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manufacturing Commission

UPSKILLING INDUSTRY:

MANUFACTURING PRODUCTIVITY AND GROWTH IN ENGLAND

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Foreword

It is no secret that the UK is experiencing a skills shortage. In our conversations with representatives from SMEs to FTSE100 companies, we have been consistently told that productivity is being held back by a lack of skilled workers. This 'skills gap' is felt acutely within the manufacturing sector, given its reliance on Science, Technology, Engineering, and Maths, along with recent shifts towards digitalisation and the need to deliver on the Government's 2050 net zero target.

The enormity of the challenge to develop a skills system that can deliver a sustainable pipeline of talent to meet the needs of a digital and green manufacturing sector looms large. This challenge has been compounded by events such as the UK's departure from the EU and the COVID-19 pandemic, both of which have further reduced the pool of skilled labour from which the manufacturing sector can draw.

However, current skills gaps cannot be blamed entirely on these events. The post-16 education system in England is a complex mix of market-based and government-supported provision, which has been subject to frequent policy change in recent decades. In other countries, Germany in particular, the skills system is perceived as a natural strategic asset and is prioritised and resourced as such. It is also true that UK manufacturing businesses invest far less in training and development than their European counterparts.

However, there is room for optimism. The Skills and Post-16 Education Act lays in statute the requirement for skills providers to work with employers on Local Skills Improvement Plans. This will allow education and training to better meet the skills needs of local areas – something that we have long been calling for. Possibly more important though than the contents of this Act, is the fact that it received cross-party support. This makes us hopeful that recent reforms to the further education system will be taken up and built on by the next Government and beyond, whichever party wins the forthcoming General Election.

Throughout the evidence sessions that have informed this inquiry, we have been inspired by accounts from UK manufacturing businesses that are using all levers available to them to upskill their workforces, from apprenticeships to Skills Bootcamps. However, we have also heard accounts of companies opting out of the skills system entirely, due to its sheer complexity. The recommendations in this report aim to help businesses, skills providers, and individuals get the most out of the system.

We see no reason why the skills system in England cannot match that of Germany, or anywhere else in the world. After all, a similar turnaround has been achieved in primary school level literacy, where England now ranks fourth in the world (for nine and ten-year-olds), after decades of stagnation. It is therefore vitally important that the Government continues to prioritise the skills system and works with both businesses and providers to deliver the skills that the manufacturing sector needs.

This inquiry has been informed by a range of expert opinions from stakeholders across the manufacturing sector. In particular, we would like to thank inquiry sponsors: Coventry University, The ERA Foundation, Lloyds Bank, The Manufacturing Technologies Association, and Warwick Manufacturing Group for their generous support.

Inquiry Chair

Lord Bilimoria of Chelsea CBE, DL
Crossbench Peer, Founder and Chair of Cobra Beer,
President of the CBI, and Chancellor of the University of Birmingham

Inquiry Vice-Chairs

Sarah Olney MP
(Liberal Democrat)

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Executive Summary

The Manufacturing Commission's previous report on resilience acknowledged that skills shortages throughout UK manufacturing were severely affecting productivity and were limiting businesses' ability to recover from both the COVID-19 pandemic and the UK's departure from the EU. This inquiry builds on this work, exploring the 'skills gap' in more detail and considers how businesses, education providers, and individuals can better navigate the complex skills system in England.

From decarbonisation to automation, the manufacturing sector faces many challenges over the next decade, and it will need to draw on a highly skilled workforce to overcome these. Currently, England's secondary, further, and higher education systems are not delivering graduates with the skills required to succeed in the green and digital economy of the future. Recent reform to post-16 technical education through the Skills for Jobs White Paper and subsequent Skills and Post-16 Education Act has sought to address this. The impact of this reform and the wider policy landscape relating to England's skills system is discussed in **Chapter 1**, along with the roles and responsibilities of the key stakeholders.

There were almost 80,000 vacancies in the manufacturing sector in the first quarter of 2023 and skills shortages within manufacturing cost the UK around £8 billion annually. **Chapter 2** explores the reasons behind these shortages by industry and geography, and how existing skills gaps can be narrowed. This chapter also sets out how developing a taxonomy system for naming, classifying, and grouping skills could benefit both businesses and individuals alike.

Failures in the education system and under-investment in training by businesses means that the current workforce is ill-prepared to meet the skills needs of the future green economy. Despite recent changes, the Apprenticeship Levy remains unfit for purpose and levy funding routinely goes unused. **Chapter 3** sets out the tools that are available to businesses to help upskill their workforces, including apprenticeships, modular training, and newly introduced T-Levels.

The provision of further education in England is a complex system and current funding structures do not incentivise providers to offer the high-quality, technical training in Science, Technology, Engineering, and Maths (STEM) that are most needed within the manufacturing sector. There is a chronic shortage of teaching staff in STEM subjects, which is exacerbated by the wide disparity in pay between teaching and working in industry. **Chapter 4** considers what education providers need to better prepare learners for a career in manufacturing.

Even if further education reforms, changes to the Apprenticeship Levy, sustainable funding for colleges, and increased participation in the teaching workforce can be successfully delivered, it will be of little consequence if a career in manufacturing does not appeal to learners. The manufacturing sector has a vital role to play in the future green economy, including the development of the technologies that all industries will need to decarbonise and meet net zero. **Chapter 5** focusses on how the manufacturing sector can better communicate this contribution to individuals – particularly women and those from minority ethnic backgrounds.

Recommendations

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Recommendation 1: The Unit for Future Skills should prioritise development of a UK-specific skills taxonomy system to map the future skills needs of the manufacturing sector and wider green economy. The Unit should draw on skills mapping already undertaken by Enginuity, the High Value Manufacturing Catapult, and others.

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Recommendation 2: The Government should provide more support to SMEs to better incentivise them to participate in the delivery of T-Levels. This should start with reinstatement of cash incentives for hosting industry placements and making costs associated with these placements tax-efficient.

Recommendation 3: The Government should better promote the discounted co-investment rate for Skills Bootcamps to SME employers within the manufacturing sector to increase take-up. Trade and sector organisations, such as the Manufacturing Technologies Association, could play a key role in doing this.

Recommendation 4: The Government should allow greater flexibility in the use of Apprenticeship Levy funding to support wider investment in education and training. Unspent levy funds should be ringfenced within an employer training fund to allow further upskilling, rather than being retained by the Treasury.

Recommendation 5: The Government should fund a long-term, national campaign that aims to increase the uptake of STEM subjects by women and people of minority ethnic backgrounds. Such a campaign should have clear objectives against which its success can be measured. It should also promote the benefits of a career in manufacturing, demonstrating the role that the sector plays in net zero and the circular economy.

Recommendation 6: Manufacturing and engineering roles should remain on the Shortage Occupation List. Retained roles should include, but not be limited to: electrical, electronics, design and development, production and process, and mechanical engineers, along with 'other' engineering professionals.

Recommendation 7: The Government should remove international students from net migration figures.

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Recommendation 8: The Government should roll out the Workforce Industry Exchange Programme, funded under the £65 million investment in the further education workforce announced in 2021.

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Recommendation 9: The Government should appoint a manufacturing 'Champion' to help raise awareness of the manufacturing sector in schools, coordinate speakers from businesses, and promote the role that the manufacturing sector is playing in combatting the climate crisis.

Recommendation 10: The Government should offer grants and subsidies to fund training in emerging green technologies as part of the forthcoming Lifelong Loan Entitlement (LLE). Consultation on which courses to subsidise should be completed prior to introduction of the LLE in 2025.

1. Introduction

The UK is currently the 8th largest manufacturing nation in the world and in 2022 the sector contributed £224 billion Gross Value Added (GVA) to the economy.[1] UK manufacturing currently provides 2.6 million people with jobs which, on average, pay 9% higher than those in the economy as a whole.[2]

However, the manufacturing sector's contribution to the UK's prosperity reaches far beyond these economic benefits. At the start of the COVID-19 outbreak, as most sectors were forced to lock down, manufacturing businesses remained open to provide the country with the things that it needed, with many repurposing their production lines to meet the need for essential items, such as personal protective equipment. The sector was also instrumental in the effort to end the pandemic by contributing to the domestic production of the Oxford-AstraZeneca vaccine. More recently, as war has returned to European soil, the manufacturing sector has assisted in the provision of humanitarian aid to Ukraine, as well as part of the Government's commitments to military assistance.

1.1. Challenges & Opportunities

Looking to the future, external shocks to our economy and society are likely to become increasingly frequent.[3] The Manufacturing Commission's previous report, ***Manufacturing Resilience***, published in 2021, identified that the world was likely to be entering an 'age of disruption' characterised by adverse impacts from environmental and geopolitical events.[4] Participants in this inquiry regularly acknowledged this situation and cited the following as key challenges that the manufacturing sector faces over the next decade and beyond.

Brexit – the impact of the UK's departure from the European Union (EU) continues to be felt throughout the sector, most acutely in the availability of labour, as workers from the EU have returned home to their countries of origin. In the longer term, there remains uncertainty around the trading relationship between the UK and other major economies, until trade deals are struck. In particular, the absence of a Free Trade Agreement with the USA will mean that US firms taking advantage of subsidies provided under the recently introduced Inflation Reduction Act will be less likely to trade with UK manufacturers. Post Brexit, the UK Government also finds itself having to keep up with competing legislation, which will influence the competitiveness of UK manufacturers. For example, from Autumn 2023 the EU will introduce a Carbon Border Adjustment Mechanism (CBAM) that will put a price on carbon emitted during production of some goods that enter the EU.[5] This risks the UK market being flooded with cheaply produced carbon-intensive goods if the Government does not act in parallel.

COVID-19 - the manufacturing sector is continuing to recover from the pandemic, which saw output fall to its lowest level on record, export orders fall to lows comparable with those of the 2008 financial crisis, and only around 10% of businesses operating at full capacity.[6] The pandemic exposed the fragile nature of global supply chains and the drawbacks of 'just in time' production strategies operated by many mid-chain businesses in the UK. Although many manufacturers learned lessons from the pandemic to make their businesses more resilient to unforeseen external shocks, the crisis has left the sector scarred in many ways. For example, employment in manufacturing in December 2021 remained 10% lower than pre-pandemic levels and sector vacancies were up 90%.[7]

[1] UK manufacturing: the engine of our economy, Make UK, September 2023
[2] UK manufacturing: the facts 2023, Make UK, 2023
[3] The future of manufacturing: a new era of opportunity and challenge for the UK, Government Office for Science, October 2013
[4] Manufacturing resilience: driving recovery towards net zero, Policy Connect, July 2021
[5] Carbon border adjustment mechanism, European Commission, 2023 (online) https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en
[6] Manufacturing outlook, Make UK, Q2 2020
[7] How has the pandemic affected industries and labour in the UK?, House of Commons Library Insight, March 2022

Net zero - meeting the Government's target of reaching net zero greenhouse gas emissions by 2050 will be a major challenge for the manufacturing sector, both in decarbonising itself and providing the products and technologies that other sectors will need to reduce their emissions. The Government's Industrial Decarbonisation Strategy requires emissions from UK industry to fall by two-thirds by 2035 and by at least 90% by 2050, with the remaining offset by technology, such as Carbon Capture, Usage, and Storage (CCUS).[8] However, several of the manufacturing sector's key industries, including chemicals, oil, iron, and steel are energy-intensive and hard to decarbonise. Others, such as ceramics and glass remain dispersed across the UK and are therefore unable to benefit from the UK's industrial 'clusters' where decarbonisation will be achieved through a combination of fuel switching, energy efficiency, and CCUS.

Industry 4.0 - technological developments associated with the fourth industrial revolution pose significant challenges, given the investment and upskilling that will be required. However, the manufacturing sector has been quick to embrace digital technologies such as Artificial Intelligence (AI), additive manufacturing, and robotics. Over the past five years, the proportion of companies that are invested in, and yielding rewards from, Industry 4.0 technologies has doubled from 4% in 2017 to 8% today.[9]

Table 1 – Industry 4.0[10]

Technology	Application
Increased computational power, big data, and enhanced connectivity	Cloud technology, internet of things, blockchain and distributed ledger technology, sensors
Analytics and intelligence	Machine learning, artificial intelligence, large language models
Human-machine interaction	Virtual reality, augmented reality, robotics, autonomous vehicles and drones
Advanced engineering	Additive manufacturing, 3D printing, nanotechnology

Although all these factors pose challenges to the manufacturing sector, they also present opportunities. The technologies associated with Industry 4.0 will improve productivity, the net zero transition will create well-paid jobs in green industries, and post-Brexit immigration rules present opportunities to source talent from beyond the EU.

[8] UK Industrial decarbonisation strategy, Department for Business, Energy, and Industrial Strategy, March 2021
[9] Industrial strategy: a manufacturing ambition, Make UK, May, 2023
[10] Adapted from: What are industry 4.0, the fourth industrial revolution, and 4IR?, McKinsey and Company, August 2022 (online) https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-are-industry-4-0-the-fourth-industrial-revolution-and-4ir

1.2. Policy Context

1.2.1. Departmental Responsibilities

Responsibility for manufacturing policy and wider industrial strategy has shifted between various departments since the current Conservative government came to power in 2010. These portfolios have previously been held by the Department for Business, Innovation and Skills and the Department for Energy and Climate Change (2009-2016), followed by the Department for Business, Energy, and Industrial Strategy (2016-2023). Earlier this year, the Department for Business, Energy and Industrial Strategy was split into the Department for Business and Trade (responsible for manufacturing policy), the Department for Energy Security and Net Zero (responsible for delivering on the Government's net zero commitment) and the Department for Science, Technology and Innovation (responsible for Research and Development (R&D) funding and championing the uptake of Science, Technology, Engineering, and Maths (STEM)). Notably, the UK does not currently have a formal Industrial Strategy, following the incorporation of elements of the previous Strategy into the Government's Plan for Growth and the dissolution of the Industrial Strategy Council in 2021. This approach is contrary to that taken by other major economies, in particular the German model, where industrial strategy is considered a national asset and the skills system forms part of a collective agreement between employers and trade unions.

Skills policy is a devolved issue, and this inquiry has considered the situation in England only. However, it is acknowledged that the devolved nations take a similar approach on key issues such as careers advice and guidance, apprenticeships, and the role of employers. Responsibility in Westminster for skills policy has been passed back and forth between the departments for Business and Education in recent years. Currently, responsibility for policy on Further Education (FE), Higher Education (HE), and wider skills lies with the Department for Education.

1.2.2. The Skills & Post-16 Education Act

In January 2021, the Government published its Skills for Jobs White Paper, which proposed reforms to post-16 technical education to support skills development and improve national productivity.[11] The Skills and Post-16 Education Bill was introduced in May 2021 as the legislative vehicle for these reforms, which was approved by Parliament in May 2022 as the Skills and Post-16 Education Act. The Act includes:

- A requirement for colleges and other FE providers to work with employers to develop **Local Skills Improvement Plans** (LSIPs) so that education and training better meets the skills needs of local areas.
- Reform of the student loans system to give individuals entitlement to a **lifelong loan** to support higher-level education and training at university or college, which they can use at any point in their lives (from 2025).
- New **Ministerial powers** to intervene when colleges are failing to deliver good outcomes for the communities they serve.
- Prioritisation of **green skills** to help deliver on the Government's net zero commitment and meet the needs of the green economy.

[11] Skills for jobs: lifelong learning for opportunity and growth, Department for Education, January 2021.

The Manufacturing Commission welcomes these measures in principle, especially the provision for a more devolved and employer-led skills system, which was one of the key recommendations from its previous inquiry, ***Manufacturing Resilience***.[12] The option for the Lifelong Loan Entitlement (LLE) to expand options for retraining later in life is also welcome, especially given the need for upskilling and reskilling to meet the needs of the green economy (see section 5.5). The Lifelong Learning (Higher Education Fee Limits) Bill has now also been introduced, which, if approved by Parliament, will allow the LLE to be rolled out from 2025.

1.3. Previous Recommendations For Skills Policy

Policy Connect has recently completed several pieces of work that make recommendations for skills policy in England. These reports have been delivered by the Manufacturing Commission, All-Party Parliamentary Manufacturing Group, Skills Commission, Higher Education Commission, All-Party Parliamentary Group for Assistive Technology, and Carbon Connect. Recommendations from these reports most relevant to the manufacturing sector are summarised in the table below:

Table 2 – Recommendations on skills policy relevant to UK manufacturing

Group/Forum	Publication (year)	Recommendations on skills policy relevant to UK manufacturing
All-Party Parliamentary Manufacturing Group	Delivering Net Zero Through Digital (2022)	• The Government should ensure that support and training packages for manufacturers are promoted and delivered at scale across the UK.
	Supporting UK Manufacturing Skills in a Post-COVID-19 World (2021)	• The Business Department must empower regional and local bodies (LEPs, Chambers of Commerce) to drive the delivery of skills. This will ensure that skills are being 'replenished' at a local level, in accordance with local needs. • The Government and the manufacturing sector must jointly fund a regional-led approach to skills improvement. The Government should provide more autonomy to local authorities on funding allocation, to ensure that training is targeted to the skills demand in each UK region. • The Government should drive forward the equality objectives published in July 2021, including through published reporting and follow-on strategies on how it can best support industry to deliver these targets.

[12] Manufacturing resilience: driving recovery towards net zero, Policy Connect, July 2021

Table 2 – Recommendations on skills policy relevant to UK manufacturing (cont)

Group/Forum	Publication (year)	Recommendations on skills policy relevant to UK manufacturing
Manufacturing Commission	Manufacturing Resilience: Driving Recovery Towards Net Zero (2021)	• The Green Jobs Taskforce should become permanent, and its membership should be expanded to work with the newly established Skills and Productivity Board and the National Manufacturing Skills Task Force. • Providers should receive multi-year funding budgets in order to deliver high-quality training that is targeted to address local skills gaps. • Delivery of Local Skills Improvement Plans should mandate training on climate change and decarbonisation to give learners a broad understanding of how their industry can help to meet the UK's net zero target and promote environmental stewardship.
Higher Education Commission	Empowering Innovation: The Role of Universities in Boosting Regional Economies (2022)	• To boost regional development and increase commercialisation, the Government should extend the geographical spread of existing Catapults, to target lower R&D intensive areas. • To deliver an innovation-ready workforce, universities should aim to build greater partnerships with further education colleges and Catapults on the delivery of skills. Short courses should be more widely available to help prepare an innovation-focussed labour force.
Skills Commission	Transition to Ambition: Navigating the Careers Maze (2021)	• The Department for Education should maintain its 2017-2020 careers strategy for a lifespan of at least five more years, to give some much-needed stability to the education system in its work on implementing the strategy. • An employer-led careers strategy advisory board should be created to provide long-term leadership and strategic direction on national careers strategy and government policies regarding careers, skills, education, training and employment. • Lifelong learning loans must be made truly flexible, so that people can take out a loan to study a qualification at whatever level they need in order to boost their employability, even if they already have an equivalent qualification at that level. • There must be much better communication of the existence and services of the National Careers Service, to ensure take-up of its services by all those who need careers advice and guidance. This should take the form of an ongoing national campaign but with a strong focus on communications activity at the local level as well.

Table 2 – Recommendations on skills policy relevant to UK manufacturing (cont)

Group/Forum	Publication (year)	Recommendations on skills policy relevant to UK manufacturing
Skills Commission	England's Skills Puzzle: Piecing Together Further Education Training and Employment (2020)	• Local and regional bodies (likely to be combined authorities, LEPs or Skills Advisory Panels) should build an assessment of their skills needs into their Local Industrial Strategies based on labour market intelligence and local employer engagement. • Local bodies will need better labour market intelligence to provide insight on innovation in key sectors and emerging industries. There needs to be processes in place for this data to flow between localities and sectors. The Government should instigate systematic mechanisms for identifying skills needs on a sectoral basis. • The Government should incentivise all parts of England to put in place governance arrangements that allow further devolution of skills funding and decision-making. • Providers should receive multi-year adult education budgets from the Education and Skills Funding Agency and devolved authorities. Furthermore, funding settlements should incentivise and require providers to meet local learning aims and skills gaps, competing on quality, not student capture.
All-Party Parliamentary Group for Assistive Technology	Talent and Technology: Building Bridges to Employment for Disabled People (2021)	• The Department for Education and Department for Work and Pensions should collaborate to ensure that disabled people on placements, traineeships, or apprenticeships are able to use assistive technology from Day One of their placements.
Carbon Connect	Connecting the Watts: The Case for a Net Zero Delivery Authority (2021)	• The Government must provide stronger regulation of new and improved skills standards in addition to incentives to expand and equip the workforce needed to deliver net zero.

There has been good progress against many of these recommendations, especially against a backdrop of frequent changes in political leadership. Notably, changes to the law under the Skills Act to place a duty on providers to cooperate with Employer Representative Bodies (ERBs) and consider LSIPs, will mean that local skills provision should be more devolved, and employer led. This is something that Policy Connect has consistently called for within many of the above reports.

However, several of the above recommendations are yet to be implemented by the Government, skills providers, or industry. Rather than repeating any of these recommendations, this report seeks to build on them, where they coincide with the evidence collected throughout the inquiry process.

1.4. Inquiry Scope

As set out within this introductory chapter, skills policy in England is a complex topic, which concerns a wide range of stakeholders across various commissioning, funding, delivery, and regulatory roles. This inquiry has focussed on policies that will benefit the manufacturing sector and therefore focusses mainly on the FE landscape. Evidence sessions that supported this inquiry focussed on the needs of businesses, FE providers, and learners, which form the focus of chapters 3-5. These chapters are preceded by a section on general skills needs within the manufacturing sector, which remained a constant theme throughout the inquiry.

2. Mapping Skills Needs

> **All of the main political parties are currently united on the need for economic growth, which can be delivered by increasing productivity. However, this will only come about if we invest in the development of skills across the manufacturing sector.**
>
> Inquiry vice-Chair, Sarah Olney MP (Roundtable 4)

TOP LINES

- The skills gap within UK manufacturing is wider than in almost all other sectors and costs the economy around £8 billion annually in lost economic output.
- Failures in the post-16 education and training system have contributed to the skills gap, along with the impact of Brexit, the COVID-19 pandemic, and an aging workforce.
- Developing a system for naming, classifying, and grouping skills, could help identify existing skills gaps and better prepare providers and businesses to develop the skills that will be needed in the future.

2.1. What Is The Skills Gap?

Put simply, the skills gap is the difference between the skills required to do a particular job, and those that are available. The skills gap manifests itself at various levels. At the individual level, workers may find that they do not hold the necessary qualifications for a given role; at the company level, businesses may find it difficult to fill positions that require certain skills; and at the industry level, there may be persistent talent shortages that affect the overall productivity of a sector.[13]

Sadly, a skills shortage in this country is not a new phenomenon. In 2010 a report by the Department for Business, Innovation and Skills acknowledged that the UK's working-age population was less skilled than that of France, Germany, and the US, and identified that the UK lacked "the vital intermediate technical skills that are increasingly important as jobs become more highly skilled and technological change accelerates".[14]

Given the requirement for higher-level technical qualifications, including in engineering, the skills gap is especially prominent within the manufacturing sector. There were 79,000 vacancies in the manufacturing sector in the first quarter of 2023 and the Government's 2019 Employer Skills Survey identified the sector to have the second highest skills-gap density, with 5.8% of the workforce lacking full proficiency.[15] Green skills and digital skills are likely to be the proficiencies in which the manufacturing sector will experience the most acute skills gaps in the future.

Skills gaps present a far greater problem than mere inconvenience. It is estimated that skills shortages within the manufacturing sector cost the country between £7.7 and £8.3 billion annually in lost economic output.[16] A lack of a skilled labour force also creates wider problems including low morale, high staff turnover, limitations on growth, and wage inflation.

[13] What is the skills gap and what can I do about it? Futurelearn, September 2022 (online) https://www.futurelearn.com/info/blog/what-is-the-skills-gap
[14] Skills for sustainable growth, Department for Business, Innovation and Skills, 2010
[15] UK job vacancies (thousands) – manufacturing, Office for National Statistics, Q1 2023; Employer skills survey 2019, Department for Education, October 2020
[16] Skills 2030: closing the gap, Make UK, September 2022

CASE STUDY – What are green skills?

To transition to a carbon-neutral economy by 2050 the UK will require the production of new, low-carbon products and services, such as electric vehicles, renewable energy technology, and the development of CCUS. Existing businesses will also be required to decarbonise their operations by increasing energy efficiency and retrofitting machinery and buildings. This transition will require new 'green skills', and in many cases will lead to the creation of whole new occupations.

However, the term is also used internationally and the UN defines green skills as the "knowledge, abilities, values and attitudes needed to live in, develop, and support a sustainable and resource-efficient society".[17] This goes beyond the delivery of the Government's net zero target and encapsulates the transition to a sustainable, decarbonised, and resource-efficient economy more generally. The Centre for Economic Policy Research cites the four areas of work most important for green occupations as: engineering and technical skills, science skills, operation and management skills, and monitoring skills – all of which are fundamental to the manufacturing sector.

2.2. Why Is There A Skills Gap?

There are many reasons for the shortage of skills within the UK's manufacturing sector. Overall, there is a chronic shortage of workers across the economy and as a result, businesses are struggling to recruit employees with the required skills.[18] The causes of labour market shortages range from long-term demographic trends associated with an aging population and an increased proportion of retirees, to more short-term and recent factors, such as changes to immigration rules following Brexit and increased long-term sickness resulting from COVID-19.[19]

The fact that the manufacturing sector has embraced digitalisation and automation quicker than other sectors also means that the skills required to support these technologies are in short supply. A recent survey by Make UK identified that a lack of digital skills remains the biggest barrier that businesses face in the adoption of industrial digital technologies.[20] The sector should accept some responsibility for this skills shortfall, given that it performs poorly compared with other sectors in access to training and development. The Government's 2019 Employer Skills Survey, cited above, reported that the proportion of employees who received any training in the preceding year was lowest in the manufacturing (47.6%) and construction (47.9%) sectors.[21]

However, the greatest contributor to the current skills gap is likely to be the failure of the post-16 education and training system to equip learners with the skills that they need to succeed. Although this will be the hardest problem to rectify, it is one that the country must face in order to deliver a sustainable pipeline of industry-ready graduates (see Section 3.1).

[17] What are green skills, United Nations Industrial Development Organisation, August 2022 (online) https://www.unido.org/stories/what-are-green-skills
[18] Skills and labour shortages, House of Commons Library, January 2023 (online) https://commonslibrary.parliament.uk/research-briefings/cdp-2023-0001/
[19] Monetary policy report, Bank of England, August 2022
[20] Innovation monitor: bouncing back smarter, Make UK, September 2020
[21] Employer skills survey 2019, Department for Education, October 2020

2.3. Benefits Of Closing The Gap

The benefits of closing the skills gap are impossible to ignore. The World Economic Forum and PwC recently calculated that giving people the skills they need to succeed in the economy of the future could add $6.5 trillion to global GDP by 2030, if skills gaps were bridged by 2028.[22] Within the UK, it is estimated that productivity gains associated with filling vacancies within the manufacturing sector could be worth up to £21 million per day to the economy.[23]

Investment in skills also benefits the individual. Obtaining a bachelor's degree has been estimated to result in a £108,000-£210,000 mean net benefit from higher wages over one's lifetime.[24] Higher-skilled individuals also have an increased probability of remaining in employment. These benefits then spread to the employer, through increased productivity and staff morale, and finally to the state, through increased tax revenue and reduced dependency on welfare.[25]

2.4. Skills Needs By Industry

This inquiry has received evidence of acute skills shortages across all parts of the manufacturing sector. The challenges faced by selected industries are set out below, along with the skills required to help to address these (this list is not considered to be exhaustive).

Buildings are the UK's second-largest source of greenhouse gas emissions, making up 17% of the country's emissions in 2022.[26] To meet the UK's climate targets, new and existing buildings will need to be constructed and retrofitted to be energy efficient and use low-carbon heating systems. This presents a challenge for the manufacturing sector to deliver the energy-efficient products and infrastructure that will be required. However, this also creates an opportunity. For example, the Government's Heat and Buildings Strategy estimates that increasing the manufacture and supply of heat pumps to the required level (300,000 units per year by 2025) would create 10,000 jobs in the manufacturing sector.[27]

UK manufacturing plays a key role in the **transport** industry. Automotive production alone contributes around £67 billion to the economy annually, employs 780,000 people, and exports vehicles to over 130 countries.[28] The surface transport industry also faces significant challenges to decarbonise, given that it remains the UK's largest source of greenhouse gas emissions, contributing 23% of the country's total emissions in 2022.[29] To deliver on trends in Electric Vehicle (EV) uptake (the Government will end the sale of new petrol and diesel cars in the UK by 2035) automotive manufacturing will require 50,000 existing workers to be reskilled.[30] Beyond the current workforce, an additional 7,500-10,000 workers will also be needed in battery cell manufacturing by 2030 as new battery gigafactories, such as the West Midlands Gigafactory, come online.[31]

[22] Upskilling for shared prosperity, World Economic Forum and PwC, January 2021
[23] Skills 2030: closing the gap, Make UK, September 2022
[24] The future of skills and lifelong learning, Government Office for Science, November 2017
[25] What is a good job? A new measure of labor-market success, Jenks, R, et. al., American Journal of Sociology, May 1988; The future of skills and lifelong learning, Government Office for Science, November 2017
[26] Progress in reducing emissions: 2023 report to Parliament, Committee on Climate Change, June 2023
[27] Heat and buildings strategy, Department for Business, Energy and Industrial Strategy, October 2021
[28] UK Automotive at a glance, Society of Motor Manufacturers and Traders, 2023 (online) https://www.smmt.co.uk/reports/smmt-motor-industry-facts/
[29] Heat and buildings strategy, Department for Business, Energy and Industrial Strategy, October 2021
[30] Report to Government, industry and the skills sector, Green Jobs Taskforce, July 2021
[31] Ibid.

The UK encountered a huge spike in **energy** costs following the COVID-19 pandemic and Russia's invasion of Ukraine. This not only affected manufacturers in energy-intensive industries, but it prompted the Government to develop a new Energy Security Strategy and establish the Department for Energy Security and Net Zero. The manufacturing sector will play a key role in the production of renewable energy infrastructure to deliver on the Government's agenda for energy security and net zero.

Although more traditional, **heavy industries**, such as steel, cement, and mining are well established in the UK, the transition to a green economy will rely on these industries to both decarbonise internally and produce the things that other sectors will need to reduce their emissions. Skills are therefore required in the production of green steel (that uses renewable energy as a fuel source); the production, distribution, and storage of hydrogen; and the development of CCUS technology.

The **food and drink** industry has reported acute labour shortages at all levels since 2019, anticipated to be as a result of the end of free movement of people between the UK and the EU, and the impact of COVID-19. The industry often suffers from the misperceptions that it is low-skilled and low-paid. However, the Food and Drink Federation (FDF) recently reported that around one-third of roles within the industry were classed as high-skilled and that EU workers occupied 19% of those roles.[32] The FDF has put forward a number of recommendations on how skills shortages in the sector can be addressed, including upskilling, better use of apprenticeships, and ensuring that the supply of education and training matches demand.[33]

The **electronics and semiconductor** industry is a key part of the UK economy, contributing 8% of GVA and 12% of R&D spend in 2021.[34] However, the industry is facing a skills shortage as a result of fewer learners in electrical and electronic engineering, both as apprentices and undergraduates. This shortage is particularly acute in the development of semiconductors and currently, 80% of UK companies involved with semiconductor chip design have unfilled vacancies.[35] This is severely hampering the ability of the UK's semiconductor industry to compete globally.

2.5. Skills Needs By Region

The Manufacturing Commission's 2020 report, ***Level Up Industry***, acknowledged regional disparities in productivity and income across the UK, with the productivity gap between London and Northern Ireland being around 60%.[36] Despite the introduction of the Levelling Up White Paper and subsequent Bill, there remains a risk that existing regional disparities are compounded when high-value manufacturing businesses choose to locate within areas that already have a large pool of skilled labour, such as the Oxford-Cambridge Arc. However, the transition to a green, circular economy presents an opportunity to reverse these trends and develop a place-based approach, that plays to regional strengths.

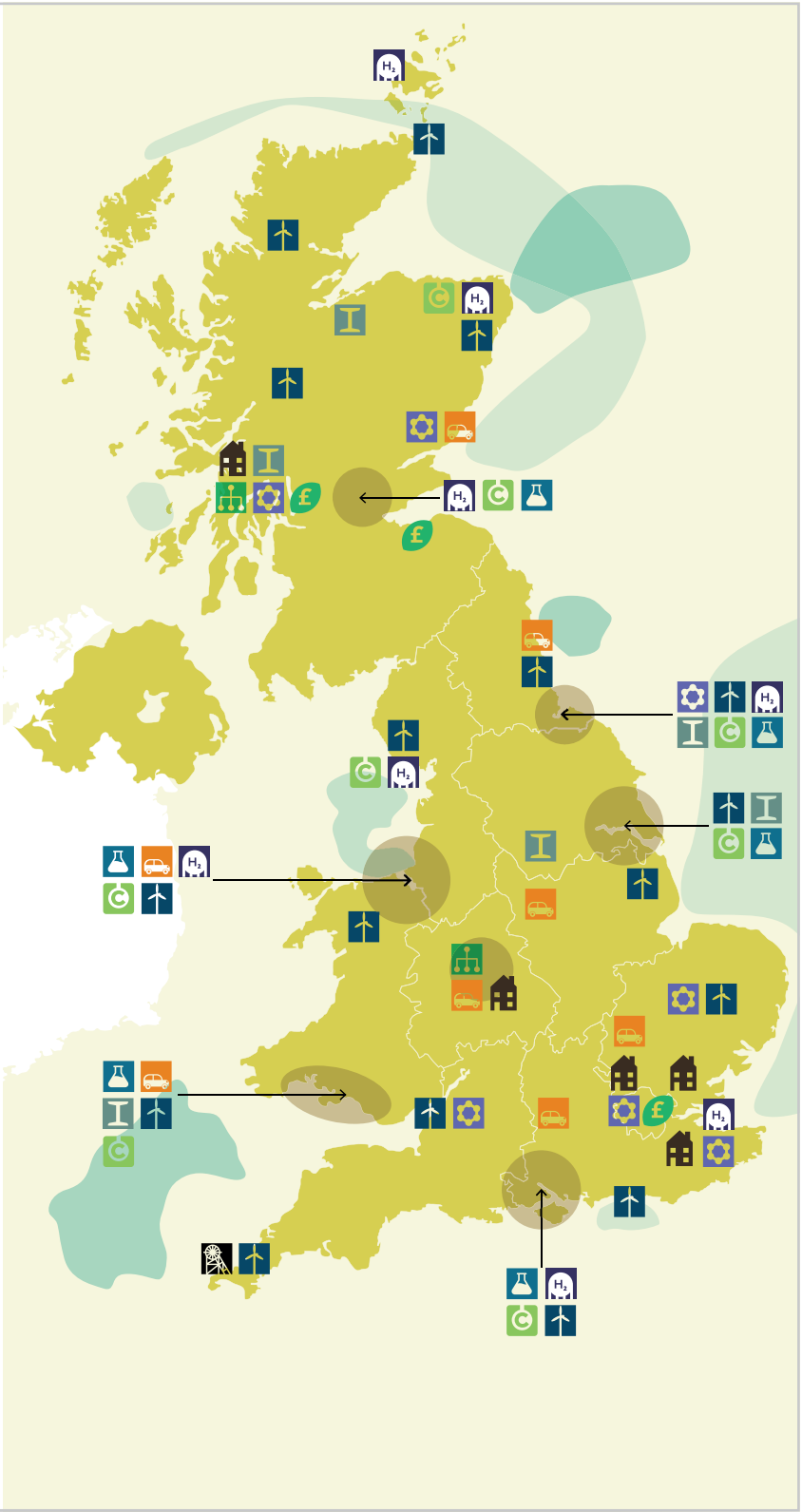
When considering manufacturing specifically, a significant proportion of the UK's capability is based within existing industrial 'clusters' at Grangemouth, Teeside, Humberside, Merseyside, South Wales, and Southampton. Recent research by Green Alliance has drawn on the location of these existing clusters and explored which regions of the UK are likely to benefit most from the green transition to define new 'net zero and service clusters', which included manufacturing capabilities. Notably, these are spread across the length and breadth of the UK. Regions that ranked highly for manufacturing export value per capita, included Devon and Cornwall (floating offshore wind), Derbyshire and Nottinghamshire (automotive), and South Yorkshire (green/blue steel).

[32] FDF Economic contribution and growth opportunities, Grant Thornton, June 2017
[33] Establishing the labour availability issues of the UK food and drink sector, Food and Drink Federation, August 2021.
[34] Call for evidence "fit for future": apprenticeships submission, UK Electronics Skills Foundation, ERA Foundation, and Techworks, February 2023
[35] Ibid.
[36] Level up industry: strengthening regional manufacturing, Policy Connect, February 2020; Levelling up the United Kingdom, Department for Levelling Up, Housing and Communities, February 2022

Figure 1:

Potential net zero and industrial service clusters[37]

(image credit: Green Alliance)



Note: Locations are approximate. Some icons refer to regions rather than specific locations.

[37] The cluster effect: why the UK needs a place-based green industrial strategy, Green Alliance, June 2023

2.6. Developing A Skills Taxonomy

Many respondents to this inquiry drew attention to the dynamic nature of the skills that the manufacturing sector needs, given the pace of technological change and to meet the requirements of a future green economy. Development of a skills taxonomy for the country, i.e. a system for naming, classifying, and grouping skills, could help identify and close existing skills gaps and also better prepare skills providers and businesses to understand the skills that will be needed in the future.

Other countries already have well-developed labour market intelligence tools in place. The most well-known and widely used is the US Occupational Information Network (O*NET), which provides details on skills, abilities, and job characteristics for almost 1,000 different occupations. The Skills and Productivity Board (SPB), operational between 2020 and 2022, was tasked with exploring which areas of the economy face the most significant skills mismatches and had started to explore the use of a taxonomy system for England. In a report commissioned by the SPB, Frontier Economics found that the O*NET system was suitable for use, but could be supplemented by other systems, including ones from European Skills, Competences, Qualifications and Occupations (ESCO), and Nesta.[38]

The SPB was dissolved in May 2022 and replaced by the Unit for Future Skills (UFS). One of the UFS's priorities for 2023 is cited as "conducting research projects on future skills demand forecasting and a UK-specific skills taxonomy".

Recommendation 1

The Unit for Future Skills should prioritise development of a UK-specific skills taxonomy system to map the future skills needs of the manufacturing sector and wider green economy. The Unit should draw on skills mapping already undertaken by Enginuity, the High Value Manufacturing Catapult, and others.

There has been progress in mapping the skills requirements for the future of the manufacturing sector elsewhere. As part of its work on a Skills Value Chain, the High Value Manufacturing Catapult has proposed a 'foresighting' process to help ensure that skills needs relating to emerging technologies are met.[39] Outputs from this process can feed into upskilling programmes for modular learning, as well as influencing standards.

CASE STUDY – A National Electrification Skills Framework

The foresighting process described above has been used as part of proposals for a national electrification skills framework and forum The process seeks to provide clarity on the capabilities, competencies, and course provision offered within the electrification sector. Firstly, relevant stakeholders are convened to foresight and articulate emerging skills needs, standards, and qualifications associated with emerging technologies. These stakeholders then work with others to curate education and training provision for a range of learner groups, putting in place relevant accreditation where necessary. Finally, training can be delivered within specialist technology centres, before being rolled out on an ongoing basis.

[38] Review of skills taxonomies: report prepared for the Skills and Productivity Board, May 2022
[39] Manufacturing the future workforce, High Value Manufacturing Catapult, January 2020

3. What Do Businesses Need?

> **UK manufacturing has currently got a massive skills shortage, as it transitions to be a more digitalised and high-tech sector. Businesses must upskill their workforce to make the best use of the people that they have and to help mid and late-career professionals transition into new roles.**

Commissioner Andrew Everett, CEO, ERA Foundation (Roundtable 4)

TOP LINES

- Limitations in teaching capacity in schools and colleges, and under-investment in training by businesses means that the current workforce is not equipped to meet the skills needs of the future green economy and Industry 4.0.
- Investment in upskilling and reskilling is therefore vital. Recent reforms to the FE system and in-work training, including T-Levels and Skills Bootcamps, are welcome. However, these initiatives should be better promoted to employers, and particularly Small and Medium-sized Enterprises (SMEs).
- Despite recent changes, the Apprenticeship Levy remains unfit for purpose. Its scope should be widened to allow broader investment in upskilling.

3.1. Industry-Ready Graduates

Participants in this inquiry from the education system felt that the pandemic has had a detrimental impact on the learning experience of many students, citing that they have "not returned to schools and academies the same". These trends have continued into industry – a recent survey by World Skills UK found that almost two-thirds of manufacturers believe that young people are not coming through the education and skills system with the necessary advanced manufacturing skills, rising to 70% for traditional manufacturing skills.[40] Earlier this year, both Deloitte and PwC announced that they would offer extra coaching to new hires who are likely to have weaker team-working and communication skills than pre-pandemic joiners.[41]

However, the quality of FE and HE graduates entering the manufacturing sector cannot be blamed solely on the pandemic. A pre-pandemic survey by the UK Commission for Employment and Skills (UKCES) found that 36% of employers regarded 17 to 18-year-old school leavers in England as "poorly" prepared for the workforce.[42] From qualification levels 1 and 2 upwards, schools are offering reduced access to design and technology, which is complementary to STEM subjects for entrants into the manufacturing industry. This is likely to be due to the cost (design and technology is one of the most expensive subjects for schools to offer) and also because of the introduction of the EBacc entry measure, given its influence on school league table position. An additional factor is the availability of teaching staff, who have been leaving the profession for better-paid roles in industry. Learners have therefore been disincentivised to take up STEM and design subjects from an early age, which has knock-on effects at levels 3 up to 7.

[40] Manufacturing excellence, World Skills UK, June 2023
[41] Pandemic-era graduates struggle with teamwork, say Deloitte and PwC, Financial Times, May 2023 (online) https://www.ft.com/content/a8b20502-8238-4655-ba82-30d6243332d9
[42] Employer perspectives survey 2014, UK results, UK Commission for Employment and Skills, November 2014

The introduction of new T-Level qualifications will go some way to address this. T-Levels have been developed in collaboration with employers and providers to meet local skills needs and prepare students for entry into skilled employment, an apprenticeship, or HE. Participants in this inquiry had mixed opinions on the introduction of T-Levels. Although several larger companies were optimistic about the potential for T-Levels to meet the needs of industry, many participants (particularly SMEs) cited concerns around the capacity of businesses to deliver the required 45-day industry placement and to provide appropriate oversight for young people, particularly within a 'shop floor' style environment. One solution to this could be to allow the industry placement to be split between several collaborating SMEs, to reduce the burden on individual businesses. Participants also raised concerns about the level of uptake by colleges and the availability of qualified teaching staff.

To date, marketing and promotion of T-Levels has naturally focussed on students. However, for T-Levels to be a success and for industry placements to be offered at scale, businesses must be made aware of their benefits, and incentivised to participate where appropriate. A £1,000 incentive was formerly available for employers who hosted T-Level placements, however this funding ceased in July 2022. Currently, employers can access support for costs associated with industry placements, albeit via the FE provider. A more appropriate incentive could be to make the costs associated with offering T-Levels more tax-efficient for businesses.

Recommendation 2

The Government should provide more support to SMEs to better incentivise them to participate in the delivery of T-Levels. This should start with reinstatement of cash incentives for hosting industry placements and making costs associated with these placements tax-efficient.

3.2. Investment In Training

UK employers invest far less in training than their European counterparts, and since 2005 training spend per employee has fallen by 28% in real terms.[43] The manufacturing sector compares particularly poorly in investment in training. As detailed in Section 2.1, in the Government's 2019 Skills Survey, the sector ranked second lowest in access to training and well below average in investment in training per employee.[44] The reasons for this are not well understood, although reliance on an expanded HE system to equip learners with the skills they require may play a role. Participants in this inquiry from industry also cited their frustration around investment in training by businesses, only for employees to use new skills to seek higher-paid employment with competitors.

The Learning and Work Institute has recently recommended that businesses could be incentivised to invest in training through a Skills Tax Credit, which would allow employers to deduct 230% of the cost of apprenticeships and accredited training from their tax bills, rising to 300% in priority levelling-up areas.[45] This builds on Recommendation 2 above (making T-Level placements tax-efficient) and as such, The Manufacturing Commission supports this recommendation.

[43] Raising the bar: increasing employer investment in skills, Learning and Work Institute, May 2022
[44] Employer skills survey 2019, Department for Education, October 2020
[45] Raising the bar: increasing employer investment in skills, Learning and Work Institute, May 2022

3.2.1. Skills Bootcamps

Skills Bootcamps, launched by the Government in 2020, are flexible courses of up to 16 weeks for adults aged 19 or over. They are primarily aimed at delivering training in medium to higher level technical skills to those who are either in work, self-employed, or unemployed. Bootcamp courses are co-designed with employers to respond to local skills shortages.

Skills bootcamps provide a cost-effective option for employers to invest in training, particularly in digital and green skills. Large employers contribute 30% of the cost, and SMEs contribute 10%. However, participants in this inquiry, particularly from the SME community, have suggested that many businesses are unaware of the introduction of Skills Bootcamps, never mind the discounted co-funding rates that are available. It is important that SME employers are made better aware of the benefits that Skills Bootcamps can provide, as they typically have found investment in training the most challenging.

Recommendation 3

The Government should better promote the discounted co-investment rate for Skills Bootcamps to SME employers within the manufacturing sector to increase take-up. Trade and sector organisations, such as the Manufacturing Technologies Association, could play a key role in doing this.

3.3. Upskilling & Reskilling

Although increasing the amount of ad-hoc training offered by employers is welcome, there is likely to remain a stark mismatch between the skills currently available across the manufacturing sector and those that will be needed to meet the demands of a green economy and embrace Industry 4.0. The Confederation of British Industry estimates that 9 in 10 UK employees will need to reskill by 2030, at a cost of £13 billion annually.[46]

Upskilling for automation will be particularly important in manufacturing – PwC estimates that up to 45% of global manufacturing jobs could be automated by 2030.[47] However, most workers that will be employed in the manufacturing sector in 2030 are already in the workforce and it is therefore vital that existing staff are upskilled to keep pace with these changes. A successful nationwide upskilling strategy, where skills gaps are closed by 2030 is estimated to result in an increase in GDP of up to 3.4% and boost employment by 0.6%.[48]

The development and roll-out of modular training will be crucial in supporting upskilling and reskilling of the future workforce. Modular training can be developed flexibly to deliver skills relating to emerging technologies and courses can be refined following feedback from early-stage adopters. Centres of Innovation (CoIs), such as the High Value Manufacturing Catapult, will be instrumental in the development and delivery of modular training in response to local industry demand.[49] However, lighter regulation may be required in order to incentivise involvement from CoIs and professional bodies.

[46] Learning for life: funding a world-class adult education system, Confederation of British Industry, October 2020
[47] Will robots really steal our jobs? An international analysis of the potential long term impact of automation, PwC, February 2018
[48] Upskilling for shared prosperity, World Economic Forum and PwC, January 2021
[49] Manufacturing the future workforce, High Value Manufacturing Catapult and The Gatsby Foundation, January 2020

3.4. Apprenticeships

Apprenticeships are vitally important to the manufacturing sector and provide learners with an opportunity to gain job-specific skills whilst working alongside experienced staff. A recent survey by Make UK showed that manufacturers believe that apprenticeships are typically the best route to develop the skills that they need to adapt to digitalisation and the requirements of the green economy.[50] Since 2015, the apprenticeship landscape has undergone significant reform, including the introduction of degree-level apprenticeships (2015), the Apprenticeship Levy (2017), and the replacement of the qualification-led framework system with an employer-led system of standards that include an end-point assessment.[51] Following the introduction of these reforms, the Government set a target of 3 million apprenticeship starts in England between 2015 and 2020. However, this target was not met.[52] Similarly, within the manufacturing sector, there has been a decline in the number of apprenticeship starts since 2015.[53]

Newly introduced Local Skills Improvement Plans (LSIPs) could provide a route to reversing this trend. LSIPs can help ensure that access to technical education and training is more closely aligned with local labour market requirements and they create a route for dialogue between employers and providers on apprenticeship needs. However, Employer Representative Bodies (ERBs), such as Chambers of Commerce, must ensure that they consider the specific skills needs of the manufacturing sector if LSIPs are to be successful in increasing the uptake of apprenticeships.

3.4.1. The Apprenticeship Levy

The Apprenticeship Levy was introduced by the Government in 2017, whereby employers with a wage bill above £3 million are required to contribute a levy allowance of 0.5% of their monthly payroll. These funds can then be reinvested back into the businesses in the form of apprenticeship training. Smaller businesses, with an annual wage bill of less than £3 million, are not subject to the Apprenticeship Levy, but can still access apprenticeship funding.

Delivering apprenticeships in engineering, manufacturing, and technology is expensive and it can cost an SME around £100,000 to train a level 3 apprentice. Much of this cost is borne up-front, which can present cashflow problems to businesses, given that levy funds can only be accessed in equal instalments, spread across the length of the apprenticeship.[54] Participants in this inquiry have cited concerns about the inflexibility in the use of Apprenticeship Levy funds and a result, many employers are reported to be opting out of the system entirely. This evidence is corroborated by recent research by both Policy Exchange and the Institute for Public Policy Research, with the latter reporting that £3.3 billion of unused levy funding has been retained by the Treasury over the last three years.[55] There have therefore been calls to broaden the scope of the levy to cover a wider range of accredited training and development.[56] Make UK and others have called specifically for a portion of unspent Apprenticeship Levy funding to be formally ringfenced as part of a new employer training fund. This would allow employers access to funding for both traditional apprenticeships and also to invest in training and development for their existing workforce. The Manufacturing Commission supports this recommendation and suggests that such a fund should be used to facilitate the provision of modular courses to upskill employees specifically for the needs of the green economy and Industry 4.0. When considering the scope of levy funding, participants have raised concerns about the use of funds for post-graduate study (such as MBAs and similar courses for senior executives), which individuals and businesses are typically likely to participate in, regardless of the presence of levy support. Finally, research by Policy Exchange, cited above, has explored issues surrounding the current

[50] Unlocking the skills needed for a digital and green future, Make UK, October 2021
[51] So what is the FE sector? A guide to the further education system in England, Education and Training Foundation, August 2020
[52] Progress report on the apprenticeship reform programme, Department for Education, July 2021
[53] Engineering and manufacturing technology starts fall 34% in nine years, Institution of Mechanical Engineers, January 2023 (online) https://www.imeche.org/news/news-article/engineering-and-manufacturing-technology-apprenticeship-starts-fall-34-in-9-years
[54] Call for evidence "fit for future": apprenticeships submission, UK Electronics Skills Foundation, ERA Foundation, and Techworks, February 2023
[55] Reforming the apprenticeship levy, Policy Exchange, May 2023; Over £3 billion in unspent apprenticeship levy lost to Treasury 'black hole' new data reveal, Institute for Public Policy Research, July 2022 (online) https://www.ippr.org/news-and-media/press-releases/over-3-billion-in-unspent-apprenticeship-levy-lost-to-treasury-black-hole-new-data-reveal
[56] Raising the bar: increasing employer investment in skills, Learning and Work Institute, May 2022

rules on Levy transfer, whereby Levy payers are able to transfer up to 25% of their levy funding to SMEs. This work recommended that the transfer scheme should be easier for businesses to navigate and that the allowable proportion of levy transfer should be increased from 25% to 35%.[57]

Recommendation 4

The Government should allow greater flexibility in the use of Apprenticeship Levy funding to support wider investment in education and training. Unspent levy funds should be ringfenced within an employer training fund to allow further upskilling, rather than being retained by the Treasury.

3.5. Closing The Vacancy Gap

Even if existing skills gaps within the manufacturing sector are closed and recent reforms to post-16 education and training can facilitate a sustainable pipeline of new talent, the sector will still have a labour shortage. This shortfall has come to be known as the 'vacancy gap'.

To close this gap, UK manufacturing must become more attractive to women and people of minority ethnic backgrounds, who have been traditionally under-represented in the sector's workforce. Evidence submitted to this inquiry suggests that learning preferences start from an early age and the uptake of STEM subjects remains lower in female students through to A-level.[58] Young women are currently three times less likely to consider a career in manufacturing than young men (18% vs 54%).[59] The industry must also do more to encourage women who have left the workforce (for example, after starting a family) to return and provide any necessary training to help them re-integrate.

There have been several excellent campaigns set up to try and reverse this trend, such as Women into Science and Engineering (WISE), Women in Manufacturing, STEM Learning, and Change the Race Ratio, the latter of which is led by Manufacturing Commission Chair, Lord Bilimoria. Government should draw on the successes of these initiatives and launch a long-term, national campaign to address the under-representation of women and people of minority ethnic backgrounds in manufacturing. In order to keep this at arm's length from government, such a campaign should be led by a non-departmental, public body.

Recommendation 5

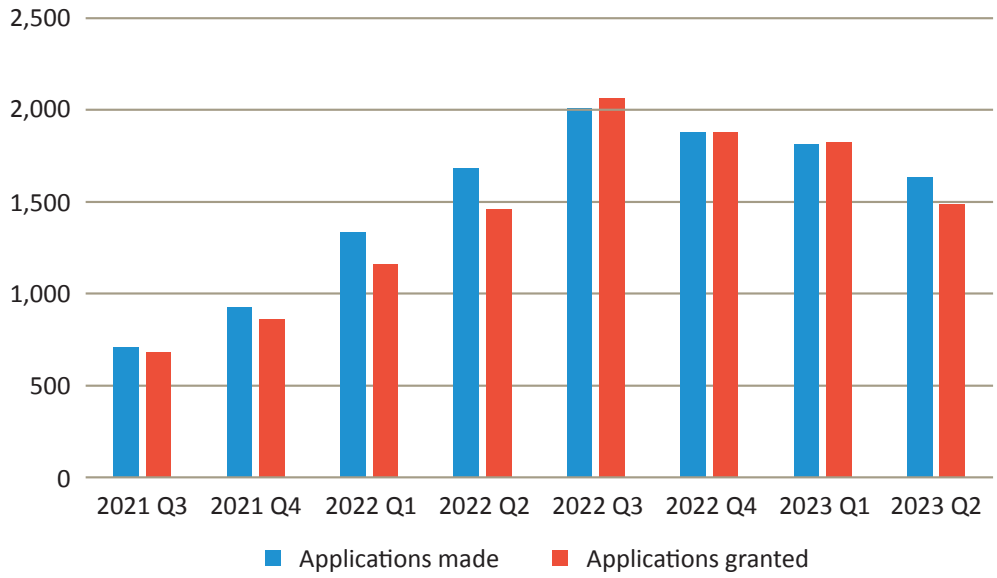
The Government should fund a long-term, national campaign that aims to increase the uptake of STEM subjects by women and people of minority ethnic backgrounds. Such a campaign should have clear objectives against which its success can be measured. It should also promote the benefits of a career in manufacturing, demonstrating the role that the sector plays in net zero and the circular economy.

Another way to fill the vacancy gap is to recruit more skilled labour from overseas. However, options for this have been severely reduced because of both Brexit and the pandemic, with businesses currently relying on the 'skilled worker' visa route within the new points-based immigration system. Following submission of Parliamentary Questions to the Home Office, the Manufacturing Commission understands that both applications made and granted for skilled worker visas have fallen since Q3 of 2022.

[57] Reforming the apprenticeship levy, Policy Exchange, May 2023
[58] Applying behavioural insights to increase female students' uptake of STEM subjects at A-level, Department for Education, November 2020.
[59] Manufacturing excellence, World Skills UK, June 2023.

Figure 2:

Skilled worker visa applications for UK manufacturing 2021-2023[60]



Evidence submitted to this inquiry indicates that businesses are choosing not to make use of the skilled worker visa route, and when they do, they often are not receiving sponsorship certificates in the volumes that they have requested. The shortage occupation list, which makes it easier to meet the 70 points needed under the current system, is currently under review by the Migration Advisory Committee.

Recommendation 6

Manufacturing and engineering roles should remain on the Shortage Occupation List. Retained roles should include, but not be limited to: electrical, electronics, design and development, production and process, and mechanical engineers, along with 'other' engineering professionals.

When considering how the immigration system can deliver for the manufacturing sector more widely, international students are currently classified as migrants, which lowers the overall number of non-student migrant workers that can come to the UK. Changing the immigration status of international students to omit them from net migration numbers would allow for the recruitment of more workers to the manufacturing sector from overseas.

[60] Immigration system statistics data tables, Home Office, August 2023, https://www.gov.uk/government/statistical-data-sets/immigration-system-statistics-data-tables#sponsored-work-visas-by-occupation-and-industry

Recommendation 7

The Government should remove international students from net migration figures.

Finally, the vacancy gap can be prevented from widening by keeping experienced staff in the workforce for longer. This has become a particular problem in recent years, as older workers opted to take early retirement during the pandemic, so much so that it was labelled the 'great resignation'. Although this trend has slowed recently as the cost-of-living crisis keeps people in work for longer, there is still scope to incentivise staff not to leave. One way that the industry can continue to benefit from the expertise of mature employees is to retain them as teachers and mentors, an intervention that can also help to ease demand for FE teaching provision (see Section 4.3).

4. What Do Providers Need?

> **Skills policy in England is constantly changing. It is therefore vital for both businesses and education providers to successfully navigate the current changes, including funding reform, qualification, reform, and the Lifelong Loan Entitlement.**
>
> Commissioner Margot James, Executive Chair, Warwick Manufacturing Group (Roundtable 3)

TOP LINES

- Businesses often opt not to engage with the FE system, due to the sheer complexity of the provision landscape. Local Skills Improvement Plans (LSIPs) will provide an opportunity for better dialogue between employers and providers through Employer Representative Bodies (ERBs).
- There remains a shortage of teaching staff in STEM subjects at both secondary and FE level. The wide disparity in pay between careers in teaching and industry means that graduates are disincentivised from embarking on a teaching career and existing teachers are leaving.

4.1. Further Education Provision In England

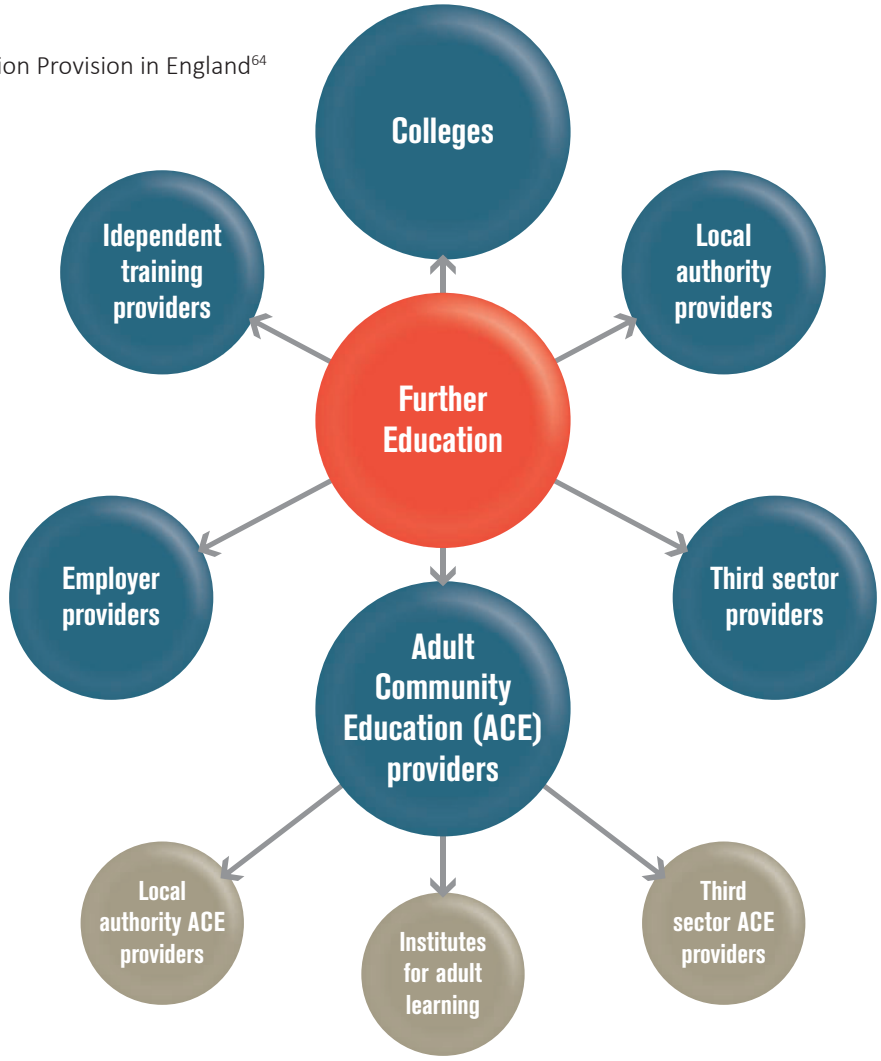
The FE system in England is made up of a mixture of market-based and government supported provision. Skills providers include FE colleges, Local Authority Providers, Independent Training Providers, Employer Providers, and Third Sector Providers, along with the provision of Adult Community Education. Combined, these providers offer a vast range of academic, vocational, and recreational courses.

Originally developed as Centres of Innovation to bridge the gap between research and business, the Catapult network also plays an important role in the co-development of skills for the manufacturing sector. The High Value Manufacturing Catapult (HVMC) currently offers apprenticeships, graduate training, and workforce continual professional development courses in manufacturing and engineering. In a recent review of the Catapult network, the Government recommended that "Catapults should identify whether they can introduce skills development into the next 5-year review cycle in a way that works for their sector".[61] Within its report on the future of the manufacturing workforce, the HVMC has explored how Catapults can play a greater role in workforce development and draw on best practice from similar organisations across the world.[62] The Labour Party has recently committed to retaining the Catapult network, should they form the party of government following the forthcoming General Election.[63]

[61] Catapult network review, Department for Business, Energy, and Industrial Strategy, April 2021
[62] Manufacturing the future workforce, High Value Manufacturing Catapult, January 2020
[63] Prosperity through partnership: Labour's industrial strategy, Labour, September 2022

Figure 3:

Further Education Provision in England[64]



[64] Adapted from: So what is the FE sector? A guide to the further education system in England, Education and Training Foundation, March 2020

4.2. Incentives

The Manufacturing Commission has previously highlighted problems with existing FE college funding structures. Currently, providers are incentivised to offer lower-value courses, which can be easily filled, rather than delivering higher-value technical training to meet local skills needs. The Government has acknowledged this challenge and stated that it is "vital that colleges have confidence to develop their response over a longer timeframe than the current funding system allows".[65] In order to address this, the Manufacturing Commission previously recommended that providers should receive multi-year funding budgets to deliver high-quality training that is targeted to address local skills gaps and aligned with local employer needs.[66]

Within the Skills for Jobs White Paper, the Government agreed to explore moving to a multi-year funding regime, however progress has been slow. In the meantime, respondents to this inquiry from industry have reported that, aside from well-subscribed courses in solar installation and electric vehicle charging, FE colleges often do not have adequate training on offer to meet the needs of the green economy.

Participants in this inquiry from FE colleges also cited the cost associated with demonstrator plant and machinery that is required to provide vocational training as a challenge. For example, the need for air-source heat pumps and hydrogen boilers in courses to retrain heating engineers. Investment in these items is often excluded from other funding sources, such as school improvement funds, and disincentivises providers from running courses that require such equipment.

At secondary level, schools are also provided with few incentives to prioritise STEM learning. Participants in this inquiry have suggested that this could be encouraged by allowing Ofsted to award credit for extra-curricular activities related to STEM as part of the school assessment process.[67]

4.3. Staff

The UK has a longstanding shortage of teaching staff across primary, secondary, and FE levels and these shortages are particularly acute within STEM subjects. Despite the Department for Education making teacher recruitment its number one delivery priority in its 2015-2020 strategy, STEM entrants into teacher training have remained low, with just 17% of the target being recruited for physics in 2022/23.[68] Consequently, at secondary level, many STEM teachers are not specialists in the subjects they teach - Engineering UK recently found that only 63% of physics teachers and 78% of maths teachers have relevant post-A level qualifications.[69] The lack of specialist Design and Technology teachers is also a particular problem, given the complementary role that Design and Technology plays with STEM. Earlier this year, Rosemary Carabine, President of the National Association of Schoolmasters Union of Women Teachers, said that the Government must "wake up" to the lack of STEM graduates going into teaching roles.[70]

[65] Skills for jobs: lifelong learning for opportunity and growth, Department for Education, January 2021
[66] Manufacturing resilience: driving recovery towards net zero, Policy Connect, July 2021
[67] UK manufacturing: a short policy paper, Engineering and Machinery Alliance, May 2023
[68] DfE strategy 2015-2020: world class education and care, Department for Education, March 2016; Initial teacher training census: academic year 2022/23, Department for Education (online) https://explore-education-statistics.service.gov.uk/find-statistics/initial-teacher-training-census
[69] Engineering UK 2020: educational pathways into engineering, Engineering UK, 2020
[70] Government must 'wake up' over STEM teaching, Rosemary Carabine, speech to National Association of Schoolmasters Union of Women teachers, April 2023, https://www.nasuwt.org.uk/article-listing/government-must-wake-up-over-stem-teaching.html

These challenges in recruitment continue into FE – 88% of college principals recently cited engineering and manufacturing as the most difficult subjects to recruit skilled staff for, especially given that teaching staff in these subject areas usually require industry experience.[71] A recent survey by the Association of Colleges also found that 78% of institutions had reported shortages in teaching staff in engineering courses.[72] One reason for this is that these individuals are also being sought by industry to fill the gaps in the workforce discussed earlier in this report. However, the scale of the problem in the FE sector is less well-known, given that there are limited data available on the current FE workforce.[73] Pay disparity certainly exacerbates this problem – the average industry salary for an engineering professional in 2019 was around £10,000 higher than in FE teaching, and for experienced engineers, this gap is likely to be far wider.[74] This means that STEM graduates are not incentivised to train as teachers and existing staff are leaving the profession for better remuneration in industry. The introduction of new T-Level offerings will also create further demand for teaching staff in STEM subjects.

The Government has introduced several initiatives to try and reverse this trend, including Taking Teaching Further, which supports providers to recruit and retrain industry professionals as FE teachers, particularly for T Levels and apprenticeships. A Workforce Industry Exchange programme has also been announced, which will facilitate a two-way exchange between industry and FE teaching.[75] Given this programme is yet to be established it should also be used as an opportunity to promote collaboration between the FE and HE sectors. For example, the use of PhD and graduate students on placement as specialist technicians in the FE system would provide individuals with teaching experience whilst also providing much needed staffing resource.

Recommendation 8

The Government should roll out the Workforce Industry Exchange Programme, funded under the £65 million investment in the further education workforce announced in 2021.

4.4. Support From Industry

Respondents to this inquiry from industry frequently cited that FE providers are not equipped to deliver the education and training that their workforce will need in the future. However, businesses also have a key role to play in closing existing skills gaps by working with providers to define the skills that they need, specifying course content, and co-delivering learning programmes.

As detailed above, newly introduced LSIPs will provide an opportunity for making the delivery of technical skills training more responsive to the needs of local businesses and it is important that employers engage with this process.

[71] Engineering UK 2020: educational pathways into Engineering, Engineering UK, 2020
[72] Financial Times: colleges in England struggle to find teachers for critical skills subjects, Association of Colleges, August 2022 (online) https://www.aoc.co.uk/news-campaigns-parliament/aoc-newsroom/in-th-news-colleges-in-england-struggle-to-find-teachers-for-critical-skills-subjects-financial-times
[73] People and skills in UK STEM, oral evidence to Science and Technology Committee inquiry, James Zuccollo, Education Policy Institute, October 2022
[74] Engineering UK 2020: educational pathways into Engineering, Engineering UK, 2020
[75] More support for further education teachers to develop, Department for Education, press release, June 2021, https://www.gov.uk/government/news/more-support-for-further-education-teachers-to-develop

CASE STUDY – Electric Revolution Skills Hub

The Electric Revolution Skills Hub was proposed as part of the UK Research and Innovation 'Driving the Electric Revolution' initiative to catalyse investment in power electronics, machines, and drives (PEMD). The Hub launched in March 2023, with the aim of supporting skills and career development in UK electrification. The project brings together providers, learners, businesses, and recruiters in a single platform that gives inclusive access to training, development, and jobs across the UK. The platform allows providers to list training and development opportunities in an online directory so that they can be accessed by prospective learners and businesses. Further features, including enhanced profiles and digital badging will be added later this year. The Hub could be used as a template for better collaboration between FE providers and industry within other parts of the manufacturing sector.

CASE STUDY – Kent and Medway Manufacturing Focus Group

Following completion of a trailblazer project in 2022, the 2023 Kent and Medway LSIP has recently been approved by the Secretary of State for Education. The LSIP considers skills shortages across the region and provides a roadmap to help close skills gaps and enable better collaboration between businesses and education providers. To inform the LSIP, an area-specific employer skills survey was completed, which found that almost half of responding businesses said that recruitment was a problem for them and that they lacked specialist skills within their workforce. The LSIP has considered the manufacturing sector in Kent and Medway specifically and established the Kent and Medway Manufacturing Focus Group as a forum to facilitate dialogue between businesses and education providers. Amongst other issues, the Forum aims to explore the challenges associated with automation and digitalisation, the perception of the manufacturing sector, and the forthcoming demand for short courses. The Forum has also run site visits to local businesses, including SEC Works Group, a company that specialises in the bespoke conversion and operation of London buses, coaches, vans, and trailers into promotional, educational, and exhibition vehicles.

4.5. Collaboration With Higher Education

The further and higher education systems often consider themselves as distinct entities, with colleges and universities pitted against each other in the debate on the skills system. However, given that both further and higher education is often delivered across both colleges and universities, there is much to gain from better collaboration and wider integration. Recent work by the College of The Future has set out the opportunities of a more joined-up approach, including reducing regional inequalities, sharing resources and infrastructure, and enhanced staff development.[76] Sadly, existing incentives to encourage collaboration are piecemeal and poorly funded, and both university and college leaders often have little capacity to develop new institutional partnerships. The above report calls on both colleges and universities to commit to creating a joined-up tertiary education system, with a focus on shared responsibility for skills development.

[76] Going further and higher: how collaboration between colleges and universities can transform lives and places, The College of the Future, Shefflield Hallam University, and Civic Network University, April 2022

5. What Do Individuals Need?

> **Survey after survey has found that two things really matter to young people when they are looking for a job. Firstly, they care passionately about climate change and sustainability – they want to see that a prospective employer is not greenwashing, but really believes in it. Secondly, they look for diversity and inclusion, especially if they can see it in the leadership.**
>
> Inquiry Chair, Lord Bilimoria of Chelsea (Roundtable 1)

TOP LINES

- The manufacturing sector is playing a crucial role in providing the products and technologies required to combat the climate crisis and achieve net zero greenhouse gas emissions in the UK.
- The sector must do better at communicating this contribution to learners. Facilitating school trips to businesses and arranging guest speakers could help increase enthusiasm for manufacturing.
- Introduction of the Lifelong Loan Entitlement (LLE) will provide an opportunity for individuals to upskill and reskill. Demand for modular provision under the LLE should be explored, prior to its introduction in 2025.

5.1. Businesses Committed To The Green Agenda

In a 2022 survey by WSP, 15% of graduates cited 'improving sustainability and tackling climate change' as an important factor when deciding upon a future career. However, although UK manufacturing is vital to the green economy and meeting net zero, the sector continues to struggle to appeal to students.[77] These findings are corroborated by participants in this inquiry from industry, who found that, although prospective apprentices are increasingly interested in the green credentials of individual businesses, the manufacturing sector as a whole has not made its contribution to combatting climate change explicit.

5.2. A Living Wage

Achievement rates for apprenticeships in England have been falling over the last decade and they are particularly poor at lower levels, with less than half of apprenticeships at Level 2 being completed between 2019 and 2022.[78] Apprenticeship salaries are likely to be a key contributor to low achievement rates. The current national minimum wage for an apprentice aged 16 to 18 (or 19 and in their first year) is £5.28 per hour. Although many businesses pay their apprentices more than this (sometimes two or three times more), this hourly rate is likely to fall far short of a living wage, particularly within London and areas of the southeast.

[77] Students not drawn to careers in sectors crucial to UK's net zero ambitions, new research suggests, WSP, November 2022 (online) https://www.wsp.com/en-gb/news/2022/students-not-drawn-to-careers-in-sectors-crucial-to-uks-net-zero-ambitions

[78] Achievement rates for apprenticeships in England 2011-2021, Statista (online) https://www.statista.com/statistics/1304654/apprenticeship-achievement-rate-england/; Apprenticeship achievements: an update from the sector, Department for Education, March 2023

5.3. Exposure To Manufacturing

Work experience plays an important role in both preparing learners for a career in industry and raising individuals' awareness and enthusiasm for manufacturing. A report by the Education and Employers' Taskforce showed that, controlling for the highest level of attainment, young people who have four or more work experience activities during their education are five times less likely to fall into the classification of 'not in education, employment, or training'.[79] Although it is acknowledged that most learners will not gain this amount of relevant industry work experience, enthusiasm for a career in manufacturing can be fostered through individual school trips to businesses or guest speakers from industry, which could be mandated within the curriculum.

Recommendation 9

The Government should appoint a manufacturing 'Champion' to help raise awareness of the manufacturing sector in schools, coordinate speakers from businesses, and promote the role that the manufacturing sector is playing in combatting the climate crisis.

The above 'Champion' role should come with sufficient resourcing to actively coordinate engagement between schools and businesses. Feedback should be collected on the most impactful interventions so that these can be replicated.

5.4. Labour Market Information

Section 2.6 of this report makes the case for the development of a skills taxonomy system to help close future skills gaps by enabling businesses to better understand the skills that will be needed in the future. However, Labour Market Information (LMI) is also useful for learners and graduates to understand current employment trends and growth areas by both region and industry.

Within the 2021 Skills White Paper, the Government acknowledged that there was no single resource available to obtain government-backed, comprehensive careers information, which made making career choices "confusing, fragmented, and unclear". The White Paper committed to updating the National Careers Service (NCS) website to bring together "all the learning and careers routes available to people, along with improved content on work experience, applying for roles, and updated labour market information".[80] Although some improvements have been made to the NCS website, there remains scope to include far more detailed LMI as part of this service.

[79] Work experience: impact and delivery - insights from the Evidence, Anthony Mann, Education and Employers Taskforce, October, April 2012
[80] Skills for jobs: lifelong learning for opportunity and growth, Department for Education, January 2021.

5.5. Lifelong Loan Entitlement

The Lifelong Loan Entitlement (LLE) was first introduced within the Jobs for Skills White Paper, as part of a lifetime skills guarantee, proposed by former Prime Minister, Boris Johnson.[81] The LLE will provide learners with a loan entitlement against tuition fees to the equivalent of four years of post-18 education, to use over their lifetime. Eligible learners will also be able to access loans to support living costs and targeted grants, depending on their circumstances. Following a government consultation and in acknowledgement of the need for reskilling, the LLE will not be contingent on enrolment in a course or qualification higher than one the student already holds.[82]

Stakeholder reaction to proposals for a LLE has generally been positive, with the chief executive of Association of Colleges, David Hughes, describing it as a "game changer" and Make UK's Senior Employment Policy Manager, Jamie Cater, calling it an "important step forward".[83] However, the University and College Union raised concerns about reinforcement of bias along class divides, given that full-time education (the LLE has a full-time study bias) is easier to access for those from more affluent backgrounds and there is a strong relationship between deprivation and take up of FE.[84] Participants in this inquiry raised similar concerns that the minimum requirements for part-time study (30 credits), would not be flexible enough to deliver modular training. The Russell Group also made several recommendations for improvement of the LLE, including further research into demand for modularised courses to meet the needs of employers, and ensuring that modular provision complements existing learning pathways. Given the importance of modular provision for the future of UK manufacturing (Section 3.3), the Manufacturing Commission strongly supports these recommendations.[85]

Participants in this inquiry have raised concerns about the appetite for learners to take out a loan to fund training in emerging technologies that may not currently have a reliable route into employment, particularly given the current cost of living crisis. For example, the use of hydrogen as a low-carbon alternative to natural gas has long been discussed as a way to decarbonise in-home heating. To roll this out on a national scale would require significant upskilling of the existing heating engineer workforce to retrofit boilers and install new infrastructure. However, following recent comments by the Secretary of State for Energy Security and Net Zero, the use of hydrogen for in-home heating is now considered to be less likely.[86] Training in such exploratory areas could be subsidised by the Government until these technologies become more established. Funding could be drawn from the Science and Technology Framework, which aims to develop skills in artificial intelligence, quantum technology, engineering biology, semiconductors, and future telecoms.[87]

Recommendation 10

The Government should offer grants and subsidies to fund training in emerging green technologies as part of the forthcoming Lifelong Loan Entitlement (LLE). Consultation on which courses to subsidise should be completed prior to introduction of the LLE in 2025.

[81] Skills for jobs: lifelong learning for opportunity and growth, Department for Education, January 2021
[82] Lifelong loan entitlement: Government consultation response, Department for Education, March 2023
[83] Student finance to be radically reformed from 2025, Department for Education, March 2023 (press release) https://www.gov.uk/government/news/student-finance-to-be-radically-transformed-from-2025
[84] Lifelong loan entitlement – Government consultation response, University and College Union, May 2022; Regional STEM skills inequity report, APPG on Diversity and Inclusion in STEM, July 2023
[85] Response to DfE lifelong loan entitlement consultation, Russell Group, May 2022
[86] UK poised to drop plans to replace home gas boilers with hydrogen alternatives, The Guardian, July 2023 (online) https://www.theguardian.com/environment/2023/jul/13/uk-poised-to-drop-plans-for-hydrogen-to-replace-natural-gas-in-homes
[87] Plan to forge a better Britain through science and technology unveiled, Department for Science, Innovation and Technology, March 2023, (press release) Plan to forge a better Britain through science and technology unveiled - GOV.UK (www.gov.uk)

Conclusion

Participants in this inquiry from industry have repeatedly stressed that, first and foremost, their priorities lie in developing sustainable businesses that deliver high-quality products for their customers. It is understandable that navigating the FE system to train and upskill their workforce often comes as secondary to this. However, the two things need not be mutually exclusive – indeed, the opposite is likely to be true, given that preparing employees in the manufacturing sector for a green and digital economy is likely to make businesses more sustainable and resilient.

England's skills system is complex, and as a result, many employers opt out of opportunities to engage with it entirely. Reform to the FE system delivered through the Post-16 Education Act and associated secondary legislation will help businesses better navigate the system. In particular, the introduction of LSIPs can help to facilitate dialogue between businesses and FE providers to deliver on the skills needs within their local area.

The recommendations in this report aim to build on recent FE reform and help businesses, providers, and individuals get the most out of the system to deliver a sustainable pipeline of skilled labour to the manufacturing sector for the future. The Manufacturing Commission has set out a timeframe for the implementation of its recommendations below:

Figure 4:

Timescale for implementation of recommendations

2023	2024	2025
RECOMMENDATION 6: Manufacturing and engineering roles to remain on shortage occupation list	**RECOMMENDATION 2:** SME support to deliver T-Levels	**RECOMMENDATION 1:** Development of a skills taxonomy system
RECOMMENDATION 7: Removal of international students from net migration figures	**RECOMMENDATION 3:** Promotion of skills bootcamps	**RECOMMENDATION 10:** Consultation on grants and subsidies prior to introduction of Lifelong Loan Entitlement
	RECOMMENDATION 4: Changes to the Apprenticeship Levy	
	RECOMMENDATION 5: Campaign for STEM uptake by women and minorities	
	RECOMMENDATION 8: Roll out of Worksforce Industry Exchange Programme	
	RECOMMENDATION 9: Appointment of a manufacturing 'Champion'	

Commissioners

Lord Karan Bilimoria, CBE, DL ..... Cross Bench Peer, Founder and Chair of Cobra Beer, Chancellor of the University of Birmingham (Chair)

Mark Pawsey ..... Member of Parliament for Rugby (vice-Chair)

Sarah Olney ..... Member of Parliament for Richmond Park (vice-Chair)

Andrew Churchill, OBE ..... Executive Chair, JJ Churchill

Andrew Everett ..... Chief Executive and Executive Secretary, The ERA Foundation

Professor Carl Perrin ..... Chief Executive, Institute for Future Transport and Cities, Coventry University

Clive Hickman, OBE ..... Chair, Manufacturing Technology Centre

David Atkinson ..... Regional Director and Head of UK Manufacturing, Lloyds Banking Group

Professor David Seall ..... Visiting Professor and Deputy Chair of the Leadership Academy, University of Surrey Business School

Faye Skelton ..... Head of Policy, Make UK

Indro Mukerjee ..... Chief Executive, Innovate UK

James Selka, DL ..... Chief Executive, Manufacturing Technologies Association

Dr Julie Nugent ..... Director of Skills and Productivity, West Midlands Combined Authority

Lynn Tomkins ..... Chair, Skills 4 UK

Margot James ..... Executive Chair, Warwick Manufacturing Group

Paul Everitt ..... Chair, Aerospace Technology Institute

Dr Rhys Morgan ..... Director of Engineering and Education, Royal Academy of Engineering

Dame Sally Dicketts, DBE ..... Non-Executive Director, STEM Learning UK

Professor Tim Minshall ..... Dr John C Taylor Professor of Innovation and Head of University of Cambridge Institute for Manufacturing

Methodology & Contributors

Work on this inquiry began in February 2022 following a scoping session, which was kindly chaired by Lord Bilimoria.

This project draws on third-party research from a range of organisations, as well as primary data collected following a call for evidence and through one-to-one interviews with experts across industry, academia, government, and NGOs. In addition, the following evidence sessions were completed, which focussed on the following topics:

Roundtable 1: perspectives from business (MACH exhibition) – 8 April 2022

Roundtable 2: articulating the skills need (online) – 27 May 2022

Roundtable 3: perspectives from students and providers (WMG) 13 September 2022

Roundtable 4: green skills and evidence gaps (online) – 10 May 2023

Policy Connect would like to thank all the individuals and organisations that participated in this inquiry. Our particular thanks to our Chair Lord Bilimoria and Vice Chairs, Mark Pawsey MP and Sarah Onley MP for their leadership and dedication to the Commission's work. A full list of contributors is outlined below. The views in this report are those of the author and Policy Connect. Although these were informed by the listed contributors, they do not necessarily reflect the opinions of these organisations.

Roundtable attendance, oral, and written evidence:

- Academy for Young Engineers
- Aerospace Technology Institute
- Alucast
- Anglian Water
- Aston Business School
- Aston Martin
- British Aerosol Manufacturers' Association
- City and Guilds
- Confederation of Paper Industries
- Coventry University
- Department for Business, Energy and Industrial Strategy
- Department for Business and Trade
- Enginuity
- Engineering and Machinery Alliance
- ERA Foundation
- Gambica
- Greater Birmingham and Solihull Institute of Technology
- Green Alliance
- Heracs
- High Value Manufacturing Catapult
- Innovate UK
- Institution of Engineering and Technology
- JJ Churchill
- Kent Further Education
- Kent and Medway Manufacturing Focus Group
- Lloyds Banking Group
- MA Business
- Made in Britain
- Made Smarter
- Make UK
- Manufacturing Management Magazine
- Manufacturing Technologies Association
- Mira Technology Institute
- Norton Motorbikes
- Optima UK
- Renewable UK
- Royal Academy of Engineering
- Skills 4 UK
- Solihull College
- Space South-Central
- The Manufacturer
- Trent Refractories
- UK Electronic Skills Foundation
- University of Cambridge Institute for Manufacturing
- University College Birmingham
- Warwick Manufacturing Group
- West Midlands Combined Authority
- WSP
- Victorian Skills Authority

About This Report

The Manufacturing Commission

The Manufacturing Commission is run by Policy Connect's Industry, Technology, and Innovation team. The Commission brings together Parliamentarians, leading figures from across the manufacturing sector, and academics to undertake high-level research into UK manufacturing policy making recommendations to government and industry. The Commission is currently chaired by Lord Bilimoria CBE DL.

The Industry, Technology, and Innovation Team

The Industry, Technology and Innovation team at Policy Connect provides the secretariat for the All-Party Parliamentary Groups for Manufacturing; Design & Innovation; and Data Analytics. The team focusses its work on building innovative industries and public services that tackle key societal challenges in productivity, clean growth, and information.

Policy Connect

Policy Connect is a cross-party think tank. We specialise in supporting parliamentary groups, forums, and commissions, delivering impactful policy research and event programmes. We bring together parliamentarians and government in collaboration with academia, business, and civil society to help shape public policy in Westminster and Whitehall, so as to improve people's lives.

Our work focusses on five key policy areas which are: Education & Skills; Industry, Technology & Innovation; Sustainability; Health; and Assistive & Accessible Technology.

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