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The Manufacturers' Organisation

MAKING DESIGN AND TECHNOLOGY MANUFACTURERS' BUSINESS

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PART 1:
THE IMPORTANCE OF DESIGN & TECHNOLOGY (D&T)

BACKGROUND

Design and Technology (D&T) has been taught in classrooms across the country since it was made a compulsory subject for pupils aged 5 to 16 years old to study in 1989. England and Wales were one of the first countries to do so, and as a result, were once the world-leaders in the D&T space.[1]

When the subject was first introduced it was an attempt to combine several, wide-ranging topics such as woodwork, crafts and needlework. But this was then changed to D&T in an effort to move away from the "pre-vocational" view of the subject. Now, more than most subjects, D&T has evolved over time, becoming more relevant to the technology changes taking place in the work of work. However, in 2010 the introduction of the English Baccalaureate (Ebacc) signalled a clear shift away from building a modern broad curriculum reflective of the changing way of work, towards a return to a more traditional purely academic focused curriculum.

1904

- English
- Maths
- Foreign Language
- Science
- History
- Geography
- Drawing

2016

- 2x English
- Maths
- Foreign Language
- 2x Science
- History
- *or* Geography

The decision to not include D&T as an EBacc subject proved unpopular not just within the manufacturing and engineering community, but also in wider spheres – in 2016 a petition to include 'Expressive Arts' in the EBacc received more than 100,000 signatures. Nevertheless, the Government continued with its programme to rollout EBacc in schools across the country, so much so, the Conservative 2017 manifesto pledge stated:

"We will expect 75 per cent of pupils to have entered for the EBacc combination of GCSEs by the end of the next Parliament, with 90 per cent of pupils studying this combination of academic GCSEs by 2025."[2]

WHY IT MATTERS FOR MANUFACTURERS

1. Industrial Strategy

The aim of the Government's Industrial Strategy is to boost productivity by backing businesses to create good jobs and increase the earning power of people throughout the UK. Getting the "People" pillar of industrial strategy right is fundamental to meeting the challenge of filling the skills gap in our industry. There is a chronic shortage of skilled workers in the manufacturing sectors, particularly in key engineering roles. Engineering UK estimated that 124,000 Engineers & Technicians with core engineering skills are needed per year to meet demand.[3]

As a collective, we must do more to attract young people into the sector. The Grand Challenges outlined in the Industrial Strategy will not be solved without future employees who not only have the theoretical knowledge, but also the ability to apply that knowledge to solve the problems identified in the Grand Challenges[4].

[1]https://www.data.org.uk/campaign/
[2]Conservative Manifesto (2017)
[3]Engineering UK, The State of Engineering (2018)
[4]Department for Business, Energy & industrial Strategy, The Grand Challenges: https://www.gov.uk/government/publications/industrial-strategy-the-grand-challenges/industrial-strategy-the-grand-challenges

PART 1: THE IMPORTANCE OF DESIGN & TECHNOLOGY (D&T)

Subjects such as D&T are integral to achieving this by inspiring and teaching the next generation of creators, makers and innovators.

2. Wider education reforms

The success of the technical reforms that the Government are currently implementing, such as T Levels, will in some part hinge on young people being encouraged to pursue STEM (science, technology, engineering and maths) alongside creative subjects such as D&T pre-16. Manufacturers are concerned that the EBacc is driving the focus towards purely academic subjects that risk leaving pupils without any vocational or practical skills at 16. Yet it is these practical skills and wider employability skills that manufacturers are increasingly looking for.

67% **OF MANUFACTURERS HAVE STRUGGLED TO FILL JOB ROLES BECAUSE APPLICANTS LACKED TECHNICAL SKILLS.**

The forthcoming introduction of T Levels in routes such as manufacturing and engineering makes the need for greater participation in D&T increasingly important. If young people are pushed towards more academic subjects pre-16, then at the point of deciding whether to pursue an academic route (A Levels) or a technical route (T Levels or Apprenticeships), they are likely to opt for the former. Even those that do opt for the new T Levels may be tempted towards other routes because they are seen to be more academic and less "hands-on". If learners aren't demanding T levels in routes such as manufacturing and engineering, the market won't supply, and we'll left with another gap in training provision at level 3 in our sector.

It is industry and indeed Government's desire to create a world-class technical education system, but aged 16 cannot be the starting block. Whilst it may not be the silver bullet to increasing supply of vocational learners at 16, promoting and encouraging greater participation in D&T remains a key factor.

3. Recruitment challenge

The scale of the skills gaps within engineering and manufacturing are well documented. Finding the right people with the right skills remains a constant challenge within our industry, with three-quarters of manufacturers finding it difficult to recruit engineering roles in the past 3 years and 72% concerned about findings the skills they need for their business. Furthermore, 67% of manufacturers have experienced recruitment difficulties due to candidates lacking technical skills.[5] For this reason, D&T remains a popular subject for manufacturers because it presents students with the opportunity to learn new techniques using new technology that is often found in the work place, e.g. 3D printing. It hones students design thinking and spatial awareness skills, all of which are key attributes manufacturers look for.

Not only does D&T give young people practical skills and knowledge but also they help to spark an interest in vocational technical pathways.

71% **OF MANUFACTURERS PRIORITISE PASSION AND ENTHUSIASM FOR MANUFACTURING WHEN RECRUITING APPRENTICES.**

This will be of growing importance as manufacturers continue to hire apprentices and potentially T Level students to fill the skills gap they face.

[5]EEF, An Up-skill Battle (2016)

WHAT DOES D&T OFFER TO YOUNG PEOPLE?

Design thinking
The rigorous process that underpins designing and making activity demands both creative speculation and logical decision making to arrive at valid, and better, solutions. The essential core of D&T lies within the balances between: creativity and control; and thought and action. These thinking and practical skills are invaluable to each individual.

Evaluation of products and services
Industry and consumerism are now integral parts of our culture and everyone needs to be equipped to play their part, be it through contribution or response. D&T helps pupils express preference and exercise influence on their spending decisions and in doing so challenge manufacturers' and suppliers' assumptions about the quality or suitability of products and services – especially important when safety or well-being are at stake.

Skills for life
Industry and consumerism are now integral parts of our culture and everyone needs to be equipped to play their part, be it through contribution or response. D&T helps pupils express preference and exercise influence on their spending decisions and in doing so challenge manufacturers' and suppliers' assumptions about the quality or suitability of products and services – especially important when safety or well-being are at stake.

Source: Design & Technology, Designed and Made in Britain...?

PART 2: WHAT DOES THE DATA SHOW?

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WHAT DOES THE DATA SHOW?

Design and Technology is then of extreme value and importance to manufacturers, and more than ever as we enter into a new era of technical education. But what is happening to the subject? We take a look at some of the trends, with some quite worrying results.

Between 2008 and 2018, the number of student taking D&T at GCSE fell by 62%. In 2008, there were over 330,000 students taking D&T but by 2018, this had fallen to under half of this at 127,000. This is reflected in the proportion of students taking D&T as a percentage of all subjects, which has fallen from 5.9% to 2.3% over the same period.

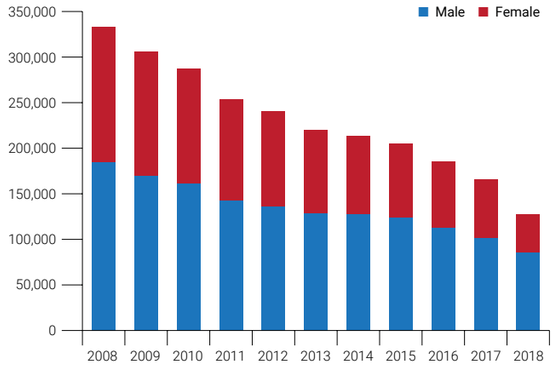
62% **THE DECREASE IN THE NUMBER OF STUDENTS TAKING D&T AT GCSE BETWEEN 2008 AND 2018**

The fall in students can be attributed to far fewer girls choosing to take the subject. As chart 1 shows, the number of girls taking D&T fell from approximately 149,000 in 2009 to just 42,000 in 2018.

This is despite the fact that girls consistently outperformed boys in D&T at GCSE, with almost 75% achieving at least a grade 4 and above, compared to just 55% of boys in 2018. We see a similar trend when analysing the number of students taking D&T at A Level. Between 2011 and 2018, the number of students taking D&T fell from approximately 18,000 to 11,000. The fall is not as bad as at GCSE, however as a proportion of all subjects taken at A Level take up of D&T fell from 2.1% in 2011 to 1.4% in 2018. This is a sharper fall compared to other creative subjects such as Art & Design, which fell from 3.0% in 2011 to 2.9% in 2018. We also see a similar picture in the number of girls taking D&T at A Level falling much more sharply than boys.

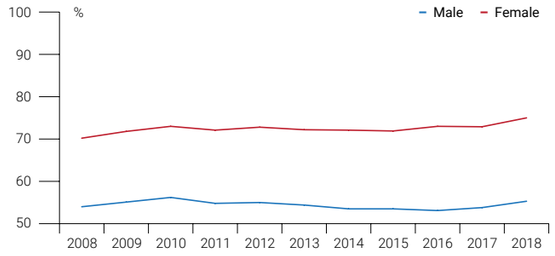
It is clear that there is a knock-on effect of the fall in students taking D&T at GCSE on the number that then take it at A Level. If we are to encourage more young people to study more creative and design-based subjects through further and higher education, we must first fix the decline in student numbers at GCSE. To do this, let us first understand what is driving this decline.

Chart 1: Number of students taking D&T at GCSE



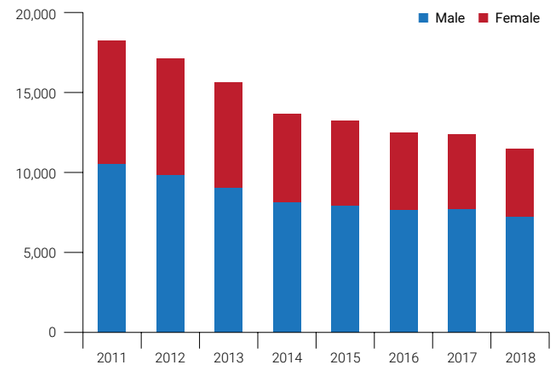
Source: JCQ, 2008 to 2018

Chart 2: Percentage of students achieving grade 4 (C) and above in D&T at GCSE



Source: JCQ, 2008 to 2018

Chart 3: Number of students taking D&T at A Level



Source: JCQ, 2008 to 2018

PART 3:
WHAT IS DRIVING THIS DOWNFALL?

There are many factors at play contributing to the decline in students taking D&T at both GCSE and A Level. Three key factors are, the growing shortage of D&T teachers, a lack of qualified D&T teachers in the system, and the diminishing status of D&T within the education curriculum.

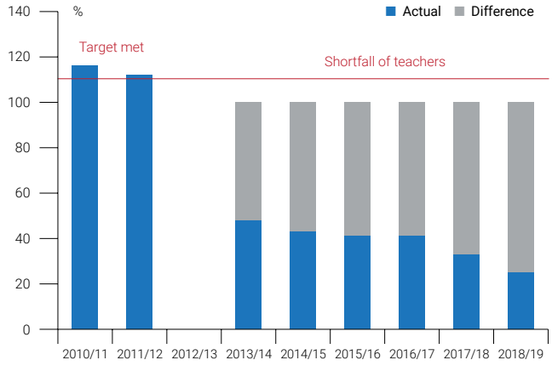
i) A teacher shortage

A key factor in the decline of students taking D&T has been a shortage of teachers to teach the subject. Analysis of the Department for Education's initial teacher training (ITT) data shows a growing gap between how many teachers are required and the actual number being recruited. As chart 4 shows, between 2010/11 and 2011/12 DfE met their target for recruiting D&T teachers, however from 2013/14 there has a been a sharp decline. The gap between the number required and those being recruited has increased from 57% to 75%.

FOR EVERY 4 D&T TEACHERS REQUIRED, ONLY 1 IS BEING RECRUITED.

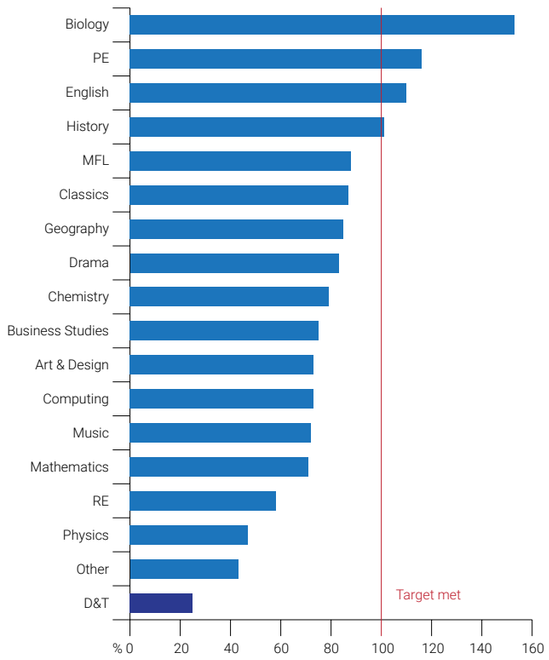
This shortfall in D&T teachers is the worst amongst all subjects taught in secondary schools. As chart 4 shows, D&T has the biggest shortfall in teachers required versus the number actually being recruited. In comparison, Biology, PE, History and English all meet the target, with more teachers being recruited than required. Although it is no surprise that D&T teachers are hard to find, this problem also exists for many other STEM subjects, such as Physics and Maths. Analysis by the National Audit Office found that if the Department were to meet their target for Maths and Physics, it would need to attract 1 in every 5 maths and physics graduates into the profession[6].

Chart 4: Training places filled against targets for D&T, 2010/11 to 2018/19



Source: DfE, Initial teacher training: trainee number census, 2010/11 to 2018/19

Chart 5: Training places filled against targets by subject, 2018/19



Source: DfE, Initial teacher training: trainee number census, 2010/11 to 2018/19

[6]National Audit Office, Training New Teachers, 2016)

PAGE 3: WHAT IS DRIVING THIS DOWNFALL?

A shortage of teachers means schools are not only less likely to offer the subject as part of their curriculum offer, but less likely to invest in the equipment required to deliver the subjects. Although this can be argued as a chicken and egg issue with schools likely to invest and recruit if there is no demand from students, previous research has shown that the Department has reduced funding for bursaries in D&T[7]. This is partly due to the decision to implement EBacc, which has meant schools have been discouraged to offer D&T, and focus on offering 'academic' subjects. The Department has argued that over-filling in some subjects, can help to compensate for the shortfall elsewhere by schools using teachers flexibly. In practice, this is difficult for schools especially given the specialist skills needed to teach the different areas that encompass D&T.

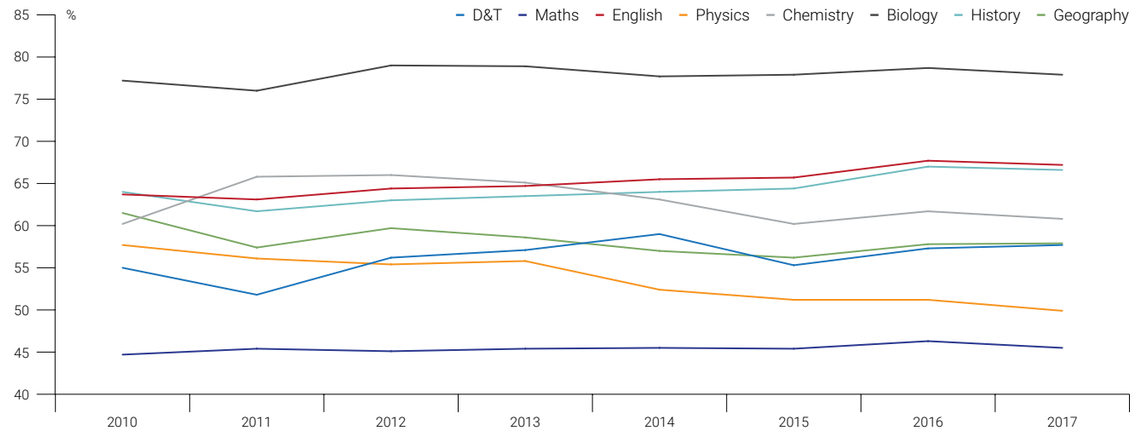
ii) Low qualifications of D&T teachers

Not only is there a concern around the quantity of D&T teachers training and teaching D&T across schools but also quality. As chart 6 demonstrates, far fewer D&T teachers hold at least a relevant degree to be able to teach D&T compared to other subjects. Between 2010 and 2018, the percentage of D&T teachers that held at least a degree in D&T only increased from 55% to 58%.

OVER 4 IN EVERY 10 TEACHERS TEACHING D&T DO NOT HOLD A RELEVANT DEGREE IN THAT SUBJECT.

This problem is not unique to just D&T however, teachers who taught STEM subject tended to be less likely to hold a degree in the subject they taught, compared to other disciplines.

Chart 6: Percentage of STEM and Non-STEM teachers that hold a degree or higher in the subject they teach, 2010 to 2018



Source: School workforce census, 2010 to 2018

[7]National Audit Office, Training New Teachers, 2016)

Last year the Department lowered entry requirements to completing Initial Teacher Training (ITT) in D&T from a minimum of a 2:1 to a 2:2. Whilst this may encourage more D&T graduates to consider completing their PGCE and become D&T teachers, this risks having a negative impact on the quality of teaching in classrooms. It is therefore important that a balance between quality and quantity is struck.

iii) D&T status within the education curriculum

D&T is nearing a point where the decline in participation threatens its critical mass and thereby endangers its future. Growing evidence from secondary schools shows that D&T is often side lined and, in some schools, is being cut from the curriculum altogether[8]. In primary schools D&T has been on the margins for some years and the ever-increasing focus on English and maths leaves less time for other subject learning. More than a third of secondary schools responded to a D&T Association survey in March this year. The following points emerged from the schools' responses:

- 89% agreed that Progress 8 and EBacc measures are influencing option choices and result in lower D&T GCSE numbers.
- 83% agreed that changes in curriculum time allocation and numbers taught are likely to reduce D&T staffing[9].

D&T curriculum time at Key Stage 3 (Years 7 to 9) was reduced in September 2015. Schools reported that D&T is consistently being undervalued by comparison with EBacc subjects. In some cases students are actively discouraged from opting for D&T, or prevented from doing so through the restricted curriculum choices on offer. Many referred to more able students being persuaded not to choose D&T, in favour of additional EBacc subjects. Given these pressures, numbers will inevitably decline and the full ability range will not be represented across the GCSE entry. Given these pressures, numbers will inevitably decline and the full ability range will not be represented across the GCSE entry.

Source: Design and Technology Association, Designed and Made in Britain...? https://www.data.org.uk/campaign/

[8]D&T Association, Designed and Made in Britain...?
[9]D&T Association, Designed and Made in Britain...?

PART 4:
D&T AS A 'MODERN' SUBJECT

The pace of technological change over the past 26 years has brought many additional demands to the D&T curriculum, including digital design and manufacturing (CAD/CAM). Contrary to public perception, D&T is everywhere and has a growing influence on our surroundings through new technologies and techniques. We see how D&T influences housing, transport, communications and the everyday objects we use, at work and in leisure. The skills and knowledge learnt in D&T are vital in understanding core engineering principles, therefore STEM as a concept inherently includes D&T. Furthermore, as engineering, manufacturing and D&T continues to shape the world around us, there is a growing need for everyone, stakeholders policymakers and the public to understand the critical role it plays in the education curriculum.

But there remain barriers to changing the perception of D&T and understanding that it is a key component of the STEM landscape. This is why it is even more important to ensure that the education curriculum on offer remains up-to-date, reflecting the role of D&T in society, and serves both pupils' and employers' needs. These factors, as well as a perception that the subject remains outdated and old-fashioned means people still believe D&T does not give young people the skills needed to pursue a career in STEM. Yet we know, it prepares young people to meet the future challenges of sustainability, in the face of increasing world population, climate change and finite resources, and to continue the development and control of technological advances.

The future will be shaped by engineering

BRITISH ENGINEERS SHAPED TODAY'S SOCIETY	IN THE FUTURE, ENGINEERS WILL DEVELOP...
Steam railways changed where we live and what we eat	**Flying taxis that make urban mobility faster and cleaner**
The jet engine that made global travel accessible to the masses	**Autonomous ships that are more efficient, safe and productive**
	Intelligent equipment making farming more sustainable

Source: Race for Engineering Excellence – ISCF Wave 3 Proposal

PART 5:
POLICY RECOMMENDATIONS

RECOMMENDATIONS TO GOVERNMENT

1. Scrap the EBacc policy

The EBacc policy has had a detrimental effect on the take up of creative subjects such as D&T. Despite warnings of the potential impact, the Department continued with the policy but admitted that its ambition to have 90% of pupils to be enrolled on the EBacc programme by 2020 will not be met – instead they have pledged to have 75% of pupils enrolled on the EBacc programme by 2022. However, evidence shows that take up of EBacc is at 38.4% in 2018, down from 39.7% in 2016. It is clear that not all schools have adopted this and recognise the value of offering a board curriculum. The EBacc policy does not develop young people with the skills and knowledge required to fill the skills gaps that manufacturers report.

2. Rename Design and Technology (D&T) to Design, Technology and Engineering (DTE)

The Government should rebrand D&T to Design, Technology and Engineering, which would reflect a new modern curriculum, and growing importance of practical skills in the world of work. Key D&T would cut across all of these subjects. As this paper demonstrates, new technology and new techniques is of growing influence in the world around us, therefore the education system should reflect this change and expose young people to this fantastic subject.

3. Offer schools incentives to invest in Design and Technology equipment and capital

Teacher recruitment drives are important, but will be of little use if schools cannot support the delivery of Design and Technology within schools. As with engineering in further and higher education, such practical-based subjects cost significantly more. There should be additional capital investment for schools to equip themselves with modern D&T equipment. Schools should be incentivised to work collaboratively with both local employers but also colleges and training providers who have the staff & equipment which could be shared.

4. Boost the number of people training to become D&T teachers

To address the declining number of D&T teachers, in addition to Government reducing entry requirements for prospective trainee D&T teachers, the Government should also encourage more people in industry to retrain and become teachers as part of the new recruitment and retention campaign[10]. Encouraging people already in industry to retrain is an excellent way to fill the knowledge gap that this paper demonstrates. They will be able to bring the D&T curriculum to life by showcasing how it's used in industry. This is an important factor in inspiring the next generation of creators, makers and innovators and boosting the talent pipeline.

[10]DfE, January 2019: https://www.gov.uk/government/news/new-national-strategy-unveiled-to-boost-teacher-numbers

PART 6:
CALLS TO ACTION FOR MANUFACTURERS

To support schools deliver D&T as part of their curriculum, manufacturers should continue to lend their support where possible. This can take the form of allocating time and space for schools to use their equipment as part of the curriculum, help to train teachers on how key concepts and subjects are used in practice and continue to offer work experience opportunities for young people. Whilst some manufacturers are already doing this, offering support in different areas such as continuous professional development for teachers and use of equipment can make a lasting difference in supporting local schools and communities and change the perception of D&T and the manufacturing industry.

Engage with STEM exchange:

The STEM Exchange acts as a matching service, providing teachers and young people (aged 14 and over) with the opportunity to access Science, Technology, Engineering and Maths (STEM) experiences offered by employers.

The Exchange links teachers with local employers, accessing opportunities from guided tours to webinars, from CPD workshops to access to online resources such as training materials.

EMPLOYERS

Are you an employer in a STEM industry or looking for talent with STEM skills? Do you want to secure your future talent pipeline? You can provide vital opportunities for young people and teachers to gain first-hand experience of what it's really like to work in industry.

TEACHERS

Are you a teacher or tutor looking to give the young people you teach the very best start to their careers? Do you want to gain a better understanding of what a STEM career really looks like and connect with industries in your local area?

YOUNG PEOPLE

Whether you're interested in sound engineering for the music industry, developing green technologies, creating software or designing buildings, STEM industries offer a huge range of career options.

Here's more information on how manufacturers can get involved in this campaign:

- Designed and Made in Britain...? www.data.org.uk/campaign/#
- Write to your local MP download a template letter
- Supporting the D&T Association's campaign www.surveymonkey.com/r/2QSCQV2
- Make UK, Making School Engagement Manufacturers Business www.makeuk.org
- Register any industrial experience opportunities that you would like to provide for teachers on The STEM Exchange www.stemexchange.co.uk

We're delighted to introduce Make UK, the new name for EEF, and our family of new brands including Make Business and Make Venues. Together they will support the needs and requirements of our vibrant sector and ever-changing marketplace.

We stimulate success for manufacturing and technology related businesses, enabling them to meet their objectives and goals. We empower individuals and inspire the next generation.

We create the most supportive environment for UK manufacturing growth and success and we represent the issues that are most important to our members, working hard to ensure UK Manufacturing remains in the government and media spotlight.

Our extensive knowledge of manufacturing that means we're able to influence policy-making at local, national and international levels. We push for the policy changes that our members want to see. We are the voice of manufacturing.

MakeUK.org

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Semta is the engineering skills body helping engineering & manufacturing employers and individual workers develop the skills they need to succeed, in order to create a vibrant UK economy.

Supporting the sector, we look to address the challenges in skills development. Strategically we work to optimise the skills landscape, attract and retain talent for the sector, and support training and development. All whilst creating products and services to support competence in delivering economic productivity for the good of the future of the industry.As an employer-led body, working with all sizes and sub sectors of UK engineering employers, we are well placed to play a leading role in providing solutions, delivering change and to be a unified voice of the sector.

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