 Grain milling
10612 Manufacture of breakfast cereals and cereals-based food
10620 Manufacture of starches and starch products
10710 Manufacture of bread; manufacture of fresh pastry goods and cakes
10720 Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes
10730 Manufacture of macaroni, noodles, couscous and similar farinaceous products
10810 Manufacture of sugar
10821 Manufacture of cocoa and chocolate confectionery
10822 Manufacture of sugar confectionery
10831 Tea processing
10832 Production of coffee and coffee substitutes
10840 Manufacture of condiments and seasonings
10850 Manufacture of prepared meals and dishes
10860 Manufacture of homogenized food preparations and dietetic food
10890 Manufacture of other food products n.e.c.
10910 Manufacture of prepared feeds for farm animals
10920 Manufacture of prepared pet foods
11010 Distilling, rectifying and blending of spirits
11020 Manufacture of wine from grape
11030 Manufacture of cider and other fruit wines
11040 Manufacture of other non-distilled fermented beverages
11050 Manufacture of beer
11060 Manufacture of malt
11070 Manufacture of soft drinks; production of mineral waters and other bottled waters
12000 Manufacture of tobacco products
13100 Preparation and spinning of textile fibres
13200 Weaving of textiles
13300 Finishing of textiles
13910 Manufacture of knitted and crocheted fabrics
13921 Manufacture of soft furnishings
13922 Manufacture of canvas goods, sacks, etc.
13923 Manufacture of household textiles
13931 Manufacture of woven or tufted carpets and rugs
13939 Manufacture of other carpets and rugs
13940 Manufacture of cordage, rope, twine and netting
13950 Manufacture of non-wovens and articles made from non-wovens, except apparel
13960 Manufacture of other technical and industrial textiles
13990 Manufacture of other textiles n.e.c.
14110 Manufacture of leather clothes
14120 Manufacture of workwear
14131 Manufacture of other men's outerwear
14132 Manufacture of other women's outerwear
14141 Manufacture of men's underwear
14142 Manufacture of women's underwear
14190 Manufacture of other wearing apparel and accessories n.e.c.
14200 Manufacture of articles of fur
14310 Manufacture of knitted and crocheted hosiery
14390 Manufacture of other knitted and crocheted apparel
15110 Tanning and dressing of leather; dressing and dyeing of fur
15120 Manufacture of luggage, handbags and the like, saddlery and harness
15200 Manufacture of footwear
16100 Sawmilling and planing of wood
16210 Manufacture of veneer sheets and wood-based panels
16220 Manufacture of assembled parquet floors
16230 Manufacture of other builders' carpentry and joinery
16240 Manufacture of wooden containers
16290 Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials
17110 Manufacture of pulp
17120 Manufacture of paper and paperboard
17211 Manufacture of corrugated paper and paperboard, sacks and bags

Appendix:

17219 Manufacture of other paper and paperboard containers

17220 Manufacture of household and sanitary goods and of toilet requisites

17230 Manufacture of paper stationery

17240 Manufacture of wallpaper

17290 Manufacture of other articles of paper and paperboard n.e.c.

18110 Printing of newspapers

18121 Manufacture of printed labels

18129 Printing n.e.c.

18130 Pre-press and pre-media services

18140 Binding and related services

19100 Manufacture of coke oven products

19201 Mineral oil refining

19209 Other treatment of petroleum products (excluding petrochemicals manufacture)

20110 Manufacture of industrial gases

20120 Manufacture of dyes and pigments

20130 Manufacture of other inorganic basic chemicals

20140 Manufacture of other organic basic chemicals

20150 Manufacture of fertilizers and nitrogen compounds

20160 Manufacture of plastics in primary forms

20170 Manufacture of synthetic rubber in primary forms

20200 Manufacture of pesticides and other agrochemical products

20301 Manufacture of paints, varnishes and similar coatings, mastics and sealants

20302 Manufacture of printing ink

20411 Manufacture of soap and detergents

20412 Manufacture of cleaning and polishing preparations

20420 Manufacture of perfumes and toilet preparations

20510 Manufacture of explosives

20520 Manufacture of glues

20530 Manufacture of essential oils

20590 Manufacture of other chemical products n.e.c.

20600 Manufacture of man-made fibres

21100 Manufacture of basic pharmaceutical products

21200 Manufacture of pharmaceutical preparations

22110 Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres

22190 Manufacture of other rubber products

22210 Manufacture of plastic plates, sheets, tubes and profiles

22220 Manufacture of plastic packing goods

22230 Manufacture of builders' ware of plastic

22290 Manufacture of other plastic products

23110 Manufacture of flat glass

23120 Shaping and processing of flat glass

23130 Manufacture of hollow glass

23140 Manufacture of glass fibres

23190 Manufacture and processing of other glass, including technical glassware

23200 Manufacture of refractory products

23310 Manufacture of ceramic tiles and flags

23320 Manufacture of bricks, tiles and construction products, in baked clay

23410 Manufacture of ceramic household and ornamental articles

23420 Manufacture of ceramic sanitary fixtures

23430 Manufacture of ceramic insulators and insulating fittings

23440 Manufacture of other technical ceramic products

23490 Manufacture of other ceramic products n.e.c.

23510 Manufacture of cement

23520 Manufacture of lime and plaster

23610 Manufacture of concrete products for construction purposes

23620 Manufacture of plaster products for construction purposes

23630 Manufacture of ready-mixed concrete

23640 Manufacture of mortars

23650 Manufacture of fibre cement

23690 Manufacture of other articles of concrete, plaster and cement

23700 Cutting, shaping and finishing of stone

23910 Production of abrasive products

23990 Manufacture of other non-metallic mineral products n.e.c.

24100 Manufacture of basic iron and steel and of ferro-alloys

24200 Manufacture of tubes, pipes, hollow profiles and related fittings, of steel

24310 Cold drawing of bars

24320 Cold rolling of narrow strip

24330 Cold forming or folding

24340 Cold drawing of wire

24410 Precious metals production

24420 Aluminium production

24430 Lead, zinc and tin production

24440 Copper production

24450 Other non-ferrous metal production

24460 Processing of nuclear fuel

24510 Casting of iron

24520 Casting of steel

24530 Casting of light metals

24540 Casting of other non-ferrous metals

25110 Manufacture of metal structures and parts of structures

25120 Manufacture of doors and windows of metal

25210 Manufacture of central heating radiators and boilers

25290 Manufacture of other tanks, reservoirs and containers of metal

25300 Manufacture of steam generators, except central heating hot water boilers

25500 Forging, pressing, stamping and roll-forming of metal; powder metallurgy

25610 Treatment and coating of metals

25620 Machining

25710 Manufacture of cutlery

25720 Manufacture of locks and hinges

25730 Manufacture of tools

25910 Manufacture of steel drums and similar containers

25920 Manufacture of light metal packaging

25930 Manufacture of wire products, chain and springs

25940 Manufacture of fasteners and screw machine products

25990 Manufacture of other fabricated metal products n.e.c.

28110 Manufacture of engines and turbines, except aircraft, vehicle and cycle engines

28120 Manufacture of fluid power equipment

28131 Manufacture of pumps

28132 Manufacture of compressors

28140 Manufacture of taps and valves

28150 Manufacture of bearings, gears, gearing and driving elements

28210 Manufacture of ovens, furnaces and furnace burners

28220 Manufacture of lifting and handling equipment

28230 Manufacture of office machinery and equipment (except computers and peripheral equipment)

28240 Manufacture of power-driven hand tools

28250 Manufacture of non-domestic cooling and ventilation equipment

28290 Manufacture of other general-purpose machinery n.e.c.

28302 Manufacture of agricultural and forestry machinery other than tractors

28410 Manufacture of metal forming machinery

28490 Manufacture of other machine tools n.e.c.

28910 Manufacture of machinery for metallurgy

28921 Manufacture of machinery for mining

28922 Manufacture of earthmoving equipment

28923 Manufacture of equipment for concrete crushing and screening and roadworks

28930 Manufacture of machinery for food, beverage and tobacco processing

28940 Manufacture of machinery for textile, apparel and leather production

28950 Manufacture of machinery for paper and paperboard production

28960 Manufacture of plastics and rubber machinery

28990 Manufacture of other special-purpose machinery n.e.c.

31010 Manufacture of office and shop furniture

31020 Manufacture of kitchen furniture

Appendix:

31030 Manufacture of mattresses

31090 Manufacture of other furniture

32110 Striking of coins

32130 Manufacture of imitation jewellery and related articles

32200 Manufacture of musical instruments

32300 Manufacture of sports goods

32401 Manufacture of professional and arcade games and toys

32409 Manufacture of other games and toys, n.e.c.

32500 Manufacture of medical and dental instruments and supplies

32910 Manufacture of brooms and brushes

32990 Other manufacturing n.e.c.

33110 Repair of fabricated metal products

33120 Repair of machinery

33190 Repair of other equipment

33200 Installation of industrial machinery and equipment

71121 Engineering design activities for industrial process and production

71122 Engineering related scientific and technical consulting activities

71129 Other engineering activities

71200 Technical testing and analysis

72190 Other research and experimental development on natural sciences and engineering

9. Other

01630 Post-harvest crop activities

01640 Seed processing for propagation

05200 Mining of lignite

07100 Mining of iron ores

07210 Mining of uranium and thorium ores

07290 Mining of other non-ferrous metal ores

08110 Quarrying of ornamental and building stone, limestone, gypsum, chalk and slate

08120 Operation of gravel and sand pits; mining of clays and kaolin

08910 Mining of chemical and fertilizer minerals

08930 Extraction of salt

08990 Other mining and quarrying n.e.c.

09900 Support activities for other mining and quarrying

36000 Water collection, treatment and supply

37000 Sewerage

38210 Treatment and disposal of non-hazardous waste

38220 Treatment and disposal of hazardous waste

38310 Dismantling of wrecks

38320 Recovery of sorted materials

39000 Remediation activities and other waste management services

49500 Transport via pipeline

58110 Book publishing

58120 Publishing of directories and mailing lists

58130 Publishing of newspapers

58141 Publishing of learned journals

58142 Publishing of consumer and business journals and periodicals

58190 Other publishing activities

80200 Security systems service activities

95220 Repair of household appliances and home and garden equipment

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