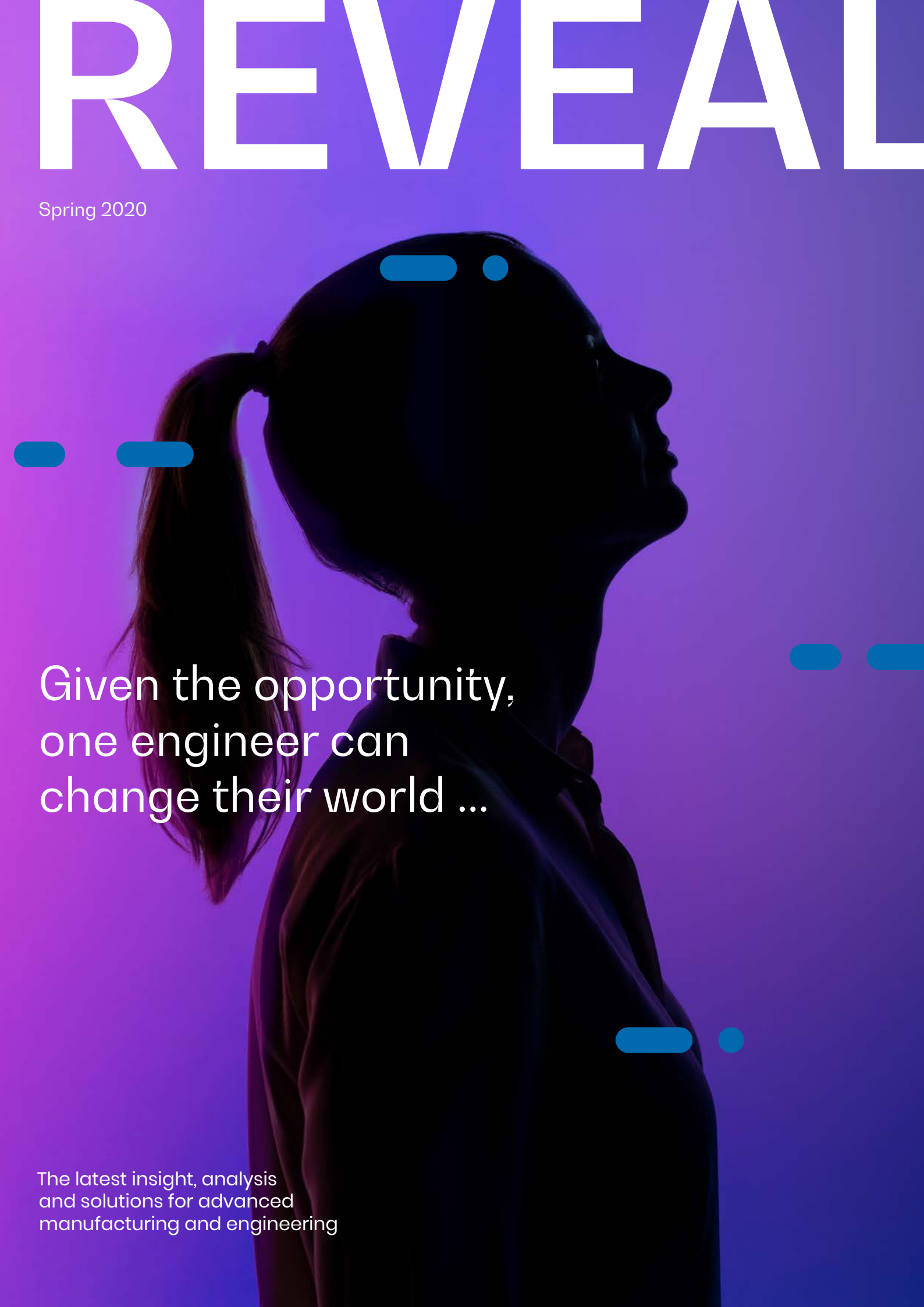
REVEAL

Spring 2020



Given the opportunity, one engineer can change their world ...

The latest insight, analysis and solutions for advanced manufacturing and engineering

A new organisation dedicated to creating practical solutions for individuals, educators, and manufacturing and engineering employers, who want to see and develop the skills needed to succeed, today and tomorrow.

Using unmatched expertise and data to create practical solutions for individuals and engineering employers so they can see and develop the skills they need to succeed – whether delivered directly to a business, via educators or online.

We work together with employers, educators and policymakers so engineers are given the opportunity to change their world and ours.

... and ours

Enginuity®

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This issue's cover photo and many images from the publication's interior are sourced from This Is Engineering's free image library as part of their wider campaign to change the image of engineering to be more inclusive and diverse.
www.thisisengineering.org.uk

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I'm delighted to welcome you to this Spring edition of RevEAL because as well as bringing you all the information you need to stay up to date on diversity, robotics, and funding and guidance across the four nations; this issue is also the first following the Semta Group evolution into Enginuity.

Welcome to Enginuity

As you're probably aware, in February the Semta Group, the employer-led skills body supporting the UK's engineering & manufacturing sectors, became Enginuity, a new engineering skills organisation, creating practical skills solutions for individuals, educators, and engineering and manufacturing employers, using unmatched industry expertise and data.

After years of planning, we publicly launched Enginuity on Thursday 6th February 2020. In the short time since that launch Enginuity's approach to Engineering Skills for a Smarter World has already created huge industry interest with positive features in Engineering, Manufacturing & Engineering Magazine, Manufacturing Management, The Engineer, People Management, BusinessGreen, The Manufacturer, Director Magazine and Training Journal. I was also invited on Jazz FM's Business Breakfast Show, BBC Radio Derby and BBC Radio Leicester to talk about Enginuity's exciting future.

The launch of Enginuity, a new type of engineering and manufacturing skills organisation, is a response to the challenges and opportunities faced by the sector. Engineers are at the forefront of tackling many of the biggest societal challenges we face today, such as how we create better-connected places to work and live, how we can prosper from the transition to a net-zero economy, and how technology can create a safer and healthier world. At the same time, Industry 4.0 is rapidly changing manufacturing and engineering.

To seize the commercial opportunities these challenges and this change creates, the UK manufacturing and engineering sector needs to adapt fast. Individuals, SMEs and large employers need to be able to see and develop the skills that will allow them to flourish, now and in the future.

Enginuity understands the potential data offers to give employers the confidence to make smarter decisions about the people and skills they need, today and tomorrow. This combined with the engineering expertise the Semta Group was known for, means Enginuity is perfectly positioned to be the connector UK engineering and manufacturing requires, for the sector to lead Industry 4.0 and offer fulfilling lifelong careers.

This is evolution, not revolution. We've maintained all the skills and expertise of Semta, but rapidly grown our capability and capacity in data and digital areas. We've employed a Chief Innovation Officer, head of digital design and data scientists as part of an Innovation Lab team. This team is responsible for exploring how we can use technology in a different way to enhance skills; bringing in technological and digital skills and blending them with existing engineering knowledge.

In short, Enginuity will enhance what Semta has always done brilliantly, but do it for the new digital world. By bringing employers, educators, and policymakers together, Enginuity will help to give engineers the opportunity to change their world and ours.

Digital technologies can discover and identify young people with the aptitude for a career in engineering and manufacturing. New platforms can help individuals make currently unaccredited skills visible to employers, and suggest where they can upskill or reskill. Better data about the skills employers need today and tomorrow can open an individual's career path into a universe of opportunities, with more routes to fulfil their potential with more employers in more areas.

Enginuity is not just a new name for the Semta Group; it's a way of thinking and solving problems. Our 'Enginuity' in marrying our existing engineering expertise and ingenuity with data. It's how we will design and constantly improve solutions that provide a great user experience for employers, educators and individuals. It's how we will create new products and services that are easy for employers and educators to integrate. It's how we will prove the business case for engineering skills development.

Together we can engineer the skills needed for a smarter world.

Ann Watson
Chief Executive, Enginuity

This Spring edition of RevEAL comes at a particularly exciting time for EAL. The evolution of the Semta Group into Enginuity creates new opportunities for EAL's specialist skills, awarding and assessment services for industry. Enginuity will build on the strengths of EAL and all the things individuals, educators and employers value from us whilst exploring how we might do such things better by using technology in a more advanced way.

Introduction

One such strength lies in industry qualifications. As part of the Semta Group, EAL has built an outstanding reputation as a provider of skills training, assessment and qualification quality assurance for industry. In fact, in the last decade over one million people embarked on an EAL qualification in schools, academies, colleges, universities and workplaces across the whole country.

EAL's recent work with City & Guilds in developing the T Levels in Construction and Building Services Engineering (BSE) continues ahead of their launch in 2021. In February a T Levels launch event took place at the Ironmongers' Hall in London and plans for a series of webinars to help prepare employers and providers for the new qualifications are underway.

In Wales, following last summer's successful joint bid between EAL and City & Guilds to deliver two T Level qualifications under the Construction route, both parties have been busy proactively working with stakeholders to ensure what is in development meets the needs of the sector.

What else does the evolution of Semta into Enginuity mean for individuals, educators and employers?

The practical skills solutions already offered by EAL will continue as part of Enginuity. Just as EAL was the Semta Group's specialist skills, awarding and assessment services organisation for industry; EAL will be Enginuity's specialist skills, awarding and assessment services organisation for industry.

If you are reading this and do not receive a copy directly to your desk give us a call on 01923 652400.

For a digital version of RevEAL or to sign up to Spotlight—our critical centre updates email—visit eal.org.uk.

Please share these articles freely and share your thoughts with us on social media using #RevEAL.

Alison Parkes
Managing Director, EAL and
Chief Customer Officer, Enginuity

Moving forward, better data will only improve the skills solutions currently offered by EAL, making these solutions more responsive to current and future needs, an even better user experience, and easier to integrate and measure. We are incredibly excited about the future and sharing developments with you over the coming months.

The intelligent use of data holds huge potential to help individuals and employers develop and see the skills that will allow them to flourish, now and in the future.

Enginuity's award-winning Engineering Talent platform is already an example of this thinking in action, providing individuals with better career pathways in engineering, helping employers recruit and retain talent, and delivering digital learning remotely.

As an online platform specifically designed to help individuals who want a future career in engineering and manufacturing industries, Engineering Talent allows individuals to find the job that best fits their skills and furthers their career development.

Engineering Talent also helps to take the pain out of recruitment by helping employers to place the right candidates in the right jobs.

It retains talent in engineering and manufacturing to reduce the ever-widening skills gap. Employers hire the best candidate for the right job at that time. But what happens to the rest of those who applied?

Large employers get inundated with applications for their apprenticeship places, often getting 20 applications per space, while SMEs often struggle to attract young people despite offering great opportunities. Engineering Talent encourages larger employers to signpost unsuccessful candidates to the online portal, where SMEs can post apprenticeship vacancies and job opportunities. Candidates can then input their skills, interests and location to view matching opportunities.

Engineering Talent also enables educators to provide trusted online resources to their learners. Today people can access learning materials anywhere, anytime, at the touch of a button, but how do you know these online resources are trusted, reliable and authentic?

We source online content for Engineering Talent that is relevant to qualifications, validated by our team of qualified curators, from a multitude of leading suppliers. Recent additions to the platform include six new interactive workbooks for Business Improvement Techniques (BIT) and three videos providing information for learners covering knowledge and competency requirements for Maintaining Mechanical Devices and Equipment (QPEO2/019N). Discover more education resources from Engineering Talent and get access at engineeringtalent.org.uk.

One way in which we've used data to drive innovation and improve service is through our Customer Satisfaction Survey (CSAT). You can read more about what we heard in our 2019 Customer Satisfaction Survey and the improvements we've made as a result in the CSAT article in this issue.

We continue to invest significantly in the development of the latest high-quality technology for delivering an enhanced end-to-end EPA service for employers and training providers. I am pleased to say that since the Autumn/Winter edition of Reveal our dedicated EPA team has expanded the portfolio of standards we offer from 18 to 23, with a further application currently in progress.

This edition also contains an excellent article on the findings of the Melrose Diversity project. The UK advanced manufacturing and engineering sector employs 1.7 million people in the UK, yet only around 12% of engineers and technicians are female. We'd love to hear your views on this research.

With diversity in mind, I was personally thrilled to see that women represent one-third of the finalists for this year's Enginuity Skills Awards. In fact, in the apprentice categories, female engineers represent half of the shortlisted entrants for the first time.

I'm pleased to see trailblazers like these women getting the recognition they deserve, making them powerful role models to inspire others to follow in their footsteps.

A full rundown of all the nominated apprentices, champions of skills development and innovative engineers tackling society's biggest challenges can be found in our feature on the Enginuity Skills Awards. I hope you will help celebrate them by sharing this article on social media.

In 2020, working together, we will take even greater strides towards helping engineers change their world and ours.

After years of planning we're delighted to finally be able to share with you the Semta Group's evolution into Enginuity; a new type of engineering and manufacturing skills organisation, creating practical skills solutions using unmatched industry expertise and data.

Revealing Thoughts:

Engineering Expertise

+

Ingenuity with Data

=

Enginuity

Enginuity is not just a new name for the Semta Group, it's a way of thinking and solving problems.

The visionary engineers changing our world today are demonstrating their 'Enginuity' by bringing together engineering expertise with ingenuity with data; pioneering new solutions in areas such as the future of mobility, energy storage, and early diagnosis.

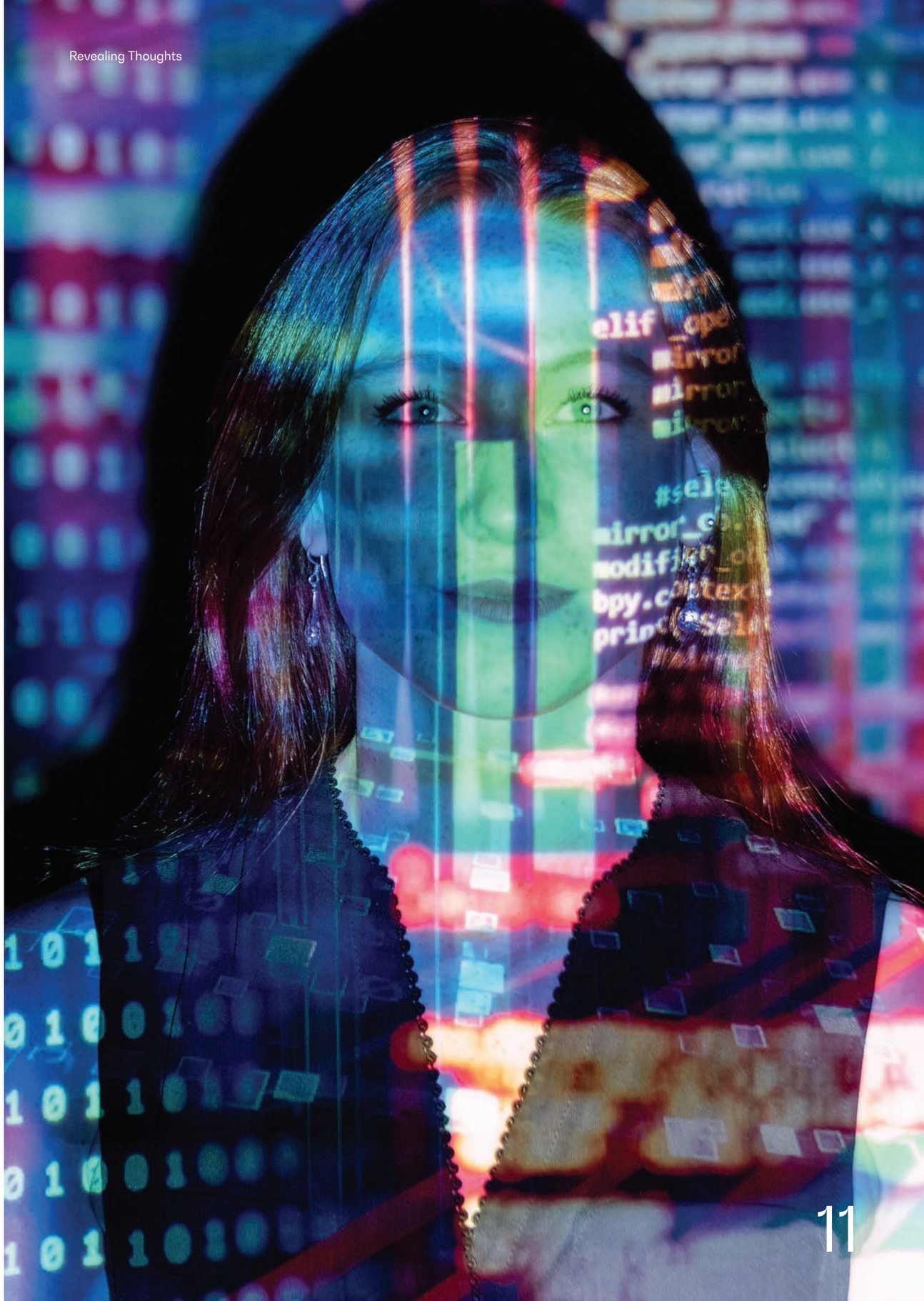
This 'Enginuity' is also at the heart of Industry 4.0, powering technologies such as smart factories, lights out manufacturing and the industrial internet of things.

Our journey to launching Enginuity started two years ago, following a major strategic review. We looked closely at the impact of Industry 4.0 on engineering and manufacturing. Something we noticed was that traditionally, each industry sector had very distinct skills needs, whether it be aerospace, automotive or rail. Those sectors were very different in terms of what they needed from skills.

With the wider adoption of technology and the growing importance of digital skills, we saw that all of the sectors' needs were starting to align. That change indicated to us that we had to do something different too. There was a need for Semta to modernise itself, and to see what we could do with the new technology; how we could apply the thinking and the technologies of Industry 4.0 to the world of skills, and how we could use that to better serve employers and their own skills needs.

We understand the potential data offers to give employers the confidence to make smarter decisions about the people and skills they need, today and tomorrow. This combined with the engineering expertise the Semta Group was known for, means Enginuity is perfectly positioned to be the connector UK engineering and manufacturing requires for the sector to lead Industry 4.0 and offer fulfilling lifelong careers.

To deliver this vision, we've invested in a talented team of experts including a Chief Innovation Officer, Head of Digital Design and Data Scientists. In our newly established Innovation Lab, working closely with our existing engineering experts across the business, these individuals use digital skills to unlock new ways of thinking and working.



"If we can unlock the hidden potential of these young people, we will not only provide amazing talent for the engineering and manufacturing sector, but give many young people a career they might otherwise have never discovered."

Digital technologies can discover and identify young people who have the aptitude for a career in engineering and manufacturing. New platforms can help individuals make currently unaccredited skills visible to employers, and suggest where they need to upskill or reskill. Better data about the skills employers need today and tomorrow can open an individual's career path into a universe of opportunities, with more routes to fulfil their potential, with more employers, in more areas.

We've maintained all the skills and expertise of Semta, but with the Innovation Lab, rapidly grown our capability and capacity in data and digital areas. In short, Enginuity will enhance what Semta has always done brilliantly, but do it for the new digital world.

The Innovation Lab is committed to exploring new digital technologies to engage young people in engineering and manufacturing.

The UK's engineering industry is facing a skills shortage of unprecedented levels. To tackle this shortage we need to recruit 60,000 new people into the sector every year until 2024.

Despite several flagship STEM initiatives, attracting young people to the sector has been slow. EngineeringUK's research[1] suggests that the proportion of young people aged 11 to 19 who would consider a career in engineering increased by just 11% between 2013 and 2017. We need to look beyond the traditional methods of attracting new talent used over the last few years.

Gaming is a potentially huge channel to reach young people, which also happens to have an even gender split. Minecraft, for example, regularly achieves over 100 million players worldwide over a single weekend.

The Innovation Lab is currently exploring how gaming can be used to discover and identify young people who have the aptitude for a career in engineering and manufacturing.

Gaming can reach amazing talent we haven't traditionally been able to bring into the engineering and manufacturing sector. It attracts a broad audience including those from disadvantaged backgrounds, ethnic minorities, and social mobility challenges. The gaming audience embraces all forms of diversity, including neurodiversity.

We've built a game in Minecraft to identify specific engineering related skills in young people. It's designed to increase self-awareness of skills, demonstrate to young people how they can apply those skills in certain careers, and highlight opportunities and potential career paths to learners at a regional or industry level.

The first version of the game, based in an electric vehicle factory, embeds engineering skills and competencies in the play. In working through the game the player will encounter opportunities to demonstrate aptitudes in engineering thinking. Other engineering environments can be created in the future.

In a safe and fun environment this game will enable young people to demonstrate a number of skills including critical reasoning, communications, digital competencies, engineering process, risk awareness, quality, application of knowledge, determination and resilience, observation and assessment, creative thinking, health and safety and problem solving - in other words the benchmark standard we look for in an Engineering Technician at Level 3.

So for a young person who's playing the game, it will show them how they're evidencing their engineering thinking and engineering skills, with a view to actually illustrating that engineering could be a career for them. Skills they may not currently be able to demonstrate in an academic way, or in a CV, interview or assessment centre.

Players will be able to access the game online at home, at school, in college or learning centre.

David Ivell, Enginuity's Chief Innovation Officer explains:

"The prize for us is getting young people into employment, onto an apprentice programme or giving them a clear direction. We will do this in this first phase by enabling the game as a competition with prizes of STEM experiences or educational bursaries for those over 16. We will collect data to identify specific players and determine what region they are in, allowing local employers to provide experiences for users.

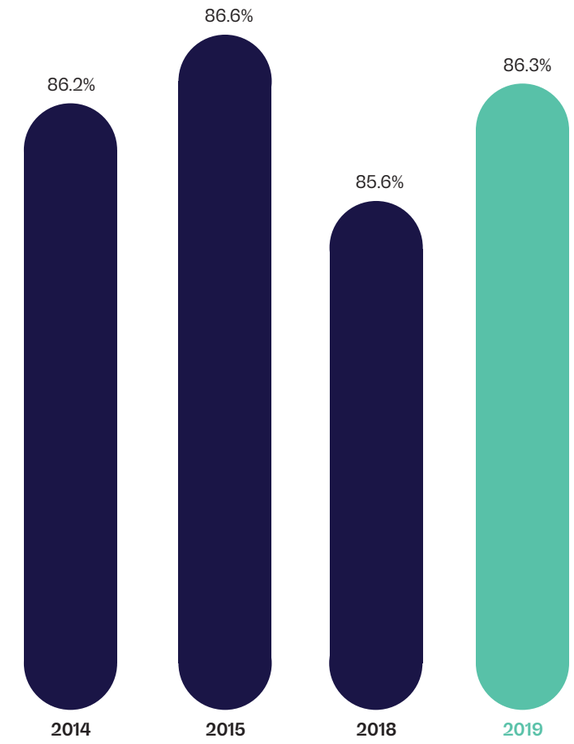
"If we can unlock the hidden potential of these young people, we will not only provide amazing talent for the engineering and manufacturing sector, but give many young people a career they might otherwise have never discovered."

But digital platforms aren't just for young people. Online lifelong learning tools can help individuals and employers document skills and competencies, match existing skills to emerging technologies, and identify skill gaps and the most relevant opportunities for training and upskilling.

We're already using technology to trawl the internet and pull in lots of different data feeds about emerging skills sets including new skills we're seeing in job descriptions and job ads, so we can help to build a picture of the future for employers. We can then put the practical steps in place, such as reskilling and redeployment, to enable them to meet that future head-on.

As Enginuity, we will take even greater strides towards helping engineers change their world and ours.

Source: TLF, EAL Customer Satisfaction Survey, 2019. Note: Data collected from a randomised sample set of over 50% of EAL active and recognised centres.



CSAT 2019 Update:

Positive Feedback Cycle

Delivering the goal of exceptional customer experience isn't the work of one outstanding individual or even a highly-trained team. It takes the dedication and skill of an entire organisation. By listening to our customers, we've made significant improvements to our service in the past 12 months, with more enhancements already underway. Discover how we've made customer's lives easier and why the future is even brighter for EAL centres.

"Basically, they're a very user friendly organisation. I raise any queries with them, and they respond very promptly, usually the same day, but with other awarding bodies I have to email them and get a response in a few days, so that's a problem with other awarding organisations."

Alexandra Buckingham
Customer Experience Manager, EAL

What We Stand For
At the heart of our service are the ever-evolving needs, expectations and challenges of our customers. As we support our centres and learners in their pursuit of excellence, we too continuously strive to reach new heights. Delivering on the promise of our name, Excellence, Achievement and Learning (EAL), means committing to a continuous cycle of improvement. It's a huge team effort and one that we're all passionate about – everyone at EAL plays a vital part in our success.

Our entire team, not just those in Customer Experience, have contributed to consistently delivering some of the very best service our sector has to offer. Yet, we are never satisfied. Over the last decade, we have measured our performance in line with the things that matter most in the eyes of our customers. So that we can serve you better.

Not all organisations share our commitment. Some lack the courage, or even the courtesy, to ask the most basic questions of their customers. Perhaps this is because when you ask a question, you may not always like the answer you get back. But we strongly believe that feedback of any kind is a gift, and if someone takes the time to tell you their story, they care about it and they care about the outcome.

Each year, we use The Leadership Factor (TLF),[1] an external independent expert agency to engage with our customers, to ensure we receive open, honest and transparent feedback. On our behalf, they conduct a wide-ranging, non-preselected survey, speaking to people in a variety of roles, who have used our products and services.

Over the years you have provided us with truly valuable insights into the quality of our service, and last year proved no different. You recounted some wonderful stories about the great experiences you've had across EAL. You also gave us some things to reflect on and improve. One thing is for sure – we remain deeply committed to listening and making our service better for you, and everyone who follows.

Our Customer Experience Team is dedicated to ensuring the service you receive is of the highest standard. The team is led by Customer Experience Manager, Alexandra Buckingham, who outlines some of this year's headlines:

Consistently High Performance
We're delighted to have achieved and maintained satisfaction scores in the highest echelon with the 2019 customer satisfaction survey, showing an overall satisfaction score of 86.3% on the education league table. This places us right in the top quartile for the 9th year in a row, in comparison to other providers in the sector. This serves as a positive endorsement of the value we place on delivering the highest standards of service to our customers across the entire EAL team.

"Every time I've been in touch with them or had anything to do with their quality people or assurance people they've been bang on the money, pleasant and courteous. They're very good, and I've been dealing with them for about 20 years and the staff were equally as good then as they are now."

Since 2015, we have achieved an average satisfaction score of 86.1% – performing consistently highly on standards of service. This year, we achieved results above average for the past five years, so we continue to move in all the right directions, whilst always looking for continuous improvement and what we can do better.

The lowest score received for another organisation was 62.2%, (the highest was 88.5%) a long way beneath our performance which indicates the low levels of service some customers encounter from other providers.

Overall Satisfaction
We saw increases in satisfaction scores across most customer needs, with year on year improvements or maintained standards in 94% of measured areas. Respondents who gave us the highest satisfaction scores prioritised good customer service, quick response times and cited positive relationships with our team. They mentioned our service as being, "very approachable," and "extremely friendly," "clear to understand," with "fast responses."

Satisfaction scores across most areas of customer importance improved, with usefulness, quality of learner assessment, value for money and the range of qualifications we offer seeing the biggest gains in satisfaction.

Satisfaction scores for the speed with which customers receive their certificates, the effectiveness of our exams system, and the relationship and expertise of External Quality Assurers showed a continuation of exceptionally high levels of service.

When It Matters Most
We live in an imperfect world, so if a problem arises, we see it as an opportunity to reflect on what went wrong, to ensure that we understand the root cause, then make a correction and improve that part of the service for all of our customers.

Over the years we've learned that the most important things for our customers are our ability to solve their problems, providing clear points of contact and keeping them informed about issues they've raised. Customers felt better for their interaction with us and reflected that in their feedback with their overall satisfaction score moving from 86.3% to between 89.1% and 93.2%. That being said, we do not want you to have a problem of any description!

If and when issues arise, some degree of dissatisfaction is inevitable, at least at the outset. The mark of a good business is how they diminish that emotion. The mark of great, customer-focused businesses is their ability to make success stories out of the little hiccups they encounter. In creatively solving problems, often with a smile, we've nurtured loyalty in our customer base in the form of people who are happy to recommend us.

Real Life Impact
Our Customer Experience Team has a privileged view of our customers' satisfaction. There are so many valuable insights, it is worthwhile exploring how we

"Our customers are central to helping us drive the design for improvement in their customer journey – without speaking to them first-hand, this is all just assumption and guess work."

have reacted to feedback and what that means in real terms for our customers.

We pride ourselves on being proactive. As a result of the feedback from this survey, we produced a set of six informative communications that were emailed to all Centre Coordinators, to address training issues we'd highlighted during the course of following up with customers. For each of the communications, a guidance document and video were developed and provided in tandem to address people's preferred communication style. We've also put in place an interactive Frequently Asked Questions (FAQs) section. With our inclusive approach to problem solving, we ensured that we're not just easy to do business with, but that our subsequent interactions improve overall customer experience.

We can also engage with customers instantly by using a remote access software tool. The tool enables us to work remotely on a computer in a centre, so we can guide the user through the platform and show them what to do in real-time across the range of platforms, which customers find impressive. This is a great way for us to connect with customers and refresh their training – and the feedback has already been really positive.

At EAL we believe that every interaction with our customers is an opportunity to improve their experience. We strive to do better tomorrow what we did today, keeping what matters most to our customers the primary focus. It's a work ethic that is engrained in our culture.

"We use technology to enhance our service levels, not to replace them. Our friendly and professional Customer Experience Team will always be on hand to deliver you the personal touch."

Our Work Doesn't Stop
Despite all the positive soundbites, this remains an ongoing continuous programme of improvement. We have achieved some great outcomes for customers, but our goals are higher still, so we will continue to work together with you to make the interactions even easier.

In addition, our Customer Experience Consultants are working towards their Improving Operational Performance Apprenticeship and applying their learning practically in identifying opportunities for improvement. We're living and breathing our work and really enjoying it at the same time.

Our continually high standards aren't just down to one team though – they're owned by the whole organisation and everyone at EAL who works hard every day to deliver excellent service to all our customers.

We want to take this opportunity to thank you for your continued support and contribution to our ongoing drive for continuous improvement. The new customer satisfaction survey will be conducted later this year and we look forward to hearing your views.

If you have any comments or suggestions for improvement in the meantime, it would be great to hear from you. Contact our friendly Customer Experience Team by emailing customer.experience@eal.org.uk or by phoning 01923 652400.

You Asked, We Did

Following customer requests, we've made several significant improvements to our service this year. Detailed help documentation and instructional videos were created to support each of the following new feature releases.

01 **Online ordering service:** you can now order Replacement Learner Certificates, EAL Publications (excluding hard copy textbooks) and Employee Rights and Responsibilities (ERR) Workbooks direct from your online account.

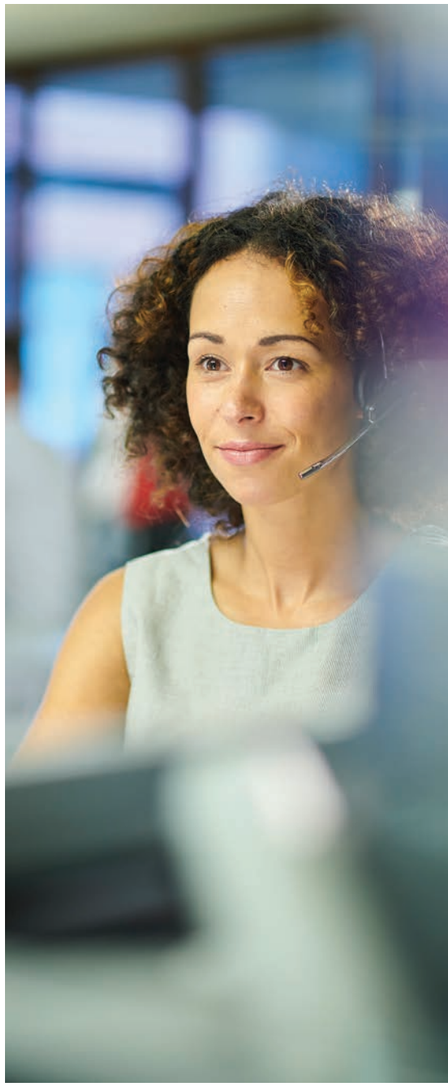
02 **Remove historic learners from your Online Service account:** This enhancement allows Centre Coordinators, or authorised Sub Users to remove historic learners without contacting us, saving time and keeping your admin clean and current.

03 **View enhanced candidate registration and certification data before submitting to EAL for processing/ claiming:** This enables customers to view each candidate's certificate claim and ensure the correct units have been assigned to their qualification.

04 **Qualification pathway review dates are now visible to customers:** This makes it easier to identify the expiration dates of qualifications that learners are registered against.

05 **Remote access:** Allows us to remotely log on to a Centres machine and visually guide users through our platforms.

"... it was so useful having somebody to guide me remotely around the platform rather than reading manuals and trying to figure it all out. I think the remote training is definitely the way to go."



Future Online Enhancements
The most requested user enhancements to our online service, as voted for by you. Here's what we're currently working on:

01 Bulk certification upload
02 The ability to add additional units post registration.
03 A filter for chosen registered units to reduce the need to scroll.
04 The ability to make full name change requests.

As an awarding organisation recognising dedication, innovation and inspiration, EAL knows talent – and how to engineer it. That's why this year, EAL and our award winning recruitment/learning platform Engineering Talent are proud to be two of the principal sponsors of the inaugural Enginuity Skills Awards 2020.

24th September 2020,
8 Northumberland Avenue

Despite our very best efforts, due to the spread of the Corona virus (COVID-19) and uncertainty surrounding indoor and large scale events, we are truly sorry to announce that we are postponing the Enginuity Skills Awards until the 24th September 2020.

We know that this will be disappointing news, however, the safety and wellbeing of all our guests are of paramount importance.

The awards bring together industry leaders to recognise brilliant apprentices, champions of skills development, and innovative engineers tackling society's biggest challenges. And, as the UK's most prestigious awards in the industry, we're looking forward to recognising and celebrating skills in the UK advanced manufacturing and engineering sectors over 13 categories.

The Enginuity Skills Awards are a celebration of Enginuity's belief that one engineer can change their world and ours, given the opportunity, and this is our opportunity to honour the people who make a difference to their workplace, and the wider industry. We'll also be celebrating the ingenious engineers who are inspiring the next generation, ensuring UK advanced manufacturing and engineering has a bright future.

Enginuity Skills Awards 2020

Our host for this year's awards is Steph McGovern.

Principal Sponsors

Skills Champion of the Year

eal Part of the Enginuity Group

Philip Long
Babcock Training Limited

Jason Phin
Siemens PLC

Anita Davenport-Brooks
Lander Automotive Ltd

Manufacturing and Materials Innovation

Sponsored by

Engineering Talent

Lloyd Ash
Ashwood Electrical Motors

Benjamina Bollag
HigherSteaks

Patrick Dodds
Hexigone Inhibitors

Graduate or Degree Apprentice of the Year

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THE ENGINEER

Catherine Llewellyn-Jones
Airbus Operations Ltd

Jake Duthie
Pipeline Induction Heat Ltd

Anesu Chivenga
Rolls-Royce PLC

Michael Jones
Thales UK

SME Apprentice of the Year

Sponsored by

BAE SYSTEMS

Kerrie-Jo O'Flynn
Oxford Space Systems

Davina Kaur
RNA Automation Ltd

Jonathan Keating
MACS Automated Bollards

Sadie Kennedy
Hyde Details Ltd

Large Employer Apprentice of the Year

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Samuel Garner
Perkins Engines Company Ltd

Matthew Booth
AMRC Cymru

Alexander Moody
Siemens Mobility Ltd

Raisa Matadar
Jaguar Land Rover

SME Investment in Skills

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PM Training and Assessing Ltd

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University of Sheffield AMRC Training Centre

Skillnet

JTL

Diversity in Engineering

Sponsored by

Bolton College

STEM Returners

InterEngineering LGBT

Skills Innovation of the Year

Sponsored by

Signalling Training Mobile Classroom by PM Training

Unipres Training Academy by Unipres

The Dynamic Demand Planning Tool by Network Rail Training

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Humanising Autonomy

James Johnston
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The Healthier & Safer World Innovation

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Perceptual Robots

Joel Gibbard
Open Bionics

Laurence Kemball-Cook
Pavegen Systems

The Energy Revolution Innovation

Sponsored by

Miles Franklin
Graviticity Ltd

Dr Sabrina Malpede
ACT Blade Ltd

Dr Alexander William Faris Reip
Oxford nanoSystems

Skills Collaboration of the Year

Sponsored by

Jaguar Land Rover and Supplier Skills Network Group

Newport Wafer Fab and Smart Solutions

Langley and Dudley College

The continued success of the Enginuity Skills Awards depends upon the generosity and expertise of our much-valued sponsors – those who help to give widespread recognition and assure that each winner is worthy by being part of our judging panel.

Their valued investment makes it all possible for the many companies and individuals who take part, and we're delighted that the awards are supported to showcase the pioneering employers, individuals and innovative skills solutions we have in our sector.

In return, sponsors gain a unique opportunity for sector-wide recognition; reaffirming their position as leaders in the industry and underscoring their organisation's ongoing commitment to skills development.

We are also very grateful to our supporting partners, as their generous backing also helps to make the awards one of the highlights of the year for our sector.

Our host for this year's awards is Steph McGovern, the ever-popular journalist and TV presenter, and we're delighted to be welcoming her back to this year's ceremony. Steph is a big advocate for engineering and has worked for the BBC as the main business presenter for BBC Breakfast, often co-hosting the entire programme.

This year's event is set to be bigger, brighter and bolder than ever before and, for those who have their tickets to this now sold-out event, we look forward to seeing you there.

Interested in sponsoring next year's Enginuity Skills Awards? Sponsorship comes with a host of benefits. To find out more contact our Customer Experience team on 0845 643 9001 or email Customer.Services@enginuity.org today.

The Nations

Updates on the latest reforms across the four nations

Scotland

Scotland: The Future of Skills and the Fourth Industrial Revolution
SCDI's Skills & Employability Leadership Group have published their report 'Upskilling Scotland: The Future of Skills and the Fourth Industrial Revolution', recommending the skills Scotland needs to thrive in the Fourth Industrial Revolution.

Bringing together experts from each sector and every part of Scotland, in strategic partnership with Skills Development Scotland, the Leadership Group considered evidence and heard from businesses and organisations on what steps were necessary to foster the skills Scotland needed to succeed in making the most of the opportunities that lie ahead.

Three key pillars structure this report and its recommendations: a high skill/ productivity, high wage and high growth Scottish economy; High Performing Individuals, including future skills and meta skills, the learning ecosystem, the talent pipeline and access to talent and migration policy; High Performance Workplaces, including skills recognition, supply and demand, innovative, inclusive recruitment, leadership and management and fair work; and In-Work Development, including reskilling and upskilling, work-based learning and lifelong learning.

The report calls for an Upskilling and Lifelong Learning Fund to give everyone in Scotland a lifelong entitlement. Anyone could use this fund to finance reskilling and upskilling opportunities at any stage of their life or career.

New website helps Scottish employers find right support
A new Economic Action Plan for Scotland includes a website containing hundreds of products, services and events from Scotland's enterprise and skills agencies that makes it easier for businesses in Scotland to get information and support. The new site is one of the commitments in the refreshed plan, launched by Economy Secretary Derek Mackay, and will be further developed to host content from across Scotland's public sector.

Scottish Budget 2020-21
Scotland's spending plans for the year ahead were released in the Scottish Budget 2020-21.

A record £15 billion invested in health and care services, £645 million for the expansion of early learning and childcare, and £180 million to raise attainment in schools are some of the main proposals.

An Enterprise, Trade and Investment priority is investment in the new National Manufacturing Institute Scotland (NMIS) and the related Lightweight Manufacturing Centre. These aim to bring together research, industry and the public sector, enabling companies across Scotland to embrace new manufacturing techniques, support research and develop the skills of the workforce.

The budget, including funding delivered through the local government settlement, in terms of Education and Skills, will fund:

01 Bringing the starting salary for a fully qualified teacher to £32,994 from April 2020 (a minimum increase of 13%) significantly higher than anywhere else in the UK.
02 Helping improve school performance and closing the attainment gap - including £120 million for the Pupil Equity Fund, spent entirely at the direction of schools themselves.
03 Almost doubling the current level of Early Learning and Childcare to 1,140 hours per year by an expanded budget of almost £645 million.
04 Increasing resource funding for further education by an above inflation of 3.6%, supporting Scotland's successful college sector.
05 Boosting funding for higher education to maintain Scotland's global reputation.
06 Expanding the skills and training budget, spurring the drive to develop more apprenticeships.

Education-based Advanced Learning and Science priorities include:

01 Promoting learning and research in Scotland through our Global Alumni network and Saltire Scholarship programme.
02 Developing an Adult Learning strategy and a Youth Work strategy in partnership with the wider skills system.
03 Supporting the continuing work of the SQA Accreditation Unit and promoting the Scottish Credit and Qualifications Framework.

Other key education funding announcements include:

04 Delivering key commitments in the STEM Education and Training Strategy to ensure we provide further and higher education that meets the changing needs of employers and learners across Scotland.
05 Guaranteeing higher education remains free of tuition fees for all eligible Scottish or EU-domiciled undergraduate students studying at our Universities.

Wales

Building the future of qualifications in Wales
Following the sector review of qualifications and the qualifications system in Construction and the Built Environment, Qualifications Wales identified the need for a single awarding body to ensure quality and consistency, and to make sure that the content and design of qualifications meet the needs of employers across Wales.

In summer last year, Qualifications Wales appointed EAL and City & Guilds (C&G) as a consortium to be that awarding body. Following the successful joint bid, both parties have been proactively working with stakeholders to ensure what is in development meets the sector's needs.

Descriptions of all qualifications are now in development with EAL and C&G working together – led by project managers Paul Rice (EAL) and Darren Norris (C&G) – alongside the Welsh government which has responsibility for apprenticeships.

Under the new guidelines, qualifications will be offered at Foundation, Progression and Level Three. Foundation (Level Two) allows learners to familiarise themselves with two separate trades before deciding which to specialise in, and Progression, which is also Level Two, which allows them to focus on one particular trade. Level Three is designed for learners at apprenticeship level.

Under the new guidelines qualifications will be assessed in a similar way with an onscreen test, a professional/technical discussion and a practical project undertaken over 80 hours.

The consortium will be submitting final versions of the qualification and assessment descriptions to Qualifications Wales in November 2020 and then, once approved, these will go live across Wales from September 2021. All qualifications will be available in both the English and Welsh languages.

Paul Rice, project manager at EAL, commented: "This is an exciting and challenging project and we're enjoying finalising the working document from which all the qualifications are being designed.

"It's been hard work, but the consortium is working really well together, and we know there is real value in what we are doing. It's so important to give learners the opportunity to get more information on the whole Construction and the Built Environment sector, not just one or two areas.

"We are opening horizons and standardising learning across the sector, which will be of huge benefit to employers and future employees alike."

The engineering and manufacturing review is currently underway in Wales with the findings due in Autumn 2020. Keep up to date with the developments in future editions of RevEAL.

To find out more visit our website at eal.org.uk, call our Customer Care team on 01923 652400 or email customercare@eal.org.uk

Energising Welsh manufacturing
The Welsh Government is developing a new plan to energise the manufacturing industry and help it meet future challenges.

Expected to be published in April this year, the plan will identify the steps needed to develop an advanced manufacturing sector that is resilient and a strong workforce with the up-to-date skills needed to deliver the products and technologies for a connected and sustainable economy.

A summit will bring together key players to discuss how best to protect and grow manufacturing in the Welsh automotive industry. Called 'The Road Ahead for Manufacturing in Mobility', the event will also look at how the way people travel will change in response to environmental and technological developments.

Although the Welsh automotive sector experienced growth in production between 2010 and 2017, the industry now faces fundamental challenges, particularly after Ford announced the closure of its Bridgend base and by Honda closing its Swindon operations, all of which will impact the Welsh supply chain.

Rail industry experts help shape proposals for Global Centre of Rail Excellence in Wales

The Welsh Government has been working with rail industry experts and academia, in partnership with Neath Port Talbot and Powys Councils, to help refine proposals for a Global Centre of Rail Excellence in Wales.

An Innovation Accelerator will be established, which will be a key part of the project bringing together the rail industry, academia and R&D centres. The accelerator's purpose is to innovate, develop, test and validate new solutions for the rail industry as well as to support and speed up commercialisation and access to market of emerging technologies.

The final masterplan proposals will form the basis of statutory consultation before the planning application for a Global Centre of Rail Excellence in Wales is submitted.

EU boost for Welsh manufacturing
Since 2007, EU-funded projects in Wales have created 49,000 jobs and 13,400 new businesses, helping over 27,000 businesses and enabling 90,000 people to move into employment.

The £20 million Advanced Manufacturing Research Centre, AMRC Cymru, opened in Broughton, Deeside in November 2019, was described by Economy Minister Ken Skates as a "magnet project which will drive innovation and excellence as well as having a big impact on our economic outlook."

Thanks to an additional £1.25 million EU funding, employees in industry across East Wales will also benefit from high level skills opportunities.

The College of Engineering at Swansea University will be delivering a series of accredited training modules at NQF levels 4-8 to 400 people, via flexible, employer-friendly classroom or online learning methods.

The Materials and Manufacturing Education Training and Learning (METaL) project already covers West Wales and the Valleys, and Swansea University has worked with employers, including Tata Steel, developing targeted courses to fulfil industry demand. This additional funding will benefit further accredited, work-based training in the key growth area of manufacturing until 2022.

Welsh Government target of creating 100,000 apprenticeships set to be exceeded.

Economy Minister Ken Skates has said the Welsh Government is on course to exceed its target of providing 100,000 all-age, high quality apprenticeships across the country during this Assembly term.

Since the target was proposed, over 74,000 people have become apprentices, boosting their career prospects and allowing them to learn while earning a wage.

Mr Skates was speaking as part of Apprenticeship Week - a week-long series of events taking place across the nation celebrating the hard work and dedication of apprentices as well as the support and commitment shown by their employers.

The Welsh Government's Apprenticeship Skills policy aims to align apprenticeships with the needs for a flourishing Welsh economy with a highly skilled workforce, enabling Wales to compete in the global market.

England

Support for T Levels launch
The first of the new T Level qualifications are launching later this year, so we wanted to share an overview of what they are and how we're providing support for their introduction.

T Levels are post-GCSE courses which have been developed in collaboration with industry to offer 'on-the-job' experience during an industry placement, as well as classroom learning, and will be equivalent to three A-levels.

The qualifications will help prepare students for work and candidates will be awarded one of four overall grades after their two years of study, ranging from distinction* to a pass.

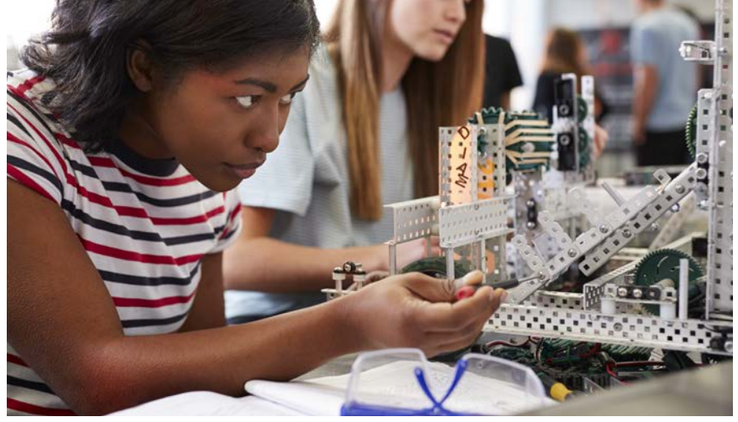
The government's vision is for T Levels to deliver world-class technical education and give learners a new choice after their GCSEs. Their introduction moves us closer to a system where students choose one of three routes at post-16 - A-levels, apprenticeships or T Levels, and is the latest step in the government's wider review of Level 3 qualifications.

EAL is working with City & Guilds to develop the T Levels in Construction and Building Services Engineering (BSE) - which will be launching in 2023.

We are also working with providers and employers on the practicalities of delivering them – and together EAL and City & Guilds held a T Levels launch event in February at the Ironmongers' Hall in London.

Speakers at the event were Patrick Craven - Executive Director of Strategic Partnerships, Policy and Contracts for City & Guilds, Pamela Rahman - Director for Implementation and Delivery for the Institute for Apprenticeships and Technical Education, and Alison Parkes - Chief Customer Officer for Enginuity and Managing Director for EAL

The event included updates on the T Levels advancements and key milestones for these new technical



qualifications, as well as discussions about how we can better interact with employers, and comments regarding concerns over post T Level progression and progression funding.

Emma Niblett, Head Of Customer Transformation Projects, commented: "The introduction of t levels is a major development for post 16 qualifications and provides a practical alternative for learners wanting classroom based learning with an integrated placement to put their skills into practice.

"We're aware that there are concerns from employers and providers about progression routes, particularly in some areas of construction and BSE, and funding and we will be continuing to strengthen links with employers and listen to their feedback as we work with City & Guilds to design and launch these qualifications for our sector in 2021."

EAL and City & Guilds are committed to using employer and provider feedback to develop qualifications that work for providers and employers, and we have organised a series of webinars to help prepare for the introduction of T Levels – to find out more about these please check the EAL and City & Guilds websites regularly for updates. Our team is also very happy to speak on a one-to-one basis with anyone who has questions or concerns about T Levels, so please get in touch with Emma Niblett, Head of Customer Transformation Projects at EAL on Emma.Niblett@eal.org.uk and she'll make sure you are put in contact with the right people to help.

University programme empowering BAME students is a success

The University of West of England started its Equity programme for Law and Business students two years ago in order to promote pay and career prospects for its Black, Asian and Minority Ethnic (BAME) graduates.

They have since opened the programme to all faculties and made 100 spaces available, which is now over-subscribed with a 70 long waiting list. 4,049 UK-based BAME undergraduates study at UWE this year, out of a total student population of 30,000.

BAME students often face a disadvantage in the jobs market after graduating, according to national statistics. UWE Bristol launched Equity as part of its commitment to empower BAME students to go on to great things after graduation.

Research in 2016 that showed black graduates were twice as likely to be unemployed than white graduates.

The latest figures showed black graduates were still paid less and employment rates remained lower at 51%, compared with 61% of white graduates. Other government research shows BAME graduates are less likely to be promoted even when more qualified.

UWE Students are offered a range of events and activities as part of the programme, including: inspiration from leading BAME role models and professionals; coaching in leadership and identity to build self-esteem and confidence; workshops on entrepreneurial and professional skills; a network of contacts in their areas of interest; and one-to-one mentoring, facilitating progress into their chosen career.

£14 billion education boost

The Prime Minister recently announced that up until 2022/23, Primary and Secondary schools across England will benefit from a £14 billion boost in education funding – raising it by £4.6bn above inflation.

The budget for 5-16 education will rise to £52.2bn. Compared to present spending this represents an increase of £2.6 billion for 2020/21, £4.8 billion for 21/22, and £7.1 billion for 22/23.

From next year every primary school will get a minimum of £4,000 per pupil, and every secondary school £5,000 per pupil.

The deal also guarantees an extra £780 million for pupils with Special Educational Needs and Disabilities (SEND) in 2020/21.

"There are challenges ahead. My focus will be on transforming the system to ensure high quality, sustainable education for the 21st century."

Northern Ireland

Northern Ireland's Education Minister sets out key priorities

Education Minister, Peter Weir, outlined his key priorities during visits to Riverside Special School in Antrim and St John the Baptist's Primary School in Belfast. These are just two out of the 18 schools to benefit from the second call to School Enhancement Programme (SEP) recently announced in the Assembly.

"Every child deserves the best start in life and to be nurtured and supported to help them reach their full potential," he said.

During his visits, the Minister said that among the priority issues his department faced was delivery of frontline resources for schools and teachers, as well as Special Educational Needs and tackling educational disadvantage.

Peter Weir added: "There are challenges ahead. My focus will be on transforming the system to ensure high quality, sustainable education for the 21st century. The future success of our society and economy depends on a high-quality education system. We must all work together to make this happen. Education is the great enabler which can provide life-changing opportunities for our children.

"Inspection is a powerful lever for raising standards and tackling underachievement to ensure learners get the best possible education. I want to ensure that children of all backgrounds and abilities can avail equally of those opportunities."

A key focus highlighted by the minister was academic underachievement as well as the implementation of a new framework for Special Education Needs and the childcare available to parents.

Mr Weir concluded: "I do not underestimate the challenges that lie ahead in pursuing my vision for a first class education system that delivers for all our children. School budgets are under severe pressure and we need to ensure our teachers receive the level of pay they deserve.

"It is imperative that adequate resources are available to deal with these, and the many other issues, currently faced within the education system."

The SEP is for capital schemes costing between £500,000 and £4,000,000.

A first list of 25 schools to advance in planning under the second call of SEP2 was announced on 8 May 2018; with a second tranche of 16 schools announced on 21 January 2019. 18 schools were announced by the Minister in the Assembly on 14 January 2020.

UK-wide

Runaway Training – 'fake apprenticeships' cost billions
A report from think tank Education and Skills (EDSK) claims that employers and universities are mis-labelling training courses as apprenticeships in order to compete for funding. With the apprenticeships programme set to overspend by hundreds of millions of pounds in 2020, Runaway Training shows that 'fake apprenticeships' accounted for £1.2 billion of funding committed by the government and 50 per cent of all courses since the apprenticeship levy was introduced in 2017.

Over £550 million of levy funding has been spent by employers on rebranded management training and professional development courses, designed for more experienced employees, and the most popular 'apprenticeship' in the country is now 'Team Leader / Supervisor' – accounting for almost 1 in 10 apprentices.

Levy funds that could have been used to support new and younger personnel have also been redirected to roles including 'Senior Insurance Professional', 'Marketing Manager', 'HR Consultant' and 'Department Manager'.

Apprenticeship Pay Survey 2018/19 GB.
The Apprentice Pay Survey (APS) helps monitor the apprentice National Minimum Wage (NMW), making sure that any changes to apprenticeship policy or minimum wage rate are compliant and based on accurate information. Evidence from the survey contributes to the Low Pay Commission's recommendations to the government and two previous Apprenticeship Pay Surveys were carried out in 2014 and 2016.

Median basic pay was £7.10 an hour (mean £7.70) for Level 2 and 3 apprentices, higher than in 2016 (median: £6.70, mean: £6.98). Basic pay was calculated by dividing all basic pay (excluding higher rate pay, tips, bonuses

and accommodation allowances) by total number of hours worked (excluding hours worked at a higher rate but including time spent training). Median basic hourly pay was higher for Level 4+ apprentices, at £10.94 (mean £12.46).

The basic hourly pay for Level 2 and Level 3 apprentices in Great Britain was lowest in Hairdressing (£3.70 median), and basic hourly pay decreased for Customer services (a decrease of £1.51 per hour), while it increased in all other frameworks - Engineering, Manufacturing Technologies and related went up from £6.44 median to £7.12.

Apprentices have to spend a minimum number of hours of formal training. The APS does not separate hours spent training from hours working but, owing to an interest in training levels, apprentices were asked in 2016 how much training they were required to undertake. 'One day per week' was chosen as a good approximation of the recommended figure, as well as being easy for apprentices to grasp during the telephone interview.

Level 2 and 3 apprentices said they received on average at least one day per week of formal training, 6% higher than in 2016.

52% of apprentices in England received on average at least one day per week of formal training, compared to apprentices in Scotland (45%) and Wales (37%).

The Social Mobility Barometer - Public attitudes to social mobility in the UK, 2019-20

The Social Mobility Commission has released The Social Mobility Barometer - Public attitudes to social mobility in the UK, 2019-20.

On average 5,000 people from across the nation are surveyed in detail every year. Qualitative accounts of their own experiences and perceptions often give a deeper insight than quantitative data and statistics. Last year's survey revealed young people were increasingly pessimistic about the future and felt that working class people had an even harder time getting on in life than previously.

The current Barometer revealed a worrying split between educational opportunities and what they lead to – work, income and job security. Although 63 per cent of respondents considered they were better educated than their parents, only 45 per cent felt they had a better standard of living, and barely 30 per cent had improved job security.

This may suggest much more attention needs to be focused on training, jobs and pay levels now that the emphasis on education seems to have borne results.

Major findings for childcare, education and work are:

01 People surveyed still feel the disadvantaged in society face more barriers than the better off. This includes opportunities at a place at a top university (77%); home ownership (71%); access to good childcare (68%); performance at school (60%).
02 People who identify as working class are half as likely to feel their background gave them an advantage in education (25%) compared to middle class (50%). Working class people felt their circumstances were more of a hindrance in career choice and advance than those who identified as middle class.
03 Most of those surveyed thought apprenticeships offered young people the best opportunity for getting on in life (32%), followed by university (26%), then further education (14%).
04 However, more 18-24-year-olds felt that going to university offered the best opportunities (35%) compared to apprenticeships (18%).

New data to help students see future earnings boost
New data, published for the first time, shows what graduates from each university earn in different regions of the UK, and can help young people make better choices about whether to go to university, where to study and what their graduate opportunities look like.

The figures reveal what graduates from each institution earned five years after finishing their studies, adjusted for regional differences.

The Universities Minister called the data a 'milestone' for future students, enabling better decision making, particularly for those from disadvantaged backgrounds.

The same data previously showed that graduates everywhere earn on average around 20% more than their peers in the same region who did not benefit from higher education.

Graduates earn a median salary of £19,900 a year after graduating, £23,300 after three years, £26,000 after five, and £30,500 after ten years.

The data will improve transparency around higher education, making sure that information about possible earnings, employability and teaching quality is available to all.

FE workforce boosted by Multi-million pound support package
Up to £24 million of extra funding will be given to further education providers across the UK, enabling them to continue recruiting, retaining and developing excellent teachers.

The investment announced today is part of an additional £400 million boost for 16 to 19 education in 2020-21, to improve access to high-quality further education and training. As well as introducing new T Level qualifications, this will bolster the FE workforce, helping to deliver the government's commitment to level up skills and opportunity across the country.

The package includes:

01 £11 million in bursaries and grants worth up to £26,000, attracting talented people to train to teach in priority subject areas such as STEM, English and SEND teaching.
02 A £10 million boost to the government's successful Taking Teaching Further programme, delivered in partnership with sector body the Education and Training Foundation (ETF), which attracts workers from industries such as engineering and computing to retrain as FE teachers. This additional funding will support up to 550 more people to train to teach a range of technical subjects in 2020, on top of the 100 recruited already.
03 £3 million for high-quality mentor training programmes, designed and delivered by the ETF to support FE teachers – especially in the important early years of their careers – to develop and progress.

£110 million boost for T Level Providers
The government is investing in a multi-million pound package of support to make sure T Level providers are ready to deliver pioneering new courses.

Up to £95 million will go to the T Level Capital Fund enabling young people taking the new technical qualifications from 2021 access to industry standard equipment and high-quality facilities. From today, eligible providers can bid for funding to refurbish existing buildings or create new spaces, while in spring next year funding for specialist equipment such as digital and audio-visual kit will be allocated to all providers

Also announced is the expansion of the innovative T Level Professional Development (TLPD), worth £15 million in 2020-21, following a successful first phase. Providing tailored training and support, improving FE teachers and leader's skills, industry knowledge and expertise from which students can benefit, the programme will be delivered by the Education and Training Foundation.

TLPD has already supported thousands of teachers, managers, support staff and governors since its launch in spring 2019. More training to an increased number of providers across a wider range of T Level subject areas will build on this success.

Project DRIVES Forward on Automotive Apprenticeships across Europe

"The DRIVES project is continuing to deliver major benefits to all those involved..."

DRIVES (Development and Research on Innovative Vocational Educational Skills) is a European Union project that brings together key partners on training in the automotive sector.

It's a four year project which is now at the halfway point, with a guarantee from the UK government that funding for this will continue for the next two years despite Brexit to ensure the project's sustainability - as has been guaranteed for all Erasmus initiatives.

Enginuity are continuing to play a key role in all the work packages included in DRIVES and our team has a key responsibility for the apprenticeships element of the project.

A DRIVES apprentices networking event was held at the end of February, hosted by our Spanish partners in Bilbao and attended by more than 30 apprentices and their supervisors from Spain, Portugal, Romania, Czech Republic, Poland, Italy and Germany. The focus of the event was to establish a network of apprentices in the EU and we will be reporting on the outcomes in future issues of RevEAL.

The DRIVES team is also currently finalising a report on the apprenticeships marketplace in the automotive sector across the EU. Due to be published in March, the report covers a number of key themes including the pace of skills change and the impact of these changes, the importance of employer involvement in the design of apprenticeships to meet changing needs, and recruitment-related issues such as the image of the automotive sector and the need to improve workforce diversity.

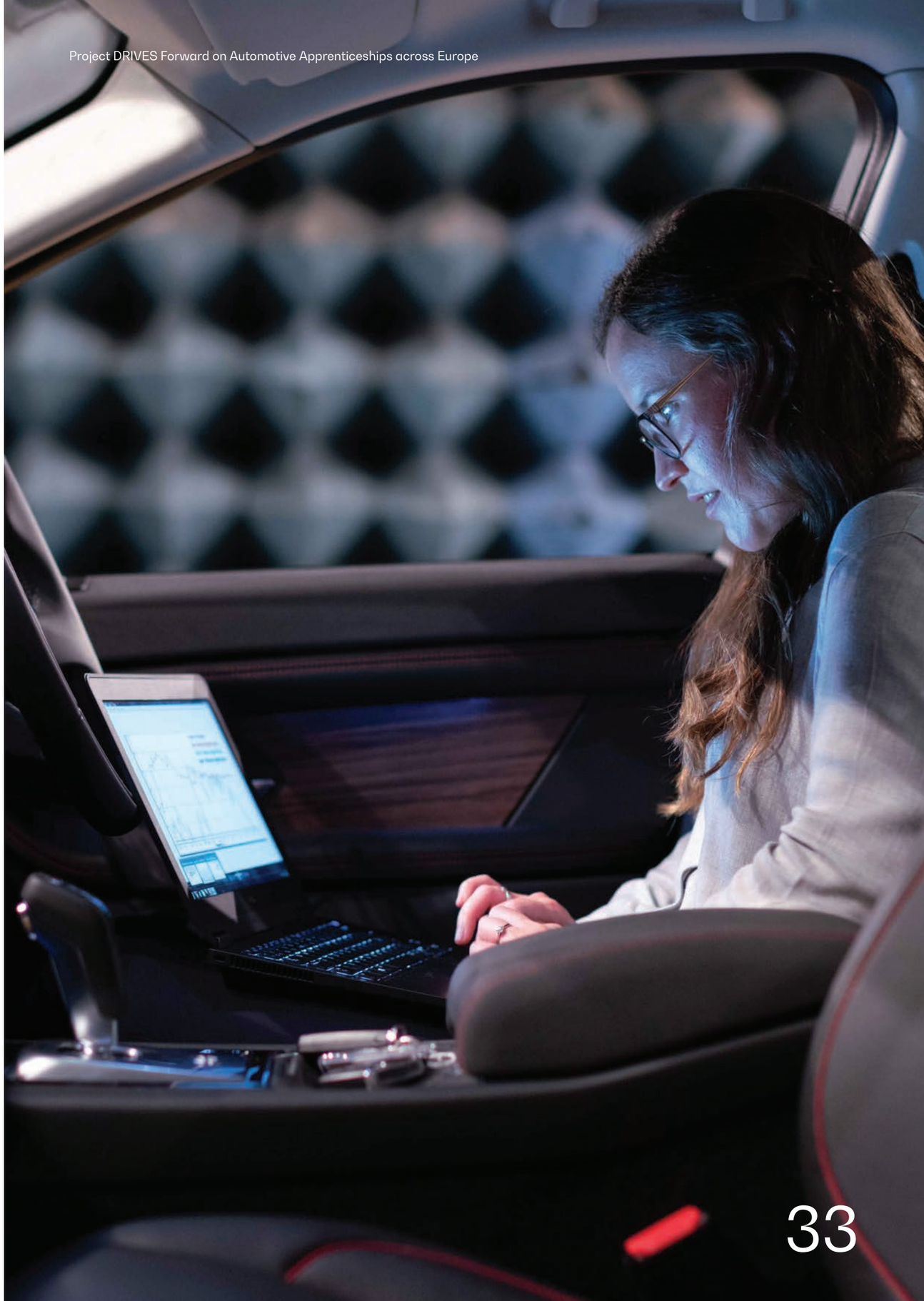
The report also includes a comparison of different EU apprenticeship models, including referencing against the criteria of the European Framework for Quality and Effective Apprenticeships (EFQFA), along with case studies and best practice examples.

Project manager for Enginuity/Semta, John Mountford, commented: "The DRIVES project is continuing to deliver major benefits to all those involved and we are particularly looking forward to the developments from the recent apprenticeships networking event and actions following the publishing of the report on the automotive apprenticeships marketplace.

"A continued relationship with EU partners is essential for UK employers, especially those in the automotive sector, so we are pleased to be helping to maintain relationships with European partners for a post-Brexit environment."

A new LinkedIn group - the DRIVES Automotive Apprenticeship Network (DAAN) - has been set-up as a forum for stakeholders to exchange ideas on apprenticeships and keep up-to-date with the DRIVES project including the recent apprenticeships networking event.

You can join the group at www.linkedin.com/groups/8814397



Because One Engineer Can Change the World

The world has seen three industrial revolutions – and now it's experiencing a fourth. Pivotal engineering feats have brought about the steam engine, complex transport networks and mass production. More recently, we've seen the world turn digital, and now Industry 4.0 is forging ahead with cloud- and data-driven technology, the Internet of Things (IoT) and artificial intelligence (AI).

While progress can be a gradual, linear journey, when it comes to momentous paradigm shifts that industrial revolutions bring about, it's a different case. Brilliant individuals come along, disrupt the established order of things and radically redefine how we see the world.

A core belief at Enginuity is that one engineer can change their world and ours, given the opportunity. Here, we highlight some of the inspirational engineers that have shaped the world we live in today, looking at three areas that have seen some of the most dramatic changes over time – transport, communication and computing, and energy.

Transport

Let's start with James Watt – the man responsible for the steam engine. While repairing the Newcomen engine, he realised there was a flaw that was making it alarmingly inefficient due to a huge loss of steam. From here, he designed a separate condensing chamber that rectified the problem; he got his first patent in 1769.

The 19th century dawned, and George Stephenson changed the world of trains further by constructing 'Blucher' – his first locomotive – in 1814, which was used for hauling coal. Moving on 15 years, his train 'Rocket' won a competition as the best train to pull heavy loads over long distances.

Stephenson's engineering talents were further utilised to construct the first public railway from Stockton to Darlington, which led to a network of railway lines across the country that took UK transport to another level.

Isambard Kingdom Brunel contributed to the next stage of wide-reaching transport, with his work in constructing a network of tunnels, bridges and viaducts for Great Western Railway. In 1833, he started work on the line that would connect London to Bristol. Previously impassable in such a direct way due to the terrain, Brunel engineered viaducts at Hanwell and Chippenham, the Maidenhead Bridge, the Box Tunnel and Bristol Temple Meads Station.

Turning to cars, the remarkable Henry Ford was pivotal in the automotive industry. His revolutionary assembly line production methods drastically reduced both the time and costs involved in manufacturing cars and made them affordable for a wider market. The changes he made can't be celebrated enough. As an example, his engineering expertise cut chassis assembly time from 12.5 hours to 93 minutes by 1914.

Transportation continues to develop at an incredibly fast pace, with even public travel into space nearing reality. Driverless cars are another hugely anticipated leap in the transport industry; they are connected to the likes of Google, Tesla and Uber, though the concept actually originated with German engineer Ernst Dickmanns. In a pivotal test run in the autumn of 1994, two limousines navigated traffic at speeds of up to 130 kph on the French A1. They changed lanes and reacted to other vehicles – all without a driver. This was the start of something that is due to become part of everyday life in the imminent future, with driverless vehicles set to be on the open roads within the next couple of years.

Communication and computing
In 1876, Alexander Graham Bell turned his fascination with speech transmission into the telephone, which was an instant hit; within a year, the first telephone exchange was built in Connecticut, along with the creation of the Bell Telephone Company.

Moving into the 20th century, along came the first signs of the internet – a pioneering development that would revolutionise how we live, work and shop. Vint Cerf and Robert Kahn are commonly known as the 'Fathers of the Internet' – during the 70s and 80s, they developed what would become the internet and went on to receive the highest honour in computer science, the A.M. Turing Award.

Timothy John Berners-Lee was the engineer who made the internet accessible to all. Linking up hypertext with the internet, he created the World Wide Web, as well as the first web browser and editor, launching the world's first website on 6th August 1991 – http://info.cern.ch.

Computers have become indispensable in all aspects of daily life. They have evolved from gigantic machines that occupy entire rooms to small handheld devices. Steve Wozniak, co-founder of Apple, designed the first commercially successful personal computer – the Apple II. His engineering prowess and the aesthetic talents of his co-founder, Steve Jobs, set Apple on the road to being one of the marketplace's most successful brands.

And now we have the cloud. Satya Nadella was one of the first to suggest the concept of the cloud after joining Microsoft in 1992. Quickly spotted for his talents, he worked his way up the company and became CEO in 2014. Cloud computing has infinitely improved security, efficiency and practicality, making the days of floppy discs unrecognisable.

With the dramatic shifts and advances of Industry 4.0, we can expect to see the way we communicate and the way we use technology to reshape our world in ever-more fascinating ways.

Energy
Thomas Edison revolutionised how we use energy when he invented the incandescent light bulb – the first practical and commercially viable solution to reliable indoor light. It's hard to imagine a world where something as simple as turning on the light wasn't an option – but to continue delivering the energy we need to power our well-illuminated world, we need to get creative.

An exciting project that is causing a stir is the proposed Da Vinci Tower in Dubai, which can only be regarded as an architectural (and energy-efficient) engineering wonder. Designed by David Fisher and his team at Dynamic Architecture, the 420-metre-high skyscraper will consist of 80 storeys, each of which will revolve 360 degrees to provide constantly changing views. But here comes the added energy bonus – the massive structure will be totally self-powered, with horizontally positioned wind turbines used in between each storey, along with solar ink on its many terraces. The final product will be a power station in its own right – a masterpiece that showcases Fisher's goal of architecture and the environment co-existing and complementing each other.

Another pioneering engineer who is making waves – well, harvesting them – is Samuel Etherington, founder of Aqua Power Technologies. Combining his love of kitesurfing and his passion for engineering, he has created MANTA – a small-scale wave energy converter that turns wave power into electricity. Just one MANTA working at optimal performance can power five houses.

Known as 'Semta Sam' even after our recent rebrand to Enginuity, Samuel joined our Hall of Fame a few years ago after being awarded the James Dyson Award for his achievements. Sam said the following of his well-deserved recognition:

"The support and recognition that Semta [Enginuity] provided not only gave the technology a profile boost, but it certainly played its part in the successful venture capital rounds I have been through. Investors took comfort in a large industry-recognised organisation like Semta [Enginuity], acknowledging that the designs and innovations I am working on are at a high level and warrant investments. It sounds clichéd, but I suspect that my progression in developing the wave power technology would be at a lower level if it had not been for Semta's [Enginuity's] timely recognition. Semta [Enginuity] can definitely claim to have been a contributing factor to the development of MANTA."

A keynote speaker at the 2019 Semta Skills Awards, Sam is everything that Enginuity wants to showcase to the up-and-coming engineers of the future – a young, exciting engineer who turned his passion into an innovation that will change the future. (You can read more about Sam on page 47.)

Industry 4.0 is in full swing, but it's far from over. Life continues to change with seemingly never-ending inventions as visionary entrepreneurs stride further forward with more innovations that could never have been imagined just a few decades ago. At Enginuity, we find it hugely motivating to think that the next generation of engineers will be inspired by iconic figures like those in this article as they attempt to resolve the challenges of today – some of which threaten our planet's survival.

Imagine what today's world would be like without the light bulb, the car or the internet – such an alternative reality is difficult to picture. Twenty-five years ago, we got by just fine without the internet, but it's now a lifeline for us all. Look ahead twenty-five years – what will be the thing that nobody can live without?

Given the opportunity, this is what pioneering engineers do. They address the challenges of today and change life into an almost unrecognisable form of its prior self. They create history.

To seize the opportunities of change, the manufacturing and engineering sector needs to adapt fast. Individuals, SMEs and large employers need the skills that will allow the next pioneering engineers to emerge and flourish. Enginuity Group provides the sector with engineering qualifications devised by engineers, to support our future talent on their pathway to what could be the next great paradigm shift.

Women in Engineering

"Companies in the top quartile for diversity are 15-24% more likely to outperform their peers on earnings before interest and taxation (EBIT) margins than are companies in the bottom quartile."

A snapshot of Britain during the Second World War gives the rare image of factories filled with women carrying out engineering roles that were previously undertaken by men. The men were sent off to fight, so, in a time where skills were desperately needed, women were drafted in to build ships, aeroplanes and munitions. Outside factories, they worked as mechanics and fulfilled a variety of technical roles such as operating and maintaining transmitters to get vital information overseas. The Queen herself entered the forces as a mechanic and a military truck driver. The vast majority of women, who had for years stayed at home as housewives, were suddenly a very active part of the working world, fulfilling tasks that were 'meant for men'. Not only did they make a sterling job of it, they also relished the challenge.

A snapshot, that's all it was though. Historically, women have been underrepresented in engineering roles – and, almost 75 years on from when women proved they could succeed in these roles, the issue continues. Studies carried out by EngineeringUK show that just 12% of all engineers in the UK are female, despite them comprising almost half of the workforce overall.

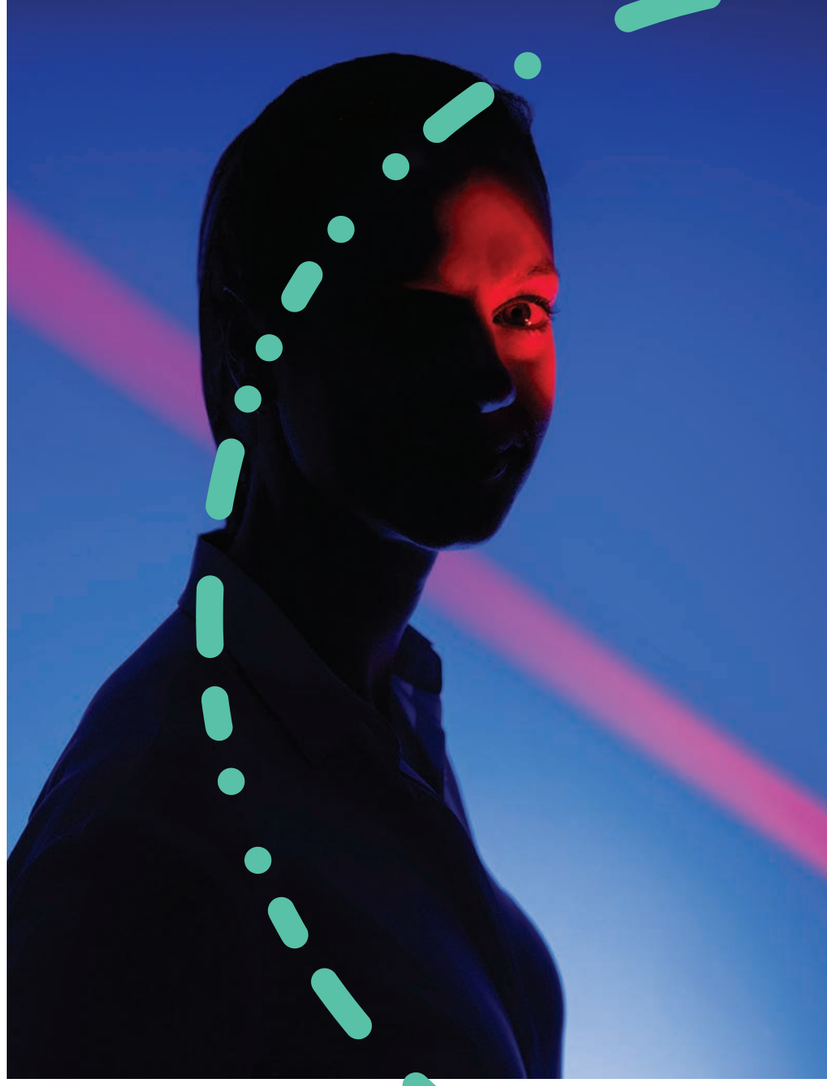
But here's what's hard to understand – women stepped in when there was a skills shortage due to men being on the frontline, but, with the pace of technological advancements and automation that Industry 4.0 brings, there is still a glaring skills shortage. While it may be for a different reason, the foundations are the same – there are simply not enough engineers in the UK. Predictions show that 1.8 million new engineers and technicians will be needed by 2025 to meet the current demand. But where are the women that could fill this gap in our sector?

What's more, a lack of diversity in the workforce is not only problematic in itself, but is also a business risk and a major missed opportunity. According to research from McKinsey, "companies in the top quartile for diversity are 15-24% more likely to outperform their peers on earnings before interest and taxation (EBIT) margins than are companies in the bottom quartile. In UK and US data, we found companies with more than 30% women on their executive teams were almost 40% more likely to outperform on EBIT margins than those with 10-30% women executives." The proof is there – more women means more business, which is vital for financial stability and economic growth.

Yet despite all this, women are still scarce in the engineering sector, and it begs the obvious question of why.

Share thoughts with us on social media using #RevEAL.

"In UK and US data, we found companies with more than 30% women on their executive teams were almost 40% more likely to outperform on EBIT margins than those with 10-30% women executives."



Why the lack of women in engineering?
A National Statistics report, Further Education and Skills, England: 2018/19 academic year, shows the troublesome issue in black and white. Looking at the figures for apprenticeships in the Construction, Planning and Built Environment sector, we see that, of the 22,533 apprentices that started out, 21,081 (94%) were male and a mere 1,452 (6%) were female. This is mirrored in the Engineering and Manufacturing sector, with 59,968 starts – 55,227 (92%) male and 4,741 (8%) female. These findings bring the divide of men and women in engineering into stark relief, even more so when compared to the figures for all sectors: 393,375 apprenticeship starts – 196,269 (50%) male and 197,106 (50%) female. Here, women have the edge on the majority. Of course, the average also considers sectors with male underrepresentation, such as Health, Public Services and Care, with 97,715 starts – 77,388 (79%) being female and only 20,327 (21%) being male.

Sophie Jackson, second year engineering apprentice at MINI Plant Oxford

Nearly 80% of female engineering students achieving a first or an upper second-class degree, compared with 74.6% of male students.

80%

BMW Group are currently accepting applications for apprenticeships. Apply online now at www.bmwgroup.jobs/uk (under “Opportunities”, click “Apprentice”).

MINI Plant Oxford

The issue remains undeniable, though – in the Advanced Manufacturing and Engineering (AME) industry, women are desperately less present than men.

It’s hard to comprehend how education and industry can fail to embrace gender diversity to such a level, especially when girls prove higher achieving in engineering fields of study in education. The Women into Science and Engineering (WISE) Campaign reports that more girls get A*–C grades in STEM A-Level subjects than boys, with the exception of Chemistry. The same is true at degree level, with nearly 80% of female engineering students achieving a first or an upper second-class degree, compared with 74.6% of male students.

So why doesn’t this translate into more women entering engineering? The truth is that the responsibility lies largely with societal expectations. Whether consciously or not, steering girls away from engineering starts in their very early years. While boys are given toolkits and dumper trucks for their first birthdays, girls get pretty pink tea sets. While this is becoming less so as the trend for non-gender-specific toys gains pace, the fact still remains that there are things for boys and things for girls. And, very sadly, it’s prevalent through educational and parental influence too.

The stories of two young women interviewed by Enginuity who are forging their way into engineering careers ring only too true of the struggles faced by many females.

Rosie, who is due to complete her apprenticeship with an automotive company later this year, overcame many barriers to get to where she is now. Without an engineering role model at home and being stereotypically steered towards hair and beauty at school, Rosie had to fight for her preference of subjects and went on to achieve good grades in mathematics, design and technology, triple science and a Level 2 in Engineering. Instead of working in a beauty salon, Rosie is now on the pathway that, she hopes, will take her to a degree apprenticeship. Fully supported by her employer, she loves her work and is a valued member of the team – a very different experience for her than when she was at school.

Micha, who is currently doing an Electrical Assembly Technician Level 3 apprenticeship, had the advantage of her dad being a maintenance engineer and fully backing her to follow the path she wanted to at school, despite her being guided towards hair and cookery for GCSEs. Working on the job with her dad on weekends, Micha was given

Construction, Planning and Built Environment sector

Female
1,452 **6.44%**
Male
21,081 **93.56%**

Engineering and Manufacturing sector,

Female
4,741 **7.91%**
Male
55,227 **92.09%**

the skills and motivation to embark on engineering in post-16 education, beginning with a Level 2 in Mechanical Engineering. The only woman on her course, she was discriminated against and left to sit on her own until she had proved her knowledge and skill – a shocking reality for an 18-year-old in this day and age.

These two women were strong enough to fight back and follow their dreams. But statistics show that the vast majority don't. Reports show that 46.4% of girls aged 11–14 would consider engineering as a career, compared to 70.3% of boys. This then drops to 25.4% as girls reach 16-18, compared to 51.9% of boys.

It is high time we question once and for all these long-held beliefs that keep women out of engineering and manufacturing.

How can we attract more women into engineering?

The evidence is there that society is still, implicitly or explicitly, pushing women away from engineering. So how can we overcome these barriers?

One company that is really bucking the trend is BMW Group. Their Girls Go Technical programme forms part of BMW Group's commitment to creating a better balance amongst its workforce. Now in its eighth year, the work experience programme has been designed to attract more girls to consider a technical career in the manufacturing industry.

Running during half terms, it is open to young women in Year 11 or above who are considering a technical apprenticeship. The participants spend the week at the heart of MINI and BMW's UK production network, not only at the manufacturing site closest to their home region for in-depth work experience, but also touring MINI Plant Oxford where they will see MINIs being built. On completion of the programme, the participants will have gained an insight into the manufacturing processes and experienced the day-to-day challenges encountered by

engineers and technical apprentices, as well as augmenting their interview and job application skills.

Sophie, currently a second-year Maintenance Apprentice at MINI Plant Oxford, first joined BMW Group on the Girls Go Technical programme: "When we came to choose our work experience at school, my careers advisor suggested the Girls Go Technical programme. I was based at MINI Plant Oxford. We shadowed a number of different roles and it was very hands-on. After the programme, I read up about the apprenticeship and decided to apply. The feel and look of the plant really swayed my decision – there are robots everywhere, it felt very futuristic and I wanted to understand more about how and why things work. My advice to any girls thinking about it would be just go for it. If you like STEM subjects, it's such great fun. Yes, there are more men in the industry right now – and I was a little apprehensive about being a female – but everyone here is included. It doesn't matter if you're male or female, we're all here because we're good at our jobs."

More information and apprenticeship opportunities can be found on the BMW website.

There are a number of initiatives that are tackling diversity as a whole in engineering, including race, age and disabilities, as well as gender.

The Department for Education (DfE) is behind the 'Fire it Up' campaign, which launched just over a year ago. National TV and social media adverts continue to spread the campaign far and wide, fighting for increased awareness of the vast choice of apprenticeships open to society as a whole, no matter what age, gender or background.

The Apprenticeship Diversity Champions Network (ADCN) is another government-led initiative that works to encourage underrepresented groups of society to consider apprenticeships, including those with disabilities, women and members of the Black, Asian and Minority Ethnic (BAME) communities. Over 40 employers have become members of the network and pledge their commitment to apprenticeship diversity.

Enginuity is proud to be a key player in the fight to eradicate the gender imbalance in our sector. An excellent role model for others, Enginuity boasts an executive team where three out of five members are women, and a board where seven out of twelve members are female. Empowering women to enter, thrive and lead in our sector is a message we want to broadcast as far as possible. Working together with employers, educators and policymakers, we want as many engineers as possible to be given the opportunity to change their world and ours – and that means maximising on the number of women, as well as men, who enter our sector.

While work is clearly being done to address gender diversity issues in engineering, here at Enginuity, we are calling on employers, educators and policymakers to make this gender gap a priority. We remain dedicated to providing the solutions that are needed. The pathways and qualifications are there – what is needed is more initiatives and a change in mindset to encourage more women into the sector. By working together to address this gap in the industry, we will also be addressing the skills gap, and the result will be a stronger workforce, and industry, moving forward in a more inclusive manner.

When we think of famous engineers who've made their mark on history, we tend to look back and marvel at individuals like Stephenson, Brunel and Da Vinci, whose work changed the world and still impacts our lives today. However, while there's no doubting the genius and importance of these engineers, they do tend to take the lion's share of the limelight and the work and innovation of today's talent often doesn't receive the recognition it deserves. To redress the balance a little, we've selected three up-and-coming engineers who, in our opinion, have the potential to change the world with their impressive work in renewable power and energy storage technologies.

03 Engineers Who Are Changing Our World Today

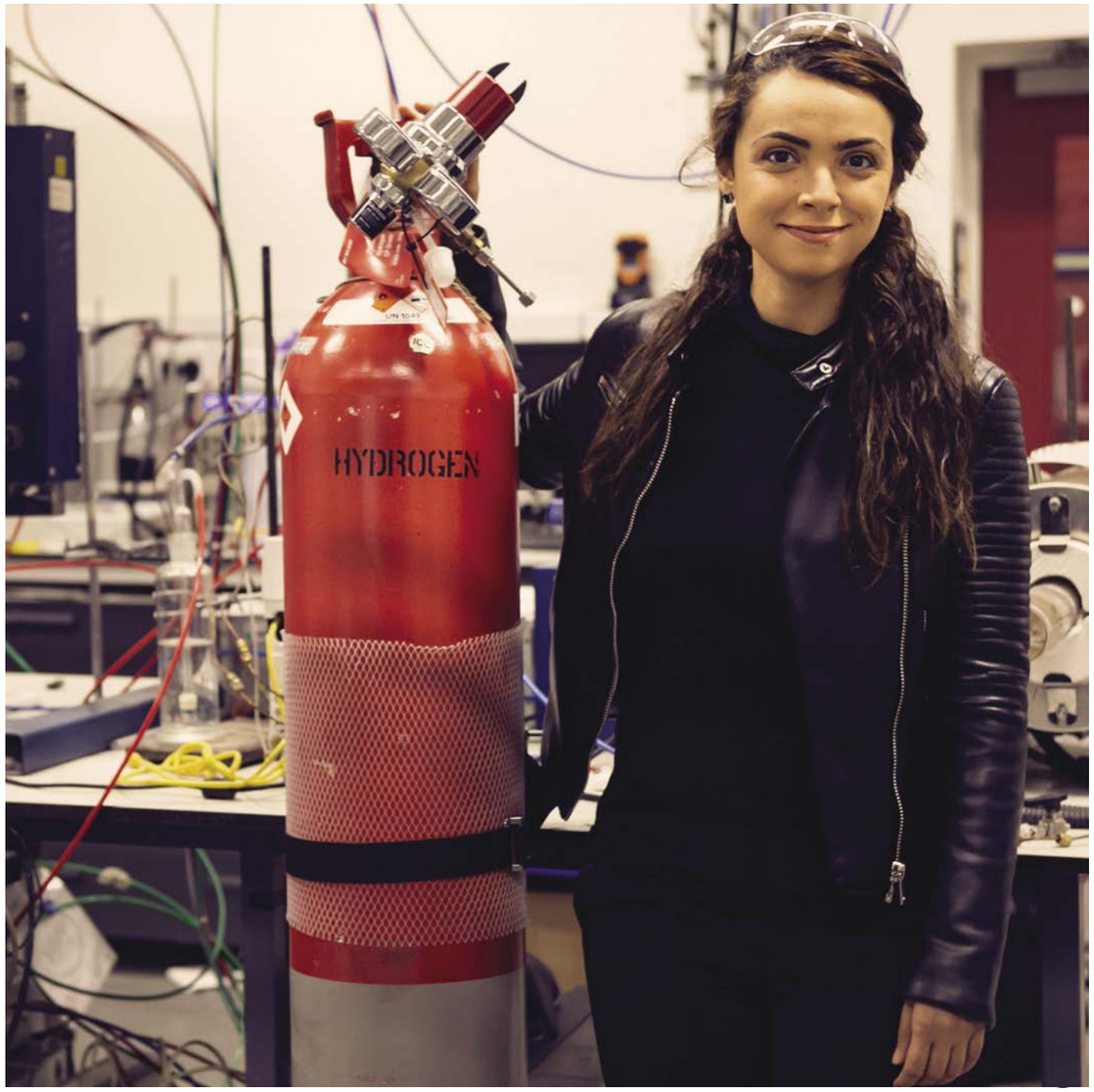
Share thoughts with us on social media using #RevEAL.

01

Enass Abo-Hamed,
CEO, H2GO Power Ltd

Her work is already being used in hospitals, within drones technologies and many UK communities to provide alternative sources of power. Enass was also named 'Visionary of the Year' in 2017 by MIT Tech Review and is an advocate of women in tech and clean power for all.

Enass is the co-founder and CEO of H2GO Power Ltd and with her engineering expertise and passion for clean energy, she is a pioneer in the production of hydrogen energy storage. Her award-winning company has, in the last two years, developed a safe and reliable hydrogen power supply with zero emissions which could go on to revolutionise the use and deployment of fuels and help tackle climate change.



02

Sam Etherington, Founder, Aqua Power Technologies Ltd

Sam has always had a passion for engineering, having grown up in a family of engineers, and it was while learning to kite surf that he was inspired to try and harness the power of waves. He has since founded Aqua Power Technologies which aims to design, develop and manufacture 'innovative and environmentally sensitive systems for generating energy from marine environments'.

Sam has since designed a number of technologies including the RWP0001, which had its beginnings as his final year thesis project at Brunel University, which then went on to win the coveted James Dyson Award. Aqua Power Technologies has now developed MANTA, a 'state-of-the-art small scale and low cost wave energy converter', which it is hoped will help make renewable wave power more accessible to many different markets.

Watch Sam's story online at youtube.com/watch?v=kkOkMS3bJSY

03

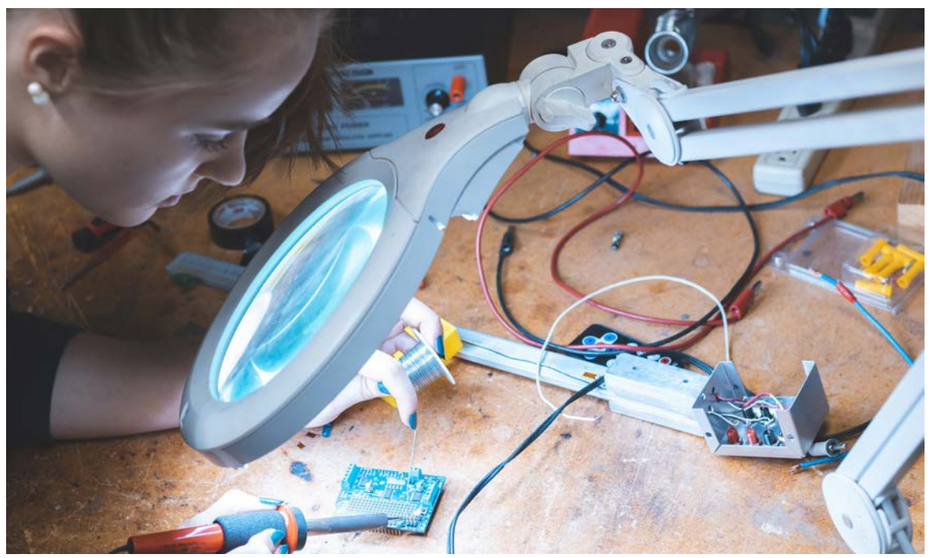
Will Bateman, CEO and Founder, CCell

Will founded CCell with the aim of harnessing the renewable power of nature to grow beautiful artificial reefs. He's utilised a clever engineering technique first developed by Dr Wolf Hilbertz to create the world's first eco-based coastal protection, powered by renewable wave energy.

CCell's patented, ultra-light curved paddle both harnesses and dampens the energy within ocean waves to generate electricity. This is used alongside Dr Hilbertz's electrolytic technique to accelerate the growth of artificial reefs, which provide long-term coastal protection and a foundation on which to grow corals. This technology is helping reefs develop in less than five years – when they would typically take hundreds of years to fully form.

Engineering Skills Q&A with Jacqueline Hall

With our deep and thorough understanding of engineering, we at Enginuity Group pride ourselves on helping people to cultivate, develop and make visible the skills needed to be a success to ensure purposeful and productive careers. We've collated some of the most popular questions asked about Industry 4.0 and engineering skills and put them to Enginuity's Head of Policy and Strategy, Jacqueline Hall, to find out more.



"Without engineering, the world we know today simply wouldn't exist."

Jacqueline Hall
Head of Policy & Strategy, Enginuity

What is engineering?
Engineering is a multi-dimensional discipline which combines maths and science to learn how things work, solve problems and provide innovative practical solutions which benefit business and productivity.

Why is engineering important?
Without engineering, the world we know today simply wouldn't exist. Everything from the buildings we live in, to the food we eat and the smart devices we use every day, in fact almost everything we touch has been made with the input or influence of an engineer.

What are the six types of engineering?
This is a question which causes a great deal of debate, as there are hundreds of different branches, specialisations and fields of study involved in engineering. In other words, it can be tricky to narrow all of these down into a universally accepted list of six.

Historically though, the four oldest 'major' disciplines are considered to be Chemical, Civil, Electrical and Mechanical engineering. To complete the list of six, two of today's more popular choices are Aeronautical and Computer engineering.

Do you need to do an engineering degree to become an engineer?
In the UK the most common route into engineering is to do A-levels in relevant subjects such as maths and the sciences, and then do an engineering degree at university. You can also go on to postgraduate study and complete a Masters or PhD. However, today there are options, whether that be through the new Engineering T levels in 2022 but more fundamentally via apprenticeships. These can combine learning with on the job training and being in employment means no student debt. Whether you choose to go to uni or do an apprenticeship they are both worth the same and are of equal value.

Whichever path you choose, there is also additional professional recognition you can gain whilst in employment from different professional engineering bodies. Enginuity can provide further guidance on this and can explain more about what career paths and opportunities are available to you. Our award-winning platform, Engineering Talent is a great place to start.

How long does it take to become an engineer?
This will depend on your chosen career pathway, but an engineering degree or apprenticeship may for example take either three or four years depending on the specialism and where you begin your journey. Engineering apprenticeships can be between two and four years in length depending on the apprenticeship standard.

Is engineering difficult to study?
Like any academic subject there will be parts of your engineering studies that you'll find more challenging than others. But if you have a passion for engineering and a desire to succeed this can certainly go a long way towards achieving your goals. Apprenticeships also offer lots of practical, hands-on training on the job too.

What skills do engineers need?
Naturally there are the specific technical skills needed for each specialism – which is something Enginuity can provide more details about – but on a general level there are also wider 'soft skills' that can improve your engineering employability.

Discover more about Engineering Talent and get access at engineeringtalent.org.uk

"If you have a passion for engineering and a desire to succeed this can certainly go a long way towards achieving your goals."

What soft skills are important for engineers?
Problem solving, critical thinking and the ability to learn is as important as being able to communicate well with others in engineering. By this we mean being able to explain – both in writing and verbally – what can sometimes be complex work or processes in a clear and accessible way.

In addition to this, being able to work well as part of a team and being disciplined enough to work as an individual can make you more productive and successful as an engineer. In a similar vein, being prepared to take the lead and demonstrate your ability to take responsibility for your work and the safety of others can help develop your engineering career.

Other important soft skills include; being organised, creative, and being able to build and manage relationships with clients and customers, which are all key for business success.

How can you further develop your engineering skills?
You can help develop these skills by completing additional qualifications and/or training, but also from the experience you'll gain during your studies and in the world of work. Again, this is something Enginuity can help with by providing you with guidance and practical solutions to make these important decisions.

What specific engineering skills do employers look for?
Most employers will primarily value the quality of your technical abilities within your particular field of engineering, but the additional soft skills we mentioned earlier can help set you apart from others. If you can demonstrate that you offer something more than just your engineering knowledge, then you're more likely to grab the attention of an employer.

Before you begin applying for graduate schemes or apprenticeships, it can be worth assessing your own abilities to see where you might have a skills gap. Then you'll be able to work out what additional support or training you might need to develop and improve your career prospects.

Where can you get more engineering experience?
In addition to degree placements, graduate schemes and apprenticeships, there are other ways you can gain more engineering experience. You could try reaching out to engineering companies in the local area or sending out speculative applications to large firms to see if they offer any internship or work experience programmes. However, such opportunities are likely to be unpaid, so you'll need to make sure this is something you can afford to do.

Another option you have is to look for any temporary roles within engineering firms, which could give you an opportunity to get your foot in the door.

How much do engineers earn?
Like any profession your salary will be subject to factors such as your experience and qualifications, the type of sector you work in and your geographical location. Recent studies[1] and analysis of UK salaries show that on average junior or graduate engineers earn around £30,000 a year, while mid-level professionals earn up to £48,000 and those at senior or director levels earn roughly £72,000. However, many companies pay even more.

What are the biggest engineering industry trends?
Unsurprisingly, many of the current major engineering trends are technology-based and are very much a reflection of the digital age we live in today.

"If you can demonstrate that you offer something more than just your engineering knowledge, then you're more likely to grab the attention of an employer."

Industry 4.0 is making a notable impression on the sector, in particular with how Data Engineers are studying, analysing and using Big Data. More and more companies are harvesting and acquiring data from their working processes and customers and thanks to Data Engineers this is being utilised to streamline and improve workflows and provide valuable insights into consumer behaviours and preferences.

Robotics and Artificial Intelligence are also big engineering trends linked to Industry 4.0. These are some of the fastest-growing technologies in the world right now and as machines are becoming more sophisticated and productive, engineers are changing their working processes to utilise these new tools.

One of the most interesting aspects about the engineering world is that it's an ever-changing and exciting area of work that continues to advance and change – that is why engineering matters.

To find out more about careers at Enginuity or EAL visit us online today at enginuity.org and eal.org.uk.

Striving for Sustainability

There's a movement happening across the world – a rising awareness and a growing hive of activism that can be seen among individuals and businesses alike. Climate anxiety is a real and growing trend.

In fact, this is so much so that a recent YouGov poll of UK residents found that environmental problems are their third most pressing concern. This places environmental concerns at a record high since YouGov started the annual research in 2010, and above such issues as crime, the economy and immigration.

This is fuelled (or perhaps epitomised) by a combination of prominent activists grabbing the attention of the world's media, big-brand businesses actively promoting their green credentials, the rise in eco-lifestyle challenges – such as Veganuary and plastic-free July – and celebrities sharing their lives on social media. People are altering the way they live and demanding that businesses, public bodies and Non-governmental organisation (NGOs) work towards the same goals. And these organisations are being forced to react.

The role of engineers in the pursuit of sustainability

As is often the case when tackling modern-day societal issues, engineers are at the forefront of this revolution. Here at Enginuity, our role is to help pioneer innovation with a focus on sustainability and ensure engineers have the necessary skills to drive the initiatives forward. Organisations can no longer do just enough to comply with legislation, or jump on the proverbial bandwagon and use environmentally friendly or sustainability-focused claims in order to reach new audiences, while paying lip service to the cause. Both the private and public sectors need to proactively work towards improving their sustainability and reducing climate change.

Towards the end of last year, UNESCO proclaimed 4th March 2020 to be the first World Engineering Day for Sustainable Development. The idea behind this annual celebration is to raise awareness of how engineering is the key to sustainable development and the driving force behind modern-day life. The awareness day will champion the United Nations' Sustainable Development Goals and the role engineers will play in the attempt to achieve them.

The Sustainable Development Goals are 17 strategic objectives that collectively address the global challenges that we all face. They are an action plan to a more sustainable and better-quality future for everyone. Engineers are going to play a big part in the aim of reaching

these objectives by the target of 2030. In fact, many of them can't be achieved without innovative, forward-thinking engineers. For example, a number of the goals are focused around providing infrastructures – such as dams, roads and water supplies – that are resilient enough to withstand the increasing weather-related events seen around the globe, and creating sustainable, eco-friendly places to live. It's only innovation and technology that will achieve this.

The goals are inclusive of everyone around the world – both in developed and developing countries – and we're really pleased that awareness of the roles engineers play in creating a safer and healthier world is going to be raised.

Results that can be felt around the world

Although not all engineers end up in the position where they get to work on projects that have a direct positive impact on developing countries, we want to champion the fact that the work they do can still be felt around the world. While it may seem that the needs of developing countries differ greatly from our own, we are closely linked when it comes to climate change. A study by the University of Melbourne and the American Geophysical Union found that, if average temperatures climb by 1.5 degrees Celsius – the lower limit set by the Paris Agreement – then it is the poorest countries that will be impacted the most, and the wealthiest countries the least. Yet, it's the wealthiest countries that create the most emissions. Let's consider some stats to put things into perspective. North America is responsible for nearly 18% of the total global CO^2 emissions, yet is home to just 5% of the world's population. On the other hand, over 60% of people live in Asia, yet only 49% of the CO^2 emissions originate from there.

This means that the Western World has a responsibility to those in other, less-developed countries – not only to innovate, but also to provide effective solutions that will make every region more sustainable. And that's where Enginuity comes in. Through ingenuity with data, we can identify any skill gaps as they arise and create training opportunities to ensure engineers are equipped to succeed in our constantly evolving world.

Alison Parkes, Enginuity's Chief Customer Officer expanded on this for us, saying: "As a global community, we need to develop new ways of thinking that focus on sustainability, yet the average individual – from any region around the world – isn't in a position where they are able to exert any influence on getting these ideas off the ground. Equipping engineers with the necessary skills and experience is the only way to ensure we are able to provide solutions to the issues we face.

"While sustainability is becoming a bit of a buzzword at the moment, it shouldn't be dismissed as a passing fad. Some of the innovations we have seen in the digital age have inadvertently improved

"Equipping engineers with the necessary skills and experience is the only way to ensure we are able to provide solutions to the issues we face."

sustainability, but we are beginning to see more and more amazing initiatives that are solely focused on the issue. Even these are only the first act in attempting to resolve what is going to be a substantial trial though. It's going to be fascinating to see how the engineering community continues to rise to that challenge."

The steps already taken towards sustainability

Let's take a moment to look at a few of the emerging innovations and success stories that are already in place.

01 **Remote connectivity:** There is now a raft of technology that exists to ensure that we don't need to travel unnecessarily. It began with conference calling, moved to video calling, and now cloud-based storage and virtual reality have taken it one step further. Employees have the ability to log in from wherever they are and access all of the necessary work systems. Technologies like rumii allow people to collaborate remotely through Virtual Reality (VR), while Microsoft HoloLens is currently working on the technology to enable people to attend meetings as a hologram. With our world becoming increasingly globalised, initiatives like this are going to become crucial in reducing plane travel.

02 **Circular thinking**: As society becomes increasingly aligned with sustainability, the focus is naturally also falling onto waste. Not only do consumers want to reduce the amount of waste they create, but they want to know that organisations are also being responsible. We've already seen some great initiatives here along the lines of circular supply chains – take a look at clothing retailer H&M for inspiration. They encourage their customers to return their old clothing so that the material can be recycled into new clothes with a view to 100% of their clothing being made from recycled or sustainably sourced materials by 2030.

Interestingly, we're also increasingly seeing circular collaboration between businesses in the form of eco-industrial parks and similar networks. Here, the idea is that – despite how different the businesses are – each organisation works together and has interlinked processes with a view to reducing energy usage, waste and transport costs.

03 **Responsible, trackable sourcing**: Increasingly, consumers are seeking to buy ethical products. Where the materials come from and how things are made are increasingly coming under scrutiny – and this means that organisations need to have full knowledge and control of each stage of their supply chain. Digitisation is going to be key here, but new ways of manufacturing may need to be found, as well as new materials created.

As Enginuity's Chief Customer Officer, Alison Parkes mentioned, this growing movement towards creating an environment where we can live and work isn't something that we think will go away any time soon – if at all. We're on the edge of a new horizon of a new way of thinking and living – and engineers will be leading the way.

In Focus: Robotics

Now individual machines are connected to systems that make decisions about the production process in real time, it's clear that Industry 4.0 is rapidly changing the manufacturing and engineering industry. To seize the commercial opportunities Industry 4.0 is creating, the manufacturing and engineering sector needs to evolve. To adapt to the change, individuals, SMEs and large employers need the skills that will allow them to flourish, both now and in the future.

"Instead of robots replacing humans in the coming years, it's far more likely that robots and humans will work together more collaboratively to fully embrace the benefits of Industry 4.0."

After all, although many employees are concerned that robots may take their jobs, research from the International Federation of Robotics shows that automation and the use of robots actually creates new jobs by increasing productivity.[1]

In the US automotive industry for example, 60,000 industrial robots were installed between 2010 and 2015. But, during the same period, the number of employees in the sector grew by 230,000. This is because, according to the McKinsey Global Institute, more than 90 percent of jobs will not be fully automatable in the future.[2]

Instead of robots replacing humans in the coming years, it's far more likely that robots and humans will work together more collaboratively to fully embrace the benefits of Industry 4.0. This is because robots can be used to complement and augment labour, rather than replacing workers. By using robots and humans collaboratively in the workforce rather than in competition with each other, businesses can increase productivity, improve demand and become more competitive.

Overall, automation provides the opportunity for humans to focus on higher-skilled, higher-quality and higher-paid tasks. This then also has a positive impact on wages, because robots drive an increase in demand for workers at the higher-skilled end of the spectrum. Meanwhile, it also provides an opportunity for middle and lower-income workers to upskill and retrain in order to take advantage of the new labour demand.

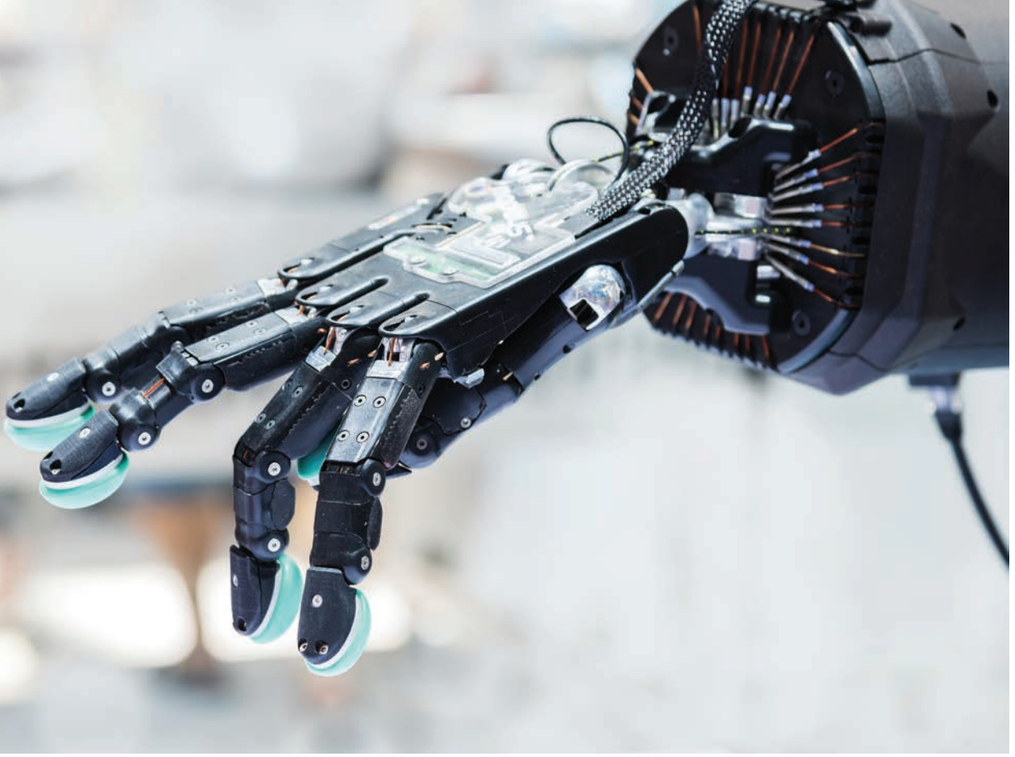
For these reasons, it appears as though fears that robots could put humans out of work are unfounded. Instead, BCG predict a net addition of around 100,000 jobs to the UK's workforce between now and 2025.[3] So, with this in mind, what are these jobs likely to look like? And what skill requirement will the increasing demand for automisation produce?

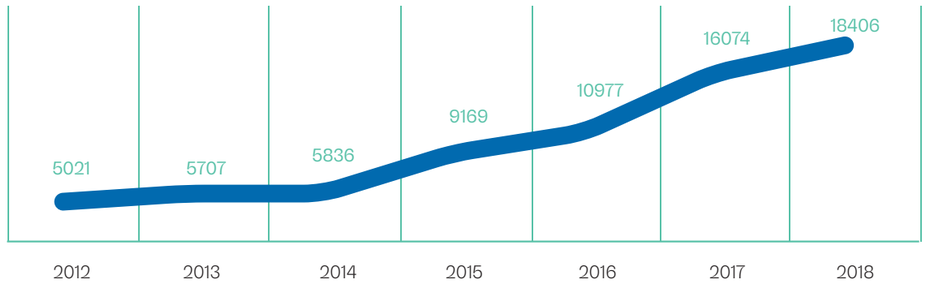
Well, it seems likely that there will be substantial demand for completely new roles in the engineering industry as man and machine become further integrated. This will eventually lead to the creation of roles for 'industrial data scientists' and 'robot coordinators', which will both become commonplace.

In addition to this, it's undoubted that some existing jobs will change almost beyond recognition. For example, maintenance engineers will view machinery remotely, order new parts for repairs off-site and be helped with decision-making processes by the machines they're maintaining.

In terms of new roles in the workforce, in a BCG survey of managers of industrial companies,[4] many respondents said that they expected to hire more people with qualifications in data security and data science in the coming years, with a particular focus on machine—machine/part communication. The survey also found that data management and programming were seen as important skills for both now and tomorrow.

"Automation provides the opportunity for humans to focus on higher-skilled, higher-quality and higher-paid tasks."





Job postings requiring Robotics as a Skill

As a result of all this, over the next decade or so, 'cobots' will become increasingly important in the manufacturing and engineering sectors. In 2016, cobot sales still only accounted for less than five percent of robot sales worldwide, but the industry will be valued at $3bn in 2020, according to estimates.[5]

The co-working relationship between humans and robots has already proved highly influential on the factory floor in places like SEW-Eurodrive's factory in Baden-Württemberg. But, for robots to become further integrated with the human workforce in the future, new technology will be required to drive this integration. All of this will become possible with the help of further improvements to augmented reality. This is a technology that will become increasingly vital as robots become able to predict when they will need maintenance, or even fix themselves.

From all the evidence of the past few years, it's clear that robotics will not replace the human workforce. Instead, the collaboration between man and machine will simply become more important than ever; and robots will actually provide humans with further employment opportunities by creating new roles in the workforce. As a result, we should be unafraid of change and embrace the oncoming wave of automation and robotics in the manufacturing and engineering sectors.

Share thoughts with us on social media using #RevEAL.

"We should be unafraid of change and embrace the oncoming wave of automation and robotics in the manufacturing and engineering sectors."

For more than 4 million of us in the UK, the daily commute to work would be very different without trains. We regularly use them to get from A to B without much thought of the changes in technology, which make them increasingly faster and more efficient. However, a great deal of thought is going into the skills gap that underpins the journey from where the rail industry is currently to where it will need to be in the future.

Case Study:

On a Training Mission with NTRS/EAL

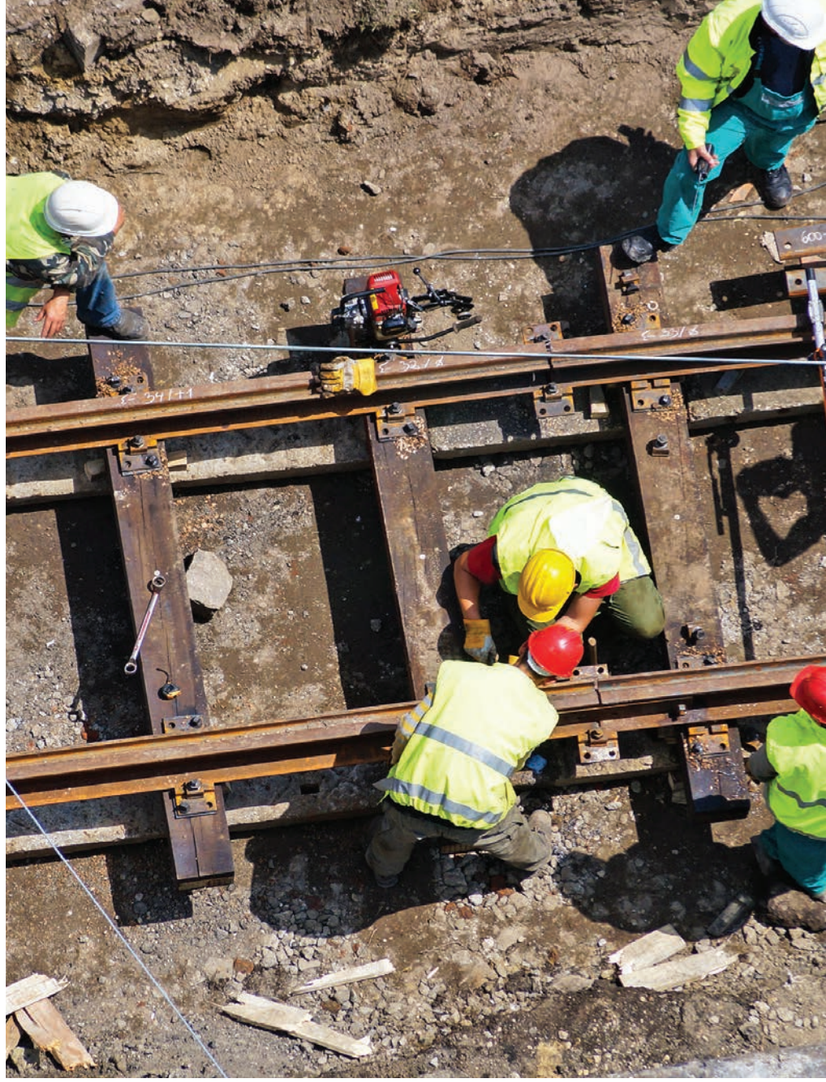
To embrace advancements in technology, the Department for Transport Infrastructure Strategy estimates that the rail sector will need £100 billion of work over the next decade in addition to 50,000 new workers by 2033. So how is this achievable? Where will people with the relevant skills be found?

This is where Network Training and Resource Solutions Limited (NTRS) comes in. NTRS are an organisation that specialise in empowering ex-military personnel with future work opportunities. Started in 2002 with a vision to expand into multiple sectors, NTRS have grown into a multi-award-winning, nationally renowned, training centre specialising in the provision of training in the rail and telecommunications sectors.

From a state-of-the-art National Training Academy in Sheffield, South Yorkshire, NTRS deliver first class training qualifications and accreditations across multiple disciplines. Encompassing a wide range of entry-level through to complex 'off the shelf' and bespoke courses. These are aimed at both businesses intending to upskill their workforce and individuals looking to further advance their careers.

Since the commencement of a partnership with EAL in 2015, NTRS has been able to provide specialist training in the form of the 'Level 3 Award In Digital Communications Network Infrastructures and Services'. Identifying a gap in the market with telecoms training that encompassed Railway telecoms, NTRS worked with EAL to develop the new industry leading course that would rival other courses available in the market.

Find out more about Network Training and Resource Solutions at ntrs.co.uk



The qualification is perfect for anyone interested in a career in Telecoms. Within the framework of an intensive Level 3 course, candidates gain fundamental knowledge necessary for a career in telecoms and rail telecoms. Specifically, the course covers an understanding of 'Health and Safety in an Industrial Environment', 'Rail Telecommunications Engineering', 'Passive Optical Networks (PONS)' and 'Air Blown Fibre Installation and Maintenance'.

This partnership between NTRS and EAL further strengthens the work of NTRS in providing courses of study for ex-service personnel. With over 17 years experience of empowering and guiding people into future career paths it was imperative that NTRS chose the right partner to work with in order to uphold their mission to provide training that 'recognises the unique potential of each candidate, accelerates learning and personal growth, and lends a shared sense of purpose in building and rewarding careers'. As the trusted specialist skills partner and awarding organisation for industry, EAL made for a perfect fit.

Through working in unison on this project, NTRS and EAL have been able to make positive steps forward in terms of not only decreasing the rail industry skills gap but also accrediting the ideal candidates for the role: ex-military personnel. The latest government stats project that by 2028 there will be approximately 1.6 million UK Armed Forces veterans residing in Great Britain. For every 80 veterans, 35 will be of working age (a 44% increase on 2016 figures). So what do employment prospects look like outside of the Forces? Well, according to a 2018 report, figures show that overall, the levels of employment for veterans are very high at 81% of those surveyed being in full or part time employment. Courses such as the 'Level 3 Award In Digital Communications Network Infrastructures and Services' provide a sustainable pathway forward for ex-service personnel with a malleable skills base.

This course has enabled NTRS to deliver a more industry specific training course to both support the development of their students and the next generation of Railway resource. The EAL course enables a flexible training course with internal modules, providing the ability to train at once, or in modular stages which has proved very successful both with individuals and corporate customers. The training on bespoke Railway kit and equipment within this course also supports students into employment, as they can demonstrate a depth of understanding within a Railway environment, as well as general telecoms environments.

"The qualification is about preparing people for the digitisation of the railway, the installation of fibre optics and joining them," says Allan Macdonald, Commercial Product Specialist for EAL. "EAL are thrilled to be supporting NTRS in this important work and to be offering qualification solutions in partnership with leading companies like NTRS as we prepare for the digitalisation of the railway infrastructure."

"As an EAL accredited centre, NTRS are able to demonstrate our commitment to training and quality," says NTRS Managing Director Taryn Edge. "As a result, NTRS are looking to explore further bespoke EAL courses to widen the portfolio delivered into the more niche markets."

The Changing World of Work: Future-Proofing Workforces

The Fourth Industrial Revolution, otherwise known as Industry 4.0, is introducing smart, autonomous systems that are fuelled by data and machine learning. By optimising the use of computers, robotics and automation in the workplace, the Fourth Industrial Revolution is revolutionising the way that we learn, enter the job market and work. A key positive here is that this will likely involve the creation of entirely new jobs, leading to further employment options and opportunities for learning providers to attract more customers.

But, on the downside, Industry 4.0 may mean that some manual roles will become redundant as robots replace human workers. This is particularly the case when we consider the changing nature of the workforce at this time. After all, studies show that 65% of children in primary school will end up in jobs that don't yet exist.[1] Plus, up to 20 million manufacturing jobs around the world could be replaced by robots by 2030.[2] Thankfully for these workers, artificial intelligence is likely to create as many jobs as it displaces in the UK, and it will boost economic growth in the process.[3]

The fast-paced demands of the technology involved in the Fourth Industrial Revolution means that new skills will be required to fill these new roles, and these skills will have to be learned quickly. Subsequently, the rapidly changing landscape brought about by Industry 4.0 will span new and different approaches to learning. As a result, the way some people are finding work or planning their careers is radically changing. What's more, established learning providers are being challenged and the field is becoming more diverse and competitive. This means that learning providers and businesses cannot afford to be complacent, and they must re-examine their offering in light of the current marketplace.

But, although Industry 4.0 undoubtedly threatens the operations of colleges and training providers, by arming yourself with the latest information on educational trends, you can look to ensure the longevity and viability of your business. With this in mind, let's look at the latest educational trends in youth markets, and assess how traditional establishments can remain relevant in an evolving educational landscape.

The first example of how new education providers are challenging traditional educational models is the rising number of coding bootcamps. By offering a choice of online and on-campus courses, providers such as Coding Dojo are giving young workers the flexibility they're looking for. Plus, their targeted, skills-based courses are well suited to the modern, technologically savvy route to employment.

These courses are particularly useful for young workers who know what they'd like from their career. This is because, due to the targeted nature of the courses, they allow participants to train for a specific profession quickly. Now, thanks to these providers, candidates can complete courses in around 14 weeks and be immediately equipped to face the training and placement challenges created by Industry 4.0.

Although the emergence of these courses is problematic for traditional education providers, there are a number of ways that colleges can stay relevant. For example, by shifting to a model that's more apprenticeship-focused, colleges can highlight the benefits of choosing a traditional course that leads directly to jobs with employers after certification. Similarly, colleges can also look to replicate the flexibility that these courses provide and offer off-campus learning.

Overall, colleges have an opportunity to replicate the successes of these industry-disrupting companies while still focusing on their own USPs. After all, colleges still hold several benefits over these new learning providers. This is because many of the new models are niche and unproven in the long term, and colleges can still point towards a lengthy track record of successful employment.

Secondly, many people with entrepreneurial spirit are deciding that the traditional educational routes are not for them, and they're instead choosing to emulate successful entrepreneurs like Mark Zuckerberg and Peter Thiel - by dropping out of college or university to instead launch and learn in startups. Whereas before, pioneering stories like these were seen as the exception to the rule, the inter-connected nature of modern life places these stories in the headlines, and we're seeing more young people wanting to follow this path as a result.

Of course, although these entrepreneurial success stories form an aspirational view for younger workers, not everyone can be the next Zuckerberg and it's unclear how widely replicated this route can be. So, although this entrepreneurial route to work tells us a lot about how people want to learn and work today, it's still widely considered to be niche and unproven. In addition, even though this route is a

"The rapidly changing landscape brought about by Industry 4.0 will span new and different approaches to learning."

"The Fourth Industrial Revolution promises to put people first and empower them by creating better opportunities."

very modern approach, we're already seeing opposition to these 'Unicorn Companies', with a push towards 'Zebra Startups' instead.[4] This may mean that such a route to work is unsustainable in the long term.

Thirdly, to ensure that their companies continue to attract the best and brightest young workers, we've already begun to see some instances of large corporations bringing learning and development programs in-house. For example, Amazon and Salesforce have both recently started programs to train their internal employees for roles that are hard to fill. This then has a double benefit for the employer. Not only can they fill a role quickly, but they can also take charge of the training and ensure that each candidate is working towards their in-house requirements from day one, rather than learning general skills that may not be applicable for that role.

Of course, this is unrealistic for smaller companies, but apprenticeships are a very similar approach. In addition, although in-house training looks like a modern trend, it can be argued that this educational approach is similar to the master and apprentice training method that has been around for decades. As a result, these models are largely reinventing the wheel to a degree, rather than revolutionising workplace learning. Plus, with the government now making a big push towards more vocational learning via apprenticeships, universities and colleges can take solace in the fact that a traditional form of learning looks just as appealing now as it did generations ago.

"This educational approach is similar to the master and apprentice training method that has been around for decades."

We've already assessed how Industry 4.0 will affect young workers and their route to work, but we also need to consider how established workers may see their jobs change as a result of Industry 4.0.

Overall, it's likely that many employers will change the way they operate due to the shift in labour requirements brought about by robotics and AI. As a result, upskilling and reskilling courses will provide important opportunities for learning providers. This is particularly true when we consider adults currently in low-paid and low-skilled roles. Due to Industry 4.0, these adults may need to become mature students and lifelong learners. This means there will always be a gap in the market for colleges and training providers who specialise in upskilling and reskilling these people as their roles are reinvented and changed.

So, with these trends in mind, is vocational education about to replace university degrees? Well, it's certainly possible, but largely unlikely. However, traditional establishments must change to remain relevant. After all, tech-savvy teens now have the opportunity to apply to work at Google straight out of high school, and many are taking this option. The Fourth Industrial Revolution promises to put people first and empower them by creating better opportunities. Consequently, traditional education providers must pay attention to the trends that are happening now and ensure they're creating an appealing alternative that mirrors what young workers are looking for.

So, although colleges and universities are facing increasing competition, there are a number of steps they can take to stay relevant. For example, re-evaluating the product offering can help these institutions stay appealing. They should keep up-to-date with positive elements (such as the flexibility and technology focus) offered from new providers, while keeping their own USPs. In addition, they should be armed with the knowledge that employers across the country will need to retrain staff or risk losing talent to organisations with better learning prospects and packages. Thankfully, colleges are already well placed to help retrain these employees through apprenticeships and skills courses.

As a customer of Enginuity, it's also important to remember that you've invested in quality, which there will always be a demand for. In such a period of change, we build on tried, tested and trusted methods and create the innovative solutions required to meet the needs of employers. In a turbulent and changeable world, we'll continue to be a beacon of best practice and continue to raise the bar in terms of the quality of our outcomes. After all, although the industry is evolving, who we are isn't. By choosing us, you'll not only benefit from our high standards today, but you'll continue to benefit from them as we forge forward in the future. In good times and in bad, we'll always be by your side.

"This means there will always be a gap in the market for colleges and training providers who specialise in upskilling and reskilling these people as their roles are reinvented and changed."

Industry 4.0 will change engineering forever. But, there are still doubts about how prepared UK engineers are for changes that are already happening in the workplace today. After all, the changes brought about by Industry 4.0 will completely transform the profession so, the quicker companies and their engineers can adapt to the changes, the better.

Are Engineers Ready for Industry 4.0?

“By arming yourself with new talents and skills, you’ll be able to future-proof your role and prepare yourself for Industry 4.0.”

For engineers who are working in the profession every day, improvements in operational processes, computational workflows, and new design tools will all be extremely helpful. But, from planning through to delivery, it appears as though Industry 4.0 could change every aspect of an engineer’s job.

According to the World Economic Forum, by 2022, the role of a traditional civil engineer may be replaced by robotics engineers, data analysts and scientists, software developers and big data specialists.[1] Overall though, according to research undertaken by New Civil Engineer and Bentley Systems, only 11% of engineers feel their job will be threatened by technology.

Having said that, there’s widespread agreement in the industry that preparedness at a company level is lacking. After all, only 29% of people surveyed believe that their firm is currently able to use the advanced data analytics that Industry 4.0 will require. It’s also a similar story when we look at preparedness for the use of artificial intelligence, machine learning and the internet of things.[2]

This survey backs data from the Boston Consulting Group (BCG), who revealed that although businesses in the UK are preparing for Industry 4.0, they lag behind their competitors in China, Germany and France. When it comes to preparedness for the skills and technology associated with Industry 4.0, the BCG survey found that The UK was in fact around 10-12 percentage points behind its European counterparts.[3]

But, the great news for UK engineers is that it isn’t too late for UK-based businesses to act and become leaders in the implementation of Industry 4.0. Chiefly, businesses must close the IT skills gap that will cause issues for both companies and education systems.

On an individual level, engineers can take responsibility for driving the growth that Industry 4.0 will create. After all, Industry 4.0 will likely lead to a renaissance for the engineering industry, as emerging markets continue to develop. As a result, numerous opportunities will emerge for engineers, and the most proactive engineers will likely receive the greatest rewards as new applications and jobs become available.

From helping to develop robotics to constructing sensors and designing drones, engineers have a vital role to play in the application of Industry 4.0. For this reason, engineers should now be looking to evolve their skillset. This is because, although new technologies will require a change in workforce needs, this will lead to the creation of new roles. These will require some adaptation and a new focus on education, but a high demand for engineers of all types will remain.

So, as an engineer, you should begin to add a cycle of reassessment and professional development to your portfolio. Discuss with your manager or team leader about how you can drive Industry 4.0 and empower other workers to drive growth. After all, an awareness and understanding of how to work with new technologies will soon become an essential part of the job, and adapting to a new generation of engineers who grew up as coders will become vital.

By arming yourself with new talents and skills, you’ll be able to future-proof your role and prepare yourself for Industry 4.0. Thankfully, with our skills solutions, you can see, develop and make visible the skills you need to succeed in engineering, today and tomorrow.

Visit our new website at **enginuity.org** to find out more.

From Field to Factory-Grown Food

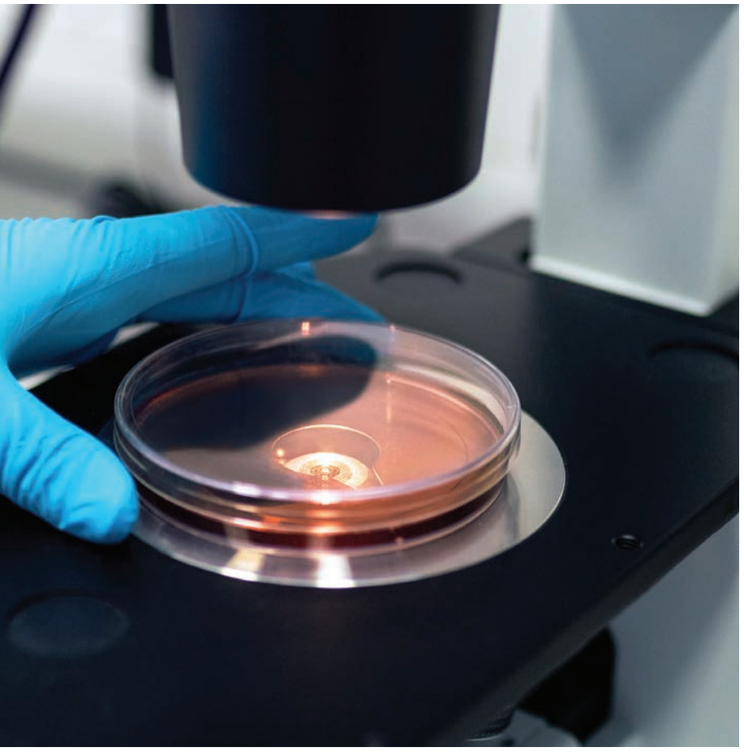
From hunter-gatherer, to farming the fields, to mass food production – the way humanity has provided sustenance for itself has changed unrecognisably over time.

At the time of the first industrial revolution (1760-1840), when farm workers left the fields to work in factories in cities, would they ever have envisioned a time where the factories would become the new fields of innovation where food would be grown? But now, in the midst of Industry 4.0, this is exactly where we are. In yet another paradigm shift that industrial revolutions bring about, factory-grown food is set to revolutionise the farming and agricultural industry as one of the only viable options for a sustainable food source that will provide for our growing population – without destroying the planet.

At Enginuity, one of our main focuses is on how we can create a safer and healthier world, so sustainability and food production are vital topics for us as our population grows and we place ever-increasing demands on our planet. Engineers are at the forefront of tackling many of the biggest societal issues such as these, and the high degree of skills and innovative technology needed to overcome them is a focal point for us as a leader in the Advanced Manufacturing and Engineering (AME) sector.

Whilst there are many aspects of factory-grown food, one of the main ones being vertical farming where crops are grown all year round in simulated ideal conditions, the scope of this article doesn't allow us to delve into each one. So here, we will be focusing on one innovation that is on course to reform the meat industry – lab-grown meat.

Could lab-grown meat be the solution?
Dr Mark Post of Maastricht University has led the way in lab-grown food, creating the first ever cultured meat burger in 2013, which he grew in his lab from cow cells and 20,000 strands of protein. The petri-dish burger was the product of human design and years of research, funded by Sergey Brin, the co-founder of Google, and the finished product alone cost $300,000. The success of this burger led to Brin and Post co-founding Mosa Meat in 2015, with the aim of finding a way to feed our ever-growing population in a sustainable, healthy and animal-friendly way.



Since then, we have seen more lab-grown food companies emerge, producing a wide range of food. Clara Foods, a cellular agriculture company, produces hen-free egg whites, Endless West is creating a test-tube whiskey called Glyph, Finless Foods is cultivating seafood and Solar Foods produces plant-free flour.

Despite it being a world away from the traditional way we have sourced food for hundreds and thousands of years, there is simply too much evidence to ignore that this way of manufacturing food could be the future – and, more than that, could help save the planet.

The shocking truth is that livestock farming accounts for close to 18% of greenhouse emissions and devours 70% of arable land, as well as almost half of crop production for animal feed. With the rising population expected to hit 10 million by 2050 and the demand for meat expected to increase by 73% by the same date, another option simply has to be found. The current solution of lab-grown meat is well under way, boasting a variety of benefits.

The benefits of lab-grown meat
Clean meat producer, Mosa Meats, states "the cultured meat process requires 99% less land and 96% less water than livestock agriculture and a 2018 report from the Good Food Institute indicates that exclusive consumption of cultured meat could reduce greenhouse gas emissions by 74 to 87% versus traditional beef."

In terms of actual numbers of livestock, Maastricht University states that 175 million quarter-pounder lab-grown burgers can be produced from the cells of one single cow, compared to a staggering 440,000 cows for the same output via traditional methods.

So, less land, less water, less damage to the environment... the benefits of lab-grown meat don't end there. No insecticides and lower pollution levels spring to mind, and although the original cells are currently taken from animals, there is no need for the billions of animals that traditional methods call for. But think about the more extensive global changes:

01 Less deforestation and land and river exploitation will bring back wildlife and complex living systems.
02 Improvements to human health from healthier eating and lowered antibiotic immunity from use in livestock will result in unimaginable savings for the economy.
03 The amount of land needed is minuscule in comparison to livestock and crop farming, and it can be anywhere, even in the vast empty expanses of deserts.

Thinktank RethinkX believes this new food economy will "replace an extravagantly inefficient system that requires enormous quantities of inputs and produces huge amounts of waste with one that is precise, targeted, and tractable and presents the greatest opportunity for environmental restoration in human history".

"Here was a technology that could just grow the part of the animal that we wanted ... For me, there was this lightbulb moment."

However, there are limitations, and it is only the AME sector that can provide the solutions needed to drive this potential life-saving change forward.

The AME sector is key to surpassing limitations
The main limitation that lab-grown food faces is the size of the bioreactors – large brewery-type chambers that provide the optimum conditions for cultured meat to be grown in. The technology has unquestionably proven successful at laboratory scale, but it now needs to be scaled up. At present, the largest existing bioreactor has a volume of 25,000 litres, which can only cultivate enough meat to feed approximately 10,000 people.

Another issue that is going to require more extensive scientific development is the serums that are used to feed the cells that grow the food. So far, the serums have been made up of sugars, amino acids and animal blood. Dr Post explains that not only is the use of blood an issue for vegetarians and vegans, but he expands on the difficulties of finding alternatives: "There are tens of thousands of different substances in blood and there are a few magical ingredients required for every different cell type."

While the products that have been produced so far have been well-received by food critics, the range remains limited. Further work needs to be done on the scaffolding used in cellular agriculture that provides support to the cells as they multiply and grow. This will allow for different textures, shape and tastes of meat to be developed, so consumers can enjoy lab-grown steaks, for example.

Cost is also a big prohibitor at the moment. The price of lab-grown burgers is already dropping, but it is yet to be at a level that would be acceptable for consumers. Dr Post would like to see the cost for a Mosa Meat burger patty come down to $10, and the more the industry and technology behind it is scaled, the cheaper the products will become. The current aim is that it will be able to compete with traditionally sourced livestock animal products, but RethinkX suggests that lab-grown proteins could be 10 times cheaper than animal protein by 2035.

The two other elephants in the room are social acceptability and the loss of livelihood for those in the farming industry. In terms of social acceptability, lab-grown meat needs to become more widely accepted. As with every paradigm shift, the hope is that, with time, people will become more open to the idea. The negativity around the concept does beg the question, however, of why people are struggling with the idea of lab-grown food when we eat so much other food that is produced in factories – often in much more synthetic ways. Lab-grown meat and fish are still made from the cells of animals, but just grown in a different, much more effective, way.

In terms of loss of livelihood in the farming industry, it would be inevitable, and could be devastating for those who come from a background of centuries of farming. However, the government is currently ploughing £560bn a year into farm subsidies, much of which is leading to deforestation, pollution and the destruction of wildlife. The Food and Land Use Coalition conducted research and goes as far as to say that "only 1% of the money is used to protect the living world", and it failed to find "any examples of governments using their fiscal instruments to directly support the expansion of supply of healthier and more nutritious food."

What if this funding was redirected into helping farmers into different areas of employment, concentrating on transferable skills and upskilling? Farmers are astute business people and their ability to adapt shouldn't be underestimated. Illtud Dunsford, a Welsh beef farmer who tended a farm that had been in his family for 300 years, discovered lab-grown food technology at a conference back in 2015:

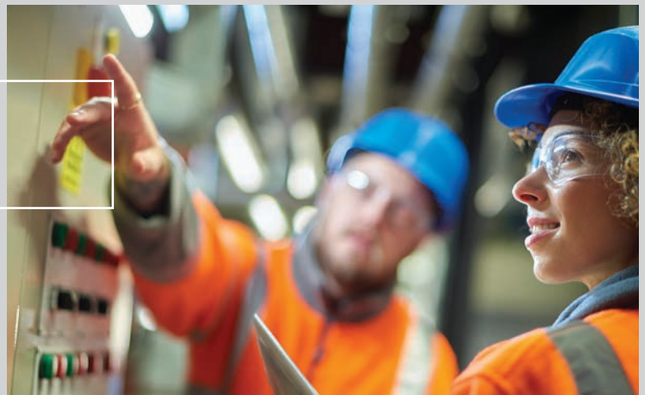
"At the time, being heavily involved in the meat industry, heavily involved in adding value to animal waste products, here was a technology that could just grow the part of the animal that we wanted to consume rather than the whole animal. From a life cycle analysis perspective, it was considerably kinder to the planet. For me, there was this lightbulb moment."

Together with Dr Marianne Ellis, Associate Dean of Engineering at the University of Bath, he consequently co-founded Cellular Agriculture Ltd with the goal of developing bioreactors to enable cultivated meat to be grown at scale

While these limitations are going to take time to address, the bottom line is that our world cannot continue to produce food in the way it is doing now. Lab-grown food offers an alternative that not only provides huge benefits to the environment, but also to health, the economy and animal welfare.

Forging forward to find the answers is the epitome of what Enginuity is about – combining innovative engineering with ingenuity to create a solution that solves a worldwide problem. Here to help provide people with the opportunities they need to change their lives, while at the same time tackle society's greatest challenges, Enginuity Group is dedicated to creating practical solutions for individuals, educators, and manufacturing and engineering employers who want to see and develop the skills needed to succeed, today and tomorrow.

Solutions



End-Point

Since 2014, Enginuity and EAL have been involved in the design, development and delivery of new apprenticeship standards and the establishment of an End-Point Assessment Organisation (EPAO) that is fit for purpose and capable of providing the high level of assurance to employers that apprentices can safely and productively do the job they trained for.

We understand the vital importance of End-Point Assessment (EPA). Over the past year we have invested heavily to deliver what we believe is a best-in-class EPA provision which is sustainable and focused on quality, ideally suited to the needs of our customers. This includes a dedicated, expert team ready to provide advice and guidance on every aspect of EPA.

EAL is on the government's approved register of End-Point assessment Organisations (EPAOs) and is endorsed to deliver EPA for 23 apprenticeship standards and applying to offer more as they become available.

Why use EAL?

01

A dedicated, expert team with a wealth of experience in the sector, passionate about the quality of our delivery, the customer journey and placing your needs at the heart of all we do.

02

We continue to invest significantly in developing and implementing high quality technology, which provides a platform for managing the end-to-end process and enhances our service.

03

500 achievements to date and a first-time pass rate of 97.7%. This success is based on being prepared and ready for EPA, offering individuals a moment to shine and giving employers assurance of a highly skilled workforce.

End-Point Assessment Services

ST0310	Associate project manager
ST0024	Electrical / electronic technical support engineer (degree)
ST0432	Engineering fitter
ST0841	Engineering manufacturing technician
ST0537	Engineering operative
ST0457	Engineering technician
ST0420	Lean Manufacturing Operative
ST0252	Lift and escalator electromechanic
ST0154	Maintenance and operations engineering technician
ST0025	Manufacturing engineer (degree)
ST0607	Metal fabricator
ST0282	Metrology Technician
ST0033	Motor vehicle service and maintenance technician (light vehicle)
ST0695	Process leader
ST0027	Product design and development engineer (degree)
ST0588	Propulsion technician
ST0316	Rail engineering advanced technician
ST0317	Rail engineering operative
ST0318	Rail engineering technician
ST0419	Rail infrastructure operator
ST0669	Tramway construction operative
ST0395	Watchmaker

To find out more about our offer and these qualifications visit **www.eal.org** or give us a call on 01923 652400.

Business Improvement and Project Management

EAL offers a range of qualifications designed to help businesses drive improvements, efficiencies, productivity and project management.

Our qualifications in Business Improvement Techniques (BIT) are an ideal complement for technical job-specific qualifications. They help learners apply a range of lean techniques and methodologies to achieve sustainable advancement in working practices.

Our Diploma in Project Management is an integrated qualification in Project Management, which includes requirements for both technical knowledge and practical competence. The requirements were defined in order to align with National and International Occupational Standards relating to project management.

End-Point Assessment
We offer End-Point Assessment for the Associate Project Manager (Level 4) apprenticeship standard.

Why use EAL?

01

Our qualifications have been developed in conjunction with industry, end users and educational institutions.

02

Our qualifications are recognised across a range of sectors and, where appropriate, are aligned to professional organisations.

03

Our qualifications use a range of different assessment methodologies to ensure that all learners have the best opportunity to achieve the qualification requirements.

Business Improvement and Project Management Qualifications	501/0856/6	EAL Level 3 NVQ Diploma in Business Improvement Techniques
	501/1495/5	EAL Level 2 Certificate in Business Improvement Techniques
	600/0297/9	EAL Level 4 NVQ Diploma in Business Improvement Techniques
	600/3559/6	EAL Level 3 Diploma in Business Improvement Techniques
	600/6034/7	EAL Level 4 Diploma in Project Management
	600/6274/5	EAL Level 4 Certificate in Group Leadership in a Manufacturing Environment
		EAL Level 2 Certificate in Applying Business Improvement Techniques
Scottish Qualifications	GM1C45	SVQ Business Improvement Techniques at SCQF Level 5
	GM1D46	SVQ Business Improvement Techniques at SCQF Level 6
	R47004	SVQ Diploma in Project Management at SCQF Level 8

To find out more about our offer and these qualifications visit **www.eal.org** or give us a call on 01923 652400.

Building Services

EAL operates at the heart of the building services sector, working hand in hand with industry employers and professional trade associations.

We recognise that industry needs robust qualifications that are flexible enough to ensure the highest quality of learning and relevancy, as well as clear progression pathways to support those new to industry and those looking to build on and enhance existing skills and knowledge.

Our qualifications are designed to equip learners with the knowledge and skills to work across a range of domestic, commercial and industrial environments.

We offer qualifications in:

01 Electrotechnical
02 Environmental technologies
03 Plumbing and domestic heating
04 Gas utilisation

Recognised by Industry
EAL qualifications are recognised by employers and professional bodies, including:

01 The Joint Industry Board (JIB) for the electrical contracting industry and the SJIB
02 The Institution of Engineering and Technology (IET)
03 The Joint Industry Board for Plumbing and Mechanical Engineering Services (JIB-PMES)
04 The Electrical Contractors' Association (ECA)
05 The Chartered Institute of Plumbing and Heating Engineering (CIPHE)
06 The Chartered Institution of Building Services Engineers (CIBSE)
07 The Microgeneration Certification Scheme (MCS)
08 Electrical Competent Person Scheme operators such as NICEIC, NAPIT and ELECSA
09 Gas Safe

Why use EAL?

01

We offer a full suite of electrotechnical competency and technical knowledge qualifications from Level 1 to Level 4, so you can use EAL for all your electrotechnical qualification requirements.

02

We are electrotechnical specialists with a huge depth of knowledge, expertise and experience in the sector, so you will always receive a solutions-based service and support to stay at the forefront of any new industry developments.

03

Our industry qualifications are recognised by the industry's professional bodies, including the Joint Industry Board (JIB) and the Scottish Joint Industry Board (SJIB) and meet the requirements for Competent Person Schemes, and, where applicable, Registered Electrician Status.

04

We are gas and plumbing specialists with a huge depth of knowledge and experience in the sector, so you can always access expert help and support.

05

We offer a full suite of gas, plumbing and domestic heating competency and technical knowledge qualifications from Level 1 to Level 3.

06

Training delivery replicates the real working environment and encompasses technical competence, safety awareness and customer care skills, ensuring learners are work-ready.

07

Where applicable, the qualifications are recognised by the industry's professional bodies – the Chartered Institute of Plumbing and Heating Engineers (CIPHE) and Gas Safe.

Electrical – For Progression into Employment	600/6724/X	EAL Level 2 Diploma in Electrical Installation
	600/9331/6	EAL Level 3 Diploma in Electrical Installation
	601/0409/0	EAL Level 1 Diploma in Electrical Installation
Key Stage 4 and 5	601/4561/4	EAL Level 2 Intermediate Diploma in Electrical Installation
	601/4563/8	EAL Level 3 Advanced Diploma in Electrical Installation
Electrical Apprenticeship and Occupational Qualifications	501/1604/6	EAL Level 3 NVQ Diploma in Electrotechnical Services (Maintaining Electrotechnical Systems)
	501/1605/8	EAL Level 3 NVQ Diploma in Installing Electrotechnical Systems and Equipment (Building, Structures and the Environment)
	601/7345/2	EAL Level 3 Electrotechnical Qualification (Apprenticeship Standard England)
	ETS3	EAL Level 3 Diploma in Electrotechnical Services Experienced Worker Assessment Route*
Electrical Continuous Professional Development (CPD)	600/4337/4	EAL Level 3 Award in the Initial Verification and Certification of Electrical Installations
	600/4338/6	EAL Level 3 Award in the Periodic Inspection, Testing and Certification of Electrical Installations
	600/4340/4	EAL Level 3 Award in the In-Service Inspection and Testing of Electrical Equipment (PAT)
	601/8231/3	EAL Level 4 Award in the Design and Verification of Electrical Installations
	603/0144/2	EAL Level 2 Award in Fundamental Inspection, Testing and Initial Verification
	603/2625/6	EAL Level 3 Award in Electrical Installation Inspection, Testing, Certification and Reporting
	603/3298/0	EAL Level 3 Award in the Requirements for Electrical Installations BS 7671:2018
	603/3929/9	EAL Level 3 Award in the Requirements for the Installation of Electric Vehicle Charging Points

*JIB restrictions apply

Building Services Project Management Occupational Qualifications	600/4309/X	EAL Level 3 NVQ Certificate in Building Services Engineering Technology and Project Management
Environmental Technology Awards	600/0665/1	EAL Level 3 Award in the Fundamental Principles and Requirements of Environmental Technology Systems
	600/5175/9	EAL Level 3 Award in the Installation of Small Scale Solar Photovoltaic Systems
BSE, Plumbing and Gas – For Progression into Employment		Building Services Engineering
	600/6005/0	EAL Level 1 Award in Building Services Engineering
	600/6004/9	EAL Level 1 Diploma in Building Services Engineering Multi-Skilled Operations
	600/1063/0	EAL Level 1 Certificate in Access to Building Services Engineering
	600/1023/X	EAL Level 2 Diploma in Access to Building Services Engineering
	603/5423/9	EAL Level 3 Award in Industrial and Panel Wiring
		Plumbing and Heating
	600/8552/6	EAL Level 1 Diploma in Plumbing
	600/6725/1	EAL Level 2 Award in Plumbing and Heating
	600/6891/7	EAL Level 2 Certificate in Plumbing and Heating
	600/6726/3	EAL Level 2 Diploma in Plumbing and Heating
	600/8593/9	EAL Level 3 Certificate in Plumbing and Heating
	600/8595/2	EAL Level 3 Diploma in Plumbing and Heating
		Gas Utilisation
	600/8547/2	EAL Level 2 Diploma in Gas Utilisation Core Skills and Knowledge
	600/0577/4	EAL Level 3 Diploma in Gas Utilisation: Core Skills and Knowledge
Key Stage 4 and 5	601/4562/6	EAL Level 2 Intermediate Diploma in Plumbing
	601/4567/5	EAL Level 3 Advanced Diploma in Plumbing

Domestic Heating, Plumbing and Gas Utilisation Apprenticeship and Occupational Qualifications

	Domestic Heating
501/1606/X	EAL Level 2 NVQ Diploma in Domestic Heating
600/1253/5	EAL Level 3 NVQ Diploma in Domestic Heating (Environmental)
600/1454/4	EAL Level 3 NVQ Diploma in Domestic Heating (Gas Fired Water & Central Heating Appliances)
	Plumbing and Heating
501/1752/X	EAL Level 2 NVQ Diploma in Plumbing and Heating
600/1252/3	EAL Level 3 NVQ Diploma in Domestic Plumbing and Heating (Environmental)
600/1657/7	EAL Level 3 NVQ Diploma in Domestic Plumbing and Heating (Gas Fired Water & Central Heating Appliances)
603/4028/9	EAL Level 3 Diploma in Plumbing and Domestic Heating (Apprenticeship Standard England)
	Gas Utilisation
601/7886/3	EAL Level 3 Diploma in Gas Utilisation
600/1661/9	EAL Level 3 Diploma in Gas Utilisation Installation and Maintenance: Water Heating and Wet Central Heating
600/0574/9	EAL Level 3 Diploma in Gas Utilisation Installation and Maintenance: Cookers, Tumble Dryers and Leisure
600/0575/0	EAL Level 3 Diploma for Gas Emergency First Call Operative
	Smart Metering
601/6690/3	EAL Level 2 Diploma in Smart Metering – Dual Fuel
601/6691/5	EAL Level 2 Diploma in Smart Metering – Gas
601/6692/7	EAL Level 2 Diploma in Smart Metering – Power

New Qualifications	603/4906/2	EAL Level 3 Award in the Requirements of Fire Detection and Fire Alarm Systems for Buildings BS 5839-1:2017
	603/4729/6	EAL Level 3 Award in the Installation and Maintenance of Compressed Gas Supply Systems (RF)
Withdrawn Qualifications	600/0576/2	EAL Level 3 Diploma in Gas Utilisation Installation and Maintenance: Cookers, Tumble Dryers, Leisure and Domestic Space Heating Registration End Date: 31/05/2020 Certification End Date: 31/05/2022

To find out more about our offer and these qualifications visit **www.eal.org** or give us a call on 01923 652400.

Engineering and Manufacturing

EAL supports the engineering sector, from aerospace, marine and automotive engineering to mechanical and core operations, with a qualifications portfolio that caters for the full spectrum of technologies and industrial applications.

These qualifications enable learners to achieve professional recognition from a range of industry organisations, such as the Engineering Council, Institution of Engineering and Technology, Institution of Mechanical Engineers, and Institute of Cast Metal Engineers.

End-Point Assessment
We have recently been endorsed to deliver End-Point Assessment for the Process Leader (Level 4) and Lift and Escalator Electromechanic (Level 3) apprenticeship standards, as well as other engineering standards.

Why use EAL?

01

We offer a full range of engineering qualifications from Level 1 to Level 4, meaning you can save time and money by using just one awarding organisation for all your engineering delivery.

02

We are engineering specialists with an unrivalled depth of knowledge, expertise and experience in the sector, so you will receive a highly responsive, solutions-based service.

03

Our qualifications are recognised by professional institutes in the sector we serve, ensuring we are providing the best possible qualifications for learners and employers in the UK.

04

Some of our engineering qualifications have UCAS point accreditation and support learner progression into higher education, an apprenticeship or other employment. The Key Stage 5 technical-level qualifications meet the Department for Education requirements and are included in the performance tables.

05

Our industry-recognised qualifications are acknowledged by the industry's professional bodies, including the Joint Industry Board (JIB) and the Scottish Joint Industry Board (SJIB) and meet the requirements for Competent Person Schemes.

Engineering and Manufacturing Qualifications

500/4286/5	EAL Level 4 Certificate in Performing and Testing Operations in the Lift and Escalator Industry
500/6147/1	EAL Level 2 Award in Industrial Environment Awareness
500/6590/7	EAL Level 2 NVQ Diploma in Business-Improvement Techniques (Process Improvement)
500/7595/0	EAL Level 2 Diploma in Engineering Technology
500/7998/0	EAL Level 2 Certificate in Metals Industries Processes
500/9851/2	EAL Level 2 NVQ Diploma in Mechanical Manufacturing Engineering (Machine Operating)
500/9852/4	EAL Level 3 NVQ Diploma in Mechanical Manufacturing Engineering (Machining)
500/9924/3	EAL Level 2 Award in Metrology – Dimensional Measurement
500/9948/6	EAL Level 3 Award in Metrology – Dimensional Measurement
501/0147/X	EAL Level 2 NVQ Diploma in Engineering Maintenance and Installation
501/0325/8	EAL Level 1 Certificate in Arc Welding
501/0372/6	EAL Level 2 NVQ Diploma in Engineering Technical Support
501/0386/6	EAL Level 1 Certificate in Engineering and Technology
501/0544/9	EAL Level 3 NVQ Diploma in Engineering Maintenance
501/0733/1	EAL Level 3 NVQ Diploma in Installation & Commissioning
501/0928/5	EAL Level 2 NVQ Diploma in Performing Manufacturing Operations
501/0979/0	EAL Level 2 Diploma in Mechanical Engineering Technology
501/0980/7	EAL Level 2 Certificate in Refrigeration/Air-conditioning Equipment Engineering Technology
501/0988/1	EAL Level 3 Diploma in Cycle Maintenance
501/1057/3	EAL Level 2 Diploma in Pipework Systems Mechanical Engineering Technology
501/1058/5	EAL Level 2 Diploma in Fabrication and Welding Engineering Technology
501/1059/7	EAL Level 2 Diploma in Maintenance Engineering Technology
501/1113/9	EAL Level 3 Diploma in Aircraft Maintenance Engineering Technology
501/1130/9	EAL Level 3 Diploma in Engineering Technology
501/1131/0	EAL Level 3 Diploma in Fabrication and Welding Engineering Technology
501/1155/3	EAL Level 3 Diploma in Mechanical Engineering Technology
501/1310/0	EAL Level 3 Diploma in Fabrication and Welding Engineering Technology (Progressive)
501/1422/0	EAL Level 3 Diploma in Mechanical Engineering Technology (Progressive)
501/1570/4	EAL Level 3 Diploma in Maintenance Engineering Technology (Progressive)
501/1807/9	EAL Level 2 Certificate in Positional Welding
501/2218/6	EAL Level 1 NVQ Diploma in Performing Manufacturing Operations
501/2317/8	EAL Level 1 Certificate in Electronics
600/0290/6	EAL Level 2 Award in Employment Rights and Responsibilities for New Entrants into the Science, Engineering and Manufacturing Industries
600/0602/X	EAL Level 2 Certificate in Preparation for Working in the Engineering Manufacturing Industry
600/0746/1	EAL Level 3 NVQ Diploma in Engineering Woodworking, Pattern and Model Making
600/0750/3	EAL Level 3 NVQ Diploma in Automotive Engineering
600/1025/3	EAL Level 3 Diploma in Casting Technology
600/1026/5	EAL Level 3 Diploma in Equipment Maintenance Engineering
600/1029/0	EAL Level 3 NVQ Diploma in Engineering Toolmaking
600/1030/7	EAL Level 3 NVQ Diploma in Engineering Leadership
600/1031/9	EAL Level 2 NVQ Diploma in Marine Engineering (Electrical Installation and Maintenance)
600/1037/X	EAL Level 3 NVQ Diploma in Aeronautical Engineering
600/1054/X	EAL Level 3 NVQ Diploma in Marine Engineering
600/1432/5	EAL Level 3 Award in Mobile Oxy-Fuel Gas Equipment Inspection
600/1433/7	EAL Level 3 Award in Applied Compressed Gases Safety
600/1650/4	EAL Level 3 NVQ Extended Diploma in Installation & Commissioning
600/1667/X	EAL Level 3 NVQ Extended Diploma in Engineering Toolmaking

Engineering and Manufacturing Qualifications

Continued

600/1701/6	EAL Level 3 NVQ Extended Diploma in Mechanical Manufacturing Engineering
600/1726/0	EAL Level 3 Diploma in Clock and Watch Servicing
600/1764/8	EAL Level 3 NVQ Extended Diploma in Marine Engineering
600/1769/7	EAL Level 3 NVQ Extended Diploma in Engineering Woodworking, Pattern and Model Making
600/1784/3	EAL Level 3 NVQ Extended Diploma in Automotive Engineering
600/1903/7	EAL Level 1 Award in Introductory Welding Skills
600/2019/2	EAL Level 2 Award in Personal Learning and Thinking Skills for New Entrants into the Science, Engineering and Manufacturing Sectors
600/2083/0	EAL Level 3 NVQ Extended Diploma in Aeronautical Engineering
600/2084/2	EAL Level 3 NVQ Extended Diploma in Engineering Maintenance
600/2116/0	EAL Level 2 Certificate in Engineering Maintenance on Military Vehicles and Equipment (Vehicle Recovery)
600/2119/6	EAL Level 3 Certificate in Engineering Maintenance on Military Vehicles and Equipment
600/2170/6	EAL Level 1 Award in Introductory Tungsten Inert Gas Welding Skills
600/2171/8	EAL Level 1 Award in Introductory Metal Inert Gas Welding Skills
600/2172/X	EAL Level 1 Award in Introductory Manual Metal Arc Welding Skills
600/2173/1	EAL Level 1 Award in Introductory Oxy Acetylene Welding Skills
600/3272/8	EAL Level 5 Diploma in the Repair, Restoration and Conservation of Clocks or Watches
600/3441/5	EAL Level 4 Diploma in the Servicing and Repair of Clocks or Watches
600/3569/9	EAL Level 2 Award in Metrology – Geometrical Tolerancing
600/5801/8	EAL Level 1 Award in Introductory Thermal and Plasma Cutting Skills
600/5973/4	EAL Level 1 Certificate in Engineering & Manufacture
600/6002/5	EAL Level 1 Award in Engineering & Manufacture
600/6003/7	EAL Level 1 Award in Introductory Brazing and Soldering Skills
600/6145/5	EAL Level 1 Diploma in Engineering & Manufacture
600/8085/1	EAL Level 2 NVQ Diploma in Composite Engineering
600/8086/3	EAL Level 3 NVQ Diploma in Composite Engineering
600/8229/X	EAL Level 1 NVQ Certificate in Performing Engineering Operations
600/8238/0	EAL Level 3 NVQ Extended Diploma in Metal Processing and Allied Operations
600/8264/1	EAL Level 2 NVQ Diploma in Performing Engineering Operations
600/8284/7	EAL Level 3 NVQ Extended Diploma in Composite Engineering
600/9174/5	EAL Level 2 NVQ Diploma in Fabrication and Welding Engineering
600/9486/2	EAL Level 4 NVQ Diploma in Engineering Manufacture
600/9576/3	EAL Level 4 NVQ Extended Diploma in Engineering Manufacture
600/9590/8	EAL Level 3 NVQ Diploma in Electrical & Electronic Engineering (Designing Electronic Circuits)
600/9591/X	EAL Level 2 NVQ Diploma in Materials Processing and Finishing
600/9592/1	EAL Level 3 NVQ Extended Diploma in Materials Processing and Finishing
600/9793/0	EAL Level 3 NVQ Diploma in Engineering Technical Support
600/9794/2	EAL Level 3 NVQ Extended Diploma in Engineering Technical Support
600/9795/4	EAL Level 3 NVQ Diploma in Materials Processing and Finishing
600/9931/8	EAL Level 3 NVQ Extended Diploma in Electrical & Electronic Engineering
600/9932/X	EAL Level 3 NVQ Extended Diploma in Fabrication and Welding Engineering
601/0003/5	EAL Level 3 NVQ Diploma in Fabrication and Welding Engineering
601/1879/9	EAL Level 3 Certificate in Standby Battery Systems
601/3375/2	EAL Level 2 Diploma in Engineering Technology – Motorsport
601/4111/6	EAL Level 1 Certificate in Introductory Welding Skills
601/4112/8	EAL Level 1 Diploma in Introductory Welding, Brazing, Soldering and Cutting Skills
601/4291/1	EAL Level 3 Diploma in Engineering Technology – Motorsport
601/5326/X	EAL Level 3 Award in Programmable Logic Controllers (PLC)
601/5658/2	EAL Level 1 Certificate in Engineering Technologies
601/5659/4	EAL Level 1 Diploma in Engineering Technologies
601/5669/7	EAL Level 2 Diploma in Engineering Technologies

Engineering and Manufacturing Qualifications

Continued

601/5670/3	EAL Level 2 Certificate in Engineering Technologies
601/5799/9	EAL Level 3 Subsidiary Diploma in Engineering Technologies
601/5800/1	EAL Level 3 Certificate in Engineering Technologies
601/5801/3	EAL Level 3 Diploma in Engineering Technologies
601/5802/5	EAL Level 3 Extended Diploma in Engineering Technologies
601/8138/2	EAL Level 1 Award in Introduction to Welding Fume Hazard Control
601/8606/9	EAL Level 1 Award in Metrology
601/8607/0	EAL Level 2 Award in Metrology
601/8608/2	EAL Level 3 Award in Metrology
603/0591/5	EAL Level 3 Diploma in Metrology and Calibration
603/0673/7	EAL Level 4 Diploma Engineer Surveyor
603/2292/5	EAL Level 3 Certificate in Traction and Rolling Stock Systems
603/2296/2	EAL Level 3 Certificate in Robotics and Automation
603/2621/9	EAL Level 3 Diploma in Advanced Manufacturing and Engineering – Fabricator (Development Competence)
604/4191/9	EAL Level 3 Award in Vehicle Tail Lift Inspection and Maintenance
603/5383/1	EAL Level 4 Diploma in Engineer Surveying

Apprenticeship Standards Qualifications

601/7179/0	EAL Level 2 Diploma in Advanced Manufacturing Engineering (Foundation Competence)
601/7289/7	EAL Level 2 Diploma in Aerospace and Aviation Engineering (Foundation Competence)
601/8618/5	EAL Level 4 Diploma in Engineering and Advanced Manufacturing (Development Competence)
601/9034/6	EAL Level 2 Diploma in Machining (Foundation Knowledge)
601/9035/8	EAL Level 2 Award for Foundation Phase Gateway Assessment
603/0050/4	EAL Level 2 Diploma in Maritime Defence (Foundation Competence)
603/0051/6	EAL Level 3 Diploma in Aerospace Manufacturing (Development Competence)
603/0372/4	EAL Level 3 Diploma in Aviation Maintenance (Development Competence)
603/0926/X	EAL Level 3 Diploma in Advanced Manufacturing and Engineering – Product Design and Development Technician (Development Competence)
603/1033/9	EAL Level 3 Diploma in Machining (Development Knowledge)
603/1034/0	EAL Level 3 Diploma in Advanced Manufacturing and Engineering – Machinist (Development Competence)
603/1221/X	EAL Level 3 Diploma in Advanced Manufacturing and Engineering – Toolmaker and Tool & Die
603/1353/5	EAL Level 3 Diploma in Advanced Manufacturing Engineering – (Development Knowledge)
603/1354/7	EAL Level 3 Extended Diploma in Advanced Manufacturing Engineering – (Development Knowledge)
603/2288/3	EAL Level 3 Diploma in Maritime Defence (Development Competence)
603/2290/1	EAL Level 3 Diploma in Advanced Manufacturing and Engineering – Technical Support Technician (Development Competence) (Engineering Software Development)
603/2311/5	EAL Level 2 Diploma in Maritime Defence (Foundation Knowledge)
603/2459/4	EAL Level 3 Diploma in Maritime Defence (Development Knowledge)
603/3194/X	EAL Level 2 Certificate in Engineering Operations (Knowledge)
603/3195/1	EAL Level 2 Diploma in Engineering Operations (Knowledge)
603/3220/7	EAL Level 2 Diploma in Engineering Operations (Skills)
603/3845/3	EAL Level 3 Diploma in Advanced Manufacturing and Engineering – Mechatronics Maintenance Technician (Development Competence)

Scottish Qualifications

GE7J22	SVQ 2 in Performing Manufacturing Operations at SCQF Level 5
GJ9A22	SVQ 2 in Performing Industrial Operations at SCQF Level 5
GJ9C23	SVQ 3 in Automotive Engineering (Vehicle Painting and Finishing) at SCQF Level 6
GJ9D24	SVQ 4 in Engineering Manufacture at SCQF Level 8
GL2M23	SVQ 3 Engineering Maintenance at SCQF Level 6
GL2N22	SVQ 2 in Fabrication and Welding at SCQF Level 5
GL2P22	SVQ 2 in Performing Engineering Operations at SCQF Level 5
GL3L23	SVQ 3 in Aeronautical Engineering at SCQF Level 6
GL3M23	SVQ 3 in Engineering Technical Support at SCQF Level 6
GL3N23	SVQ 3 in Fabrication and Welding Engineering at SCQF 6
GL3P23	SVQ 3 in Marine Engineering at SCQF Level 6
GL9444	SVQ Performing Engineering Operations at SCQF Level 4
GM1V46	SVQ 3 in Mechanical Manufacturing Engineering at SCQF Level 6
GN5D46	SVQ 3 in Electrical Manufacture at SCQF Level 6
GN5E45	SVQ Performing Manufacturing Operations at SCQF Level 5
R47004	SVQ Diploma in Project Management at SCQF Level 8

New Qualifications

603/4864/1	EAL Level 2 Diploma in Performing Engineering Operations (Northern Ireland)
603/5083/0	EAL Level 4 Diploma in Aerospace and Aviation (Development Competence)

Withdrawn Qualifications

500/9857/3	EAL Level 2 Award in Metrology – Portable Co-ordinate Measurement Systems Registration End Date: 30/12/2019 Certification End Date: 30/12/2020
500/9936/X	EAL Level 1 Award in Metrology – Foundation Measurement Registration End Date: 30/12/2019 Certification End Date: 30/12/2020
600/3567/5	EAL Level 3 Award in Metrology – Geometrical Tolerancing Registration End Date: 30/12/2019 Certification End Date: 30/12/2021
600/3568/7	EAL Level 3 Award in Metrology – Laser Safety Registration End Date: 30/12/2019 Certification End Date: 30/12/2021
600/3565/1	EAL Level 3 Award in Metrology – Portable Co-ordinate Measurement Systems Registration End Date: 30/12/2019 Certification End Date: 30/12/2021
601/9006/1	EAL Level 2 Diploma in Safe Working Practice in the Wind Turbine Industry Registration End Date: 31/10/2019 Certification End Date: 31/10/2021
603/0586/1	EAL Level 2 Certificate in Cycle Maintenance Registration End Date: 30/11/2019 Certification End Date: 30/11/2021

To find out more about our offer and these qualifications visit **www.eal.org** or give us a call on 01923 652400.

Foundations for Learning

EAL's functional skills qualifications are applied qualifications in English, Mathematics and Information and Communications Technology (ICT) available in England.

These qualifications are available at Level 1 and Level 2. They allow learners to demonstrate that they have practical skills in literacy, numeracy and IT that help them to live and work confidently, effectively and independently.

Why use EAL?

01

We are able to deliver exam results within seven days.

02

We have a dedicated exams team who can assist directly with enquires via email or telephone – we can resolve most issues on the day or even during an exam.

03

Practice exams for all subjects are available free of charge.

04

Candidate reports are available to download, which indicate how well a candidate has scored against the Learning Outcomes. These are useful for identifying strengths and weaknesses.

05

Chief Examiner candidate feedback reports are available, giving a more detailed breakdown on areas where candidates need to improve.

06

Guidance documents and tutorial videos are available to assist with delivery.

Foundations for Learning Qualifications

500/9833/0	EAL Functional Skills Qualification in English at Level 1 Registration End Date: 31/08/2019 Certification End Date: 31/07/2020
500/9834/2	EAL Functional Skills Qualification in English at Level 2 Registration End Date: 31/08/2019 Certification End Date: 31/07/2020
501/1135/8	EAL Functional Skills Qualification in Information and Communication Technology at Level 1 Registration End Date: 31/08/2019 Certification End Date: 31/07/2020
501/1138/3	EAL Functional Skills Qualification in Information and Communication Technology at Level 2 Registration End Date: 31/08/2019 Certification End Date: 31/07/2020
501/1139/5	EAL Functional Skills Qualification in Mathematics at Level 2 Registration End Date: 31/08/2019 Certification End Date: 31/07/2020
501/1187/5	EAL Functional Skills Qualification in Mathematics at Level 1 Registration End Date: 31/08/2019 Certification End Date: 31/07/2020

Scottish Qualifications

FT9304	Problem Solving (SCQF Level 3)
FT9404	Problem Solving (SCQF Level 4)
FT9604	Problem Solving (SCQF Level 5)
FT9704	Problem Solving (SCQF Level 6)
FT9804	Working with Others (SCQF Level 3)
FT9904	Working with Others (SCQF Level 4)
FT9A04	Working with Others (SCQF Level 6)
FT9C04	Working with Others (SCQF Level 5)
FT9D04	Numeracy (SCQF Level 3)
FT9E04	Numeracy (SCQF Level 4)
FT9F04	Numeracy (SCQF Level 5)
FT9G0	Numeracy (SCQF Level 6)
FT9H04	Information and Communication Technology (SCQF Level 3)
FT9J04	Information and Communication Technology (SCQF Level 4)
FT9K04	Information and Communication Technology (SCQF Level 5)
FT9L04	Information and Communication Technology (SCQF Level 6)
FT9M04	Communication (SCQF Level 3)
FT9N04	Communication (SCQF Level 4)
FT9P04	Communication (SCQF Level 5)
FT9R04	Communication (SCQF Level 6)

To find out more about our offer and these qualifications visit **www.eal.org** or give us a call on 01923 652400.

Rail

EAL has been at the forefront of creating pioneering, employer-led rail engineering qualifications. Our extensive portfolio of qualifications covers all six rail engineering disciplines:

01 Track
02 Traction and rolling stock
03 Signalling
04 Telecoms
05 Electrification
06 Overhead line

Our rail qualifications have been developed to promote safety and behaviours, and are recognised and supported by professional industry bodies and employers, such as the National Skills Academy for Rail (NSAR) and the Rail Engineering Trailblazer Employer Group, and, as such, reflect industry best practice and current skills needs.

End-Point Assessment
We have recently been endorsed to deliver End-Point Assessment for the Tramway Construction Operative (Level 2) apprenticeship standard, as well as other rail standards.

Why use EAL?

01

We have an extensive portfolio – covering track, traction and rolling stock, signalling, telecoms, electrification and overhead line – to meet all your rail engineering requirements.

02

We offer cutting-edge qualifications developed with leading rail employers, the National Skills Academy for Rail (NSAR) and National Training Academy for Rail (NTAR).

03

We create qualifications that map to and support compliance with rail industry regulations, including Institution of Railway Signal Engineers (IRSE) licensing schemes and companies' Competence Management System (CMS) requirements.

04

We provide support from dedicated rail experts who are fully qualified, time-served professionals and Personal Track Safety (PTS) accredited, with a Sentinel card, so you can always access expert help for you and your team, including trackside assistance.

05

Innovative learning and support materials are available, designed around the needs of the workplace, enabling flexible qualification delivery.

Rail Qualifications

600/8550/2	EAL Level 2 Certificate in Railway Engineering Track Renewals
601/0158/1	EAL Level 3 NVQ Diploma in Rail Engineering Telecoms Maintainer and Fault Finder
601/0159/3	EAL Level 3 NVQ Certificate in Rail Engineering Traction and Rolling Stock
601/0196/9	EAL Level 3 NVQ Diploma in Rail Engineering Track Maintenance
601/0197/0	EAL Level 3 NVQ Certificate in Rail Engineering Electrification Maintenance
601/0198/2	EAL Level 2 NVQ Diploma in Rail Engineering Track Maintenance
601/0246/9	EAL Level 3 NVQ Diploma in Rail Engineering Signalling Maintainer and Fault Finder
601/1379/0	EAL Level 2 Certificate in Railway Engineering Overhead Line Construction
601/2609/7	EAL Level 2 NVQ Diploma in Rail Engineering Overhead Line Construction
601/2610/3	EAL Level 3 NVQ Diploma in Rail Engineering Overhead Line Construction
601/3836/1	EAL Level 1 NVQ Certificate in Rail Engineering Track Renewals
601/3837/3	EAL Level 3 NVQ Certificate in Rail Engineering Telecoms Installer
601/3838/5	EAL Level 3 NVQ Diploma in Rail Engineering Telecoms Installer
601/3839/7	EAL Level 3 NVQ Certificate in Rail Engineering Signalling Installer
601/3855/5	EAL Level 3 NVQ Certificate in Rail Engineering Signalling Functional Tester
601/3865/8	EAL Level 3 NVQ Diploma in Rail Engineering Signalling Installer
601/3880/4	EAL Level 3 NVQ Certificate in Rail Engineering Electrification Construction

Apprenticeship Standards Qualifications

603/0374/8	EAL Level 3 Diploma in Rail Engineering Technician Competence (Track)
603/0375/X	EAL Level 3 Diploma in Rail Engineering Technician Knowledge (Track)
603/1295/6	EAL Level 2 Diploma in Rail Engineering Operative Competence (Track)
603/1296/8	EAL Level 2 Diploma in Rail Engineering Operative Knowledge
603/2089/8	EAL Level 4 Higher Technical Certificate in Rail Engineering Advanced Technician Knowledge
603/2090/4	EAL Level 4 Diploma in Rail Engineering Advanced Technician Competence

Scottish Qualifications

GJ4C22	SVQ 2 in Permanent Way Installation and Maintenance at SCQF Level 5
GK5622	SVQ 2 Rail Engineering: Signalling and Telecoms (Signalling Installation) at SCQF Level 5
GK5723	SVQ 3 Rail Engineering: Signalling and Telecoms (Signalling Installation) at SCQF Level 6
GK5822	SVQ 2 Rail Engineering: Electrification Construction Maintenance at SCQF Level 5
GK5923	SVQ 3 Rail Engineering: Electrification Construction Maintenance at SCQF Level 6
GK5A23	SVQ 3 Permanent Way Installation and Maintenance at SCQF Level 6

Withdrawn Qualifications

601/0158/1	NVQ Diploma in Rail Engineering Telecoms Maintainer and Fault Finder Registration End Date: 31/10/2019 Certification End Date: 31/10/2020
601/0246/9	EAL NVQ Diploma in Rail Engineering Signalling Maintainer and Fault Finder Registration End Date: 31/10/2019 Certification End Date: 31/10/2021

To find out more about our offer and these qualifications visit **www.eal.org** or give us a call on 01923 652400.

Logistics Operations

EAL's specialist logistics operations and warehousing and storage qualifications are tailored to meet employer needs in a range of settings, helping businesses run at full capacity and ensure the safe and timely movement of goods to the customer, covering activities such as warehousing, storage, and logistics operations management.
From industrial plants with complex mechanical systems to warehouses and commercial ports moving vast quantities of stock, learners and apprentices can use these qualifications in logistics and operations to reach national standards and prove their ability to work safely and effectively.
For businesses, these qualifications provide a clear benchmark for skills development and help improve productivity, raise awareness of health and safety, and reduce delays from incidents in the workplace.
Developed in close consultation with industry bodies, EAL qualifications enable businesses to equip their workforce with essential skills, improve productivity and efficiency, and provide real career progression for learners. We offer qualifications in:

01 Distribution, warehousing and storage
02 Logistics operations management
03 Plant operations
04 Port operations
05 Supply chain management

Why use EAL?

01

We offer a full suite of warehousing, logistics and supply chain management qualifications from Level 1 to Level 5.

02

Delivery suits SMEs as well as large employers.

03

You can save time and money by using just one awarding organisation for all your warehousing and logistics delivery.

04

Our supply chain qualifications are extremely flexible, with a dockside to shelf approach.

05

Learners can be offered wider employment options and clear progression pathways from entry level to management.

Logistics Operations Qualifications

500/1435/3	Supervision of Port Operations (General Supervision)
501/1707/5	EAL Level 2 Certificate in Warehousing and Storage
501/1709/9	EAL Level 3 Certificate in Logistics Operations
600/4825/6	EAL Level 2 Certificate in Supply Chain Operations
600/4838/4	EAL Level 3 Diploma in Supply Chain Management
600/4839/6	EAL Level 5 Diploma in Supply Chain Management
600/4981/9	EAL Level 2 Award in Employee Rights and Responsibilities in the Logistics Industry
600/5266/1	EAL Level 2 NVQ Certificate in Port Operations
600/6882/6	EAL Level 2 Certificate in Preparation for Working in the Advanced Manufacturing Logistics Industry
601/7286/1	EAL Level 2 Certificate in Logistics Operations
601/7369/5	EAL Level 3 Diploma in Warehousing and Storage
601/7790/1	EAL Level 2 Certificate in Plant Operations

To find out more about our offer and these qualifications visit **www.eal.org** or give us a call on 01923 652400.

Appendix

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Revealing Thoughts: Engineering Expertise + Ingenuity with Data = Enginuity

01 Engineering UK 2017, The state of engineering https://www.engineeringuk.com/media/1355/enguk-report-2017.pdf

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CSAT 2019 Update: Positive Feedback Cycle

01 TLF Research: https://www.tlfresearch.com
02 EAL Customer Satisfaction Survey 2019
03 The UK Customer Satisfaction Index (UKCSI)
04 EAL Customer Satisfaction Survey 2018-19

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The Nations

01 Black graduates were twice as likely to be unemployed than white graduates https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/610805/GLMS_2016_v2.pdf
02 Black graduates paid less and employment rates lower https://www.gov.uk/government/statistics/graduate-labour-market-statistics-2018
03 Government research shows BME graduates are less likely to be promoted even when more qualified https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/594336/race-in-workplace-mcgregor-smith-review.pdf
04 Full report on Scottish upskilling and future skills https://www.scdi.org.uk/wp-content/uploads/Upskilling-Scotland-The-Future-of-Skills-and-the-Fourth-Industrial-Revolution.pdf
05 Economic Action Plan for Scotland website https://findbusinesssupport.gov.scot
06 Full Scottish Budget 2020-21 https://www.gov.scot/budget
07 Social Mobility Barometer https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/858908/Social_Mobility_Barometer_2019-2020.pdf
08 New data, shows what graduates earn in different regions of the UK https://www.gov.uk/government/statistics/graduate-outcomes-leo-region-by-provider-2016-to-2017
09 Previously data showed economic benefit of higher education https://www.gov.uk/government/statistics/graduate-outcomes-leo-regional-outcomes-2016-to-2017
10 £400 million boost for 16 to 19 education in 2020-21 https://www.gov.uk/government/news/chancellor-announces-400-million-investment-for-16-19-year-olds-education
11 Taking Teaching Further programme https://www.et-foundation.co.uk/supporting/support-teacher-recruitment/taking-teaching-further
12 T Level Capital Fund https://www.gov.uk/government/publications/T Levels-capital-fund
13 Education and Training Foundation https://www.et-foundation.co.uk/T Level-professional-development-continuation

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Project DRIVES forward on automotive apprenticeships across Europe

01 DRIVES Automotive Apprenticeship Network (DAAN) https://www.linkedin.com/groups/8814397

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Because One Engineer Can Change the World

01 Tim Berners-Lee creates the World Wide Web http://info.cern.ch
02 Read more about Samuel Etherington at 'Semta' Sam Making Waves https://enginuity.org

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Women in Engineering

01 Just 12% of all engineers in the UK are female according to Engineering UK https://www.engineeringuk.com/research/data/2019-excel-resource
02 Predictions show that 1.8 million new engineers and technicians will be needed by 2025 https://www.theguardian.com/careers/2019/jun/26/how-changing-attitudes-are-closing-the-gender-gap-in-engineering
03 McKinsey research at https://www.mckinsey.com/mgi/overview/in-the-news/3-ways-we-can-help-women-join-the-age-of-automation
04 Further Education and Skills, England: 2018/19 academic year https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/848534/FE_and_Skills_commentary_November_2019.pdf
05 Women into Science and Engineering (WISE) campaign report https://www.wisecampaign.org.uk/wp-content/uploads/2018/04/WISE_UK_Statistics_2014.pdf
06 Nearly 80% of female engineering students achieving a first or an upper second-class degree https://www.theguardian.com/careers/2019/jun/26/how-changing-attitudes-are-closing-the-gender-gap-in-engineering
07 Reports show that 46.4% of girls aged 11–14 would consider engineering as a career, compared to 70.3% of boys. This then drops to 25.4% as girls reach 16–18, compared to 51.9% of boys. https://www.theguardian.com/careers/2019/jun/26/how-changing-attitudes-are-closing-the-gender-gap-in-engineering
08 Opportunities can be found on the BMW website https://www.bmwgroup.jobs/gb/en/opportunities/a
09 https://www.bmwgroup.jobs/gb/en/opportunities/girls-go-technical.html
10 Further Education and Skills Report: November 2019 https://www.gov.uk/government/statistics/further-education-and-skills-november-2019

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Engineering Skills Interview; Q and A with Jacqueline Hall

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02 4th March 2020 to be the first World Engineering Day for Sustainable Development https://worldengineeringday.net/about-wed
03 United Nations' Sustainable Development Goals and the role engineers will play in the attempt to achieve them https://www.un.org/sustainabledevelopment/sustainable-development-goals
04 University of Melbourne climate study https://eos.org/scientific-press/study-global-warming-hits-poorest-nations-hardest
05 Paris Agreement essential elements https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement
06 Global CO2 emission stats comparing rich and poor parts of the world https://ourworldindata.org/co2-by-income-region
07 H&M circular supply chain https://sustainability.hm.com/content/dam/hm/about/documents/masterlanguage/CSR/2018_sustainability_report/HM_Group_SustainabilityReport_2018_Chapter4_100%25Circular%26Renewable.pdf
08 Eco-industrial parks https://www.unido.org/our-focus-safeguarding-environment-resource-efficient-and-low-carbon-industrial-production/eco-industrial-parks

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03 BCG – Internet Economy in the G-20, March 2012 https://www.bcg.com/en-gb/publications/2012/technology-digital-technology-planning-internet-economy-g20-4-2-trillion-opportunity.aspx
04 BCG – Is UK Industry Ready for the Fourth Industrial Revolution? https://media-publications.bcg.com/Is-UK-Industry-Ready-for-the-Fourth-Industrial-Revolution.pdf
05 Financial Times - Meet the cobots: humans and robots together on the factory floor https://www.ft.com/content/6d5d609e-02e2-11e6-af1d-c47326021344

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The changing world of work. Future-proofing workforces

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03 PWC – AI will create as many jobs as it displaces by boosting economic growth https://www.pwc.co.uk/press-room/press-releases/AI-will-create-as-many-jobs-as-it-displaces-by-boosting-economic-growth.html
04 Entrepreneur.com – Forget Unicorns. We Need More 'Zebra' Startups https://www.entrepreneur.com/article/322407

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Are engineers ready for Industry 4.0?

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02 New Civil Engineer – Insight Report | Readiness for Industry 4.0 https://www.newcivilengineer.com/guides/insight-report-readiness-industry-4-0
03 BCG – Is UK Industry Ready for the Fourth Industrial Revolution? https://media-publications.bcg.com/Is-UK-Industry-Ready-for-the-Fourth-Industrial-Revolution.pdf

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From Field to Factory Grown Food

01 Clara Foods at https://www.clarafoods.com
02 Endless West at https://endlesswest.com
03 Finless Foods at https://finlessfoods.com
04 Solar Foods at https://solarfoods.fi/
05 Livestock farming environmental impact https://www.forbes.com/sites/daphneewingchow/2019/06/20/is-cultured-meat-the-answer-to-the-worlds-meat-problem/#4cc12c044468
06 Lab-grown meat research at Maastricht University https://www.forbes.com/sites/daphneewingchow/2019/06/20/is-cultured-meat-the-answer-to-the-worlds-meat-problem/#4cc12c044468
07 RethinkX on replacing crops and livestock with microbes https://www.theguardian.com/commentisfree/2020/jan/08/lab-grown-food-destroy-farming-save-planet
08 Largest existing bioreactor producing artificial meat https://www.sciencefocus.com/future-technology/the-artificial-meat-factory-the-science-of-your-synthetic-supper
09 Dr Post explains science of synthetic meat https://www.sciencefocus.com/future-technology/the-artificial-meat-factory-the-science-of-your-synthetic-supper
10 Work on cellular scaffolding https://www.cell.ag/cell-ag-from-lab-to-market
11 Cost of synthetic meat burger could come down to $10 https://www.cell.ag/cell-ag-from-lab-to-market
12 RethinkX suggests lab-grown proteins 10 times cheaper than animal protein by 2035 https://www.theguardian.com/commentisfree/2020/jan/08/lab-grown-food-destroy-farming-save-planet
13 Government pumps £560bn a year into farm subsidies https://www.theguardian.com/commentisfree/2020/jan/08/lab-grown-food-destroy-farming-save-planet
14 Welsh beef farmer converted to lab-grown food technology at a conference back in 2015 https://www.biospace.com/article/the-challenge-of-cultured-meat
15 Cellular Agriculture Ltd at https://www.cellularagriculture.co.uk