

## **Supplementary evidence for the Science and Technology (Lords) Committee inquiry into people and skills in UK STEM to support the evidence provided by Dame Judith Hackitt during Evidence Session No. 7**

### **Introduction**

1. On 25 October 2022, Dame Judith Hackitt appeared before the Science and Technology Committee (Lords) as an expert witness in Evidence Session No. 7 of the Committee's inquiry into people and skills in UK STEM. Dame Judith would like to provide some additional information to the Committee to support and underline the points she made in response to the Committee's Questions 47 to 54.
2. Dame Judith is Chair of the National Manufacturing Skills Taskforce and Enginuity, the sector connector for the Engineering and Advanced Manufacturing industries. She is the former Chair of Make UK.

### **Questions**

Q47

Briefly outline your view of the current state of apprenticeships and lifelong learning provision in the UK. Are we adequate, with room for improvement? Are we failing to provide sufficient apprenticeships and lifelong learning? Do we need fundamental reform? As a supplementary, we have noticed in the figures that national apprenticeship enrolment is declining. If you can give us any insight as to why you think it is declining and what can be done about it, that would be a helpful additional point.

### **Shortages**

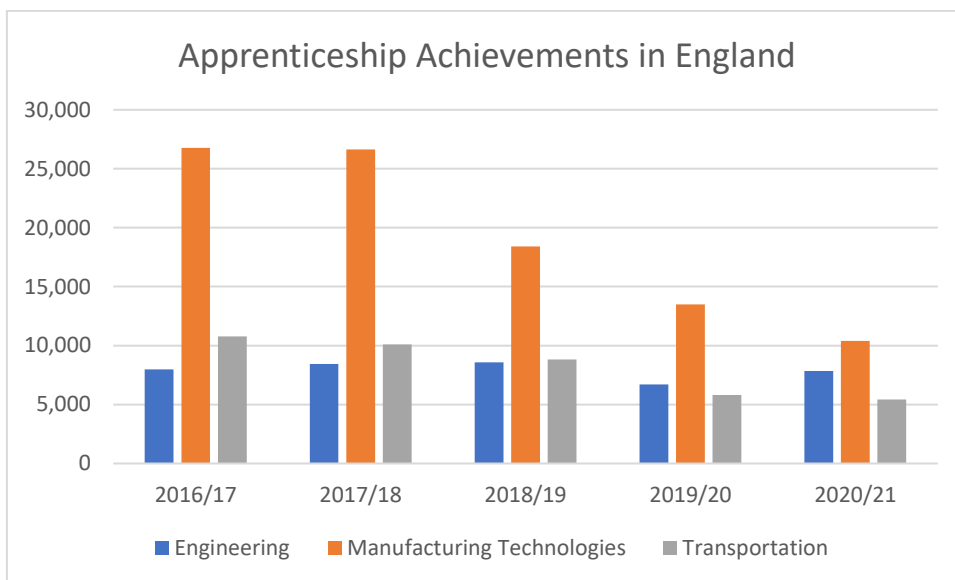
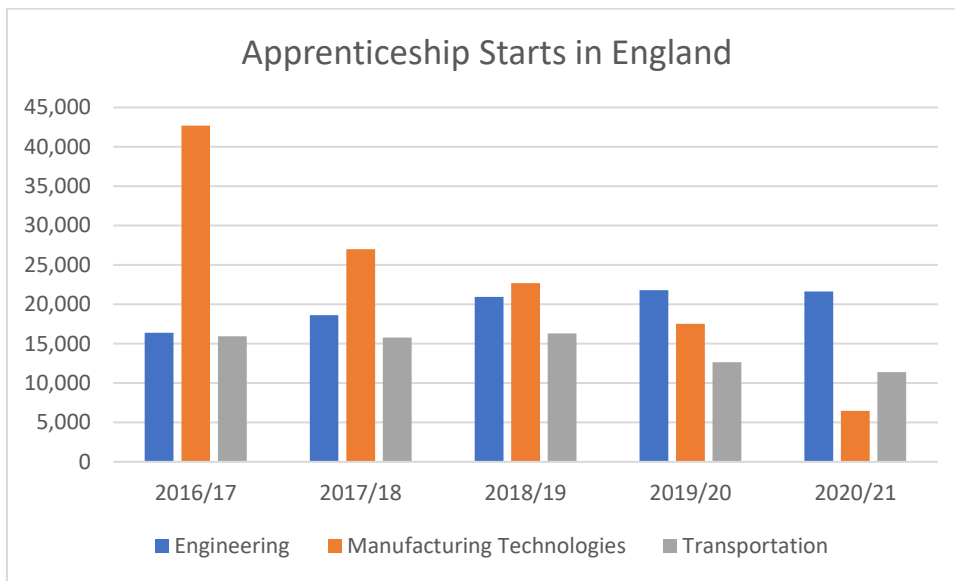
3. The Engineering and Manufacturing sector in England is facing acute labour shortages in both high skilled areas, such as automation, robotics and applications engineers, and lower entry level skills. Digitalisation of manufacturing processes is creating a need for a high level of cross-sectoral digital skills,<sup>1</sup> while businesses in the aerospace and automotive sectors are struggling to recruit people across a range of common disciplines related to electrification of transport and battery production, as well as the proposed use of alternative fuels such as hydrogen.
4. Apprenticeships are a fundamental part of the intermediate and longer-term solution to many of these labour shortages, but numbers of starts and achievements in manufacturing are continuing to decline.<sup>2</sup> While some of the decline may be attributed to changes in policy, such as the move from

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<sup>1</sup> See, for example, [Pyetait, EAMA, Enginuity and Gatsby, 2020 Skills Vision: The Skills, Recruitment and Training Landscape](#).

<sup>2</sup> <https://explore-education-statistics.service.gov.uk/data-tables/permalink/3dfc0c43-a0b9-4750-b4ab-416ada9e2e56>

frameworks to standards, and the covid pandemic, there are clearly structural issues as well.



### Rapid pace of change

5. In Engineering and Manufacturing the pace of technological change is rapid. Apprenticeships need to be able to respond and adapt as rapidly to introductions of technology, so that young people are equipped with skills that enable them to realise their career ambitions, and industry is provided with the actual skills it needs and has confidence in the system's capability to deliver those skills over the lifetime of its investments.

### The pipeline for future talent

6. We need to support better the future generation of talent throughout the entire pipeline, from the earliest stages through lifelong education and training. From

inspiring young children with innovative, engaging, and motivating STEM careers advice, such as Enginuity's Skills Miner minigames<sup>3</sup>, to STEM outreach activities which ensure young people are well-informed about the rewarding and fulfilling career opportunities in our sectors, to continued support and engagement through a lifetime of upskilling.

### Demographics and under-represented groups

7. The decline in STEM apprenticeships is exacerbated by the low levels of participation by females and ethnic minorities. There is a stark gender imbalance in STEM apprenticeships. For example, in 2019-2020, females made up 49% of starts across all apprenticeships, but just 11.4% of STEM apprenticeships. The figures are even worse for females under 19, who made up just 6% of starts in STEM apprenticeships that year.<sup>4</sup> People from ethnic minority backgrounds are also under-represented in apprenticeships.
8. The barriers creating these imbalances need to be addressed so that females, ethnic minorities, and other under-represented groups have every opportunity to discover and take up the rich and diverse opportunities which our sectors offer. It is particularly important to recognise that these barriers to participation by under-represented groups are present throughout the pipeline and require solutions at all stages. For example, research commissioned by Enginuity from CHILDWISE<sup>5</sup> found that girls aged 11-14 say they know less about, and are four times less likely to be interested in, an engineering career than boys of the same age.<sup>6</sup>
9. Industry is trying to overcome these problems by, for example, developing STEM activities to reach out to students in less economically developed areas. The Jon Dennison Bursary<sup>7</sup> is an example of an initiative which supports the 'Insight into University' programme for disadvantaged young people. Enginuity is leveraging gamification to provide accessible and inspiring STEM careers advice for children which can be easily implemented by teachers in schools without other resources for STEM careers advice.<sup>8</sup>
10. However, we need much greater energy and imagination in this space, especially in encouraging and supporting innovative approaches which can reach under-represented groups more effectively. Industry would welcome a re-energised partnership with government in this area to increase the participation of under-represented groups in STEM apprenticeships and other technical training.

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<sup>3</sup> <https://enginuity.org/innovation-lab/skills-miner/>

<sup>4</sup> [Youth Unemployment Committee \(Lords\) report: Skills for every young person, November 2021.](#)

<sup>5</sup> [CHILDWISE](#) is a leading specialist in research with children and young people.

<sup>6</sup> Enginuity/Childwise, *Research Report*, August 2022.

<sup>7</sup> <https://theagp.aero/john-dennison-bursary/>

<sup>8</sup> <https://enginuity.org/innovation-lab/skills-miner/>

Q48

Germany's vocational training system is much admired in this country. What are your thoughts about what we are doing differently? Can we learn from other countries? What are the major factors that might prevent us adopting these policies? Is it predominantly cultural, to do with funding, or related to different economic structures?

### Foresighting

11. The HVM Catapult has done a significant amount of work on foresighting skills needs through its Emerging Skills Project.<sup>9</sup> The project developed an automated data flow using Enginuity's common skills language to connect current and future skills. The processes and IT tools to facilitate and enable skills foresighting are available under Open Government License, with specialist advice and support from HVMC needed for take-up.

### Review and redevelopment of the Engineering Scottish Modern Apprentices Standard and Framework

12. Over the last 10 months, Enginuity has been using data engineering techniques to support a completely new approach in the redevelopment, on behalf of Skills Development Scotland, of the Scottish Apprenticeship Standard and Framework for Engineering.
13. The redevelopment puts employers at the heart of the creation of the new standard and framework by creating a standard which allows transition and transferable skills throughout engineering environments and creates a broad-based engineering skills and knowledge programme.
14. The apprenticeship standard content has been created by working closely with employees across the sector, to understand their job tasks and functions, and with a wide range of engineering employer technical experts. The experts, drawn from across all geographical regions and business sizes, include representatives from Network Rail, BAE systems, Babcock, Doosan, and Rolls Royce.
15. This group has a key role in agreeing the final content of the standard to ensure that it aligns with and meets the needs of the broad-based engineering sector. Enginuity has a key role in recruiting experts, production of the standard and in correlating and co-ordinating wider stakeholder engagement in project including consultation on new standard proposals. Enginuity is also leading on work of Qualifications design with Awarding organisations that will underpin and show competence for those undertaking the new standard. The Engineering Apprenticeship Standard, Framework and associated qualifications are expected to be available in Summer 2023.

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<sup>9</sup> <https://emergingskillsproject.com/>

Q49

What role do you think universities have in preparing people for apprenticeships and in general for STEM subjects more effectively?

16. We need to reduce the incentive for schools to keep their students on an academic route rather than an apprenticeship or other technical training. This incentive will weaken if universities become more involved in the apprenticeship system. UCL, for example, is developing apprenticeship offerings based on their established MSc programmes in Systems Engineering Management and Technology Management.<sup>10</sup>

Q50

First, I would like to explore what you think are the major factors preventing companies taking on more apprentices. You have mentioned two of them, which are perhaps the lack of candidates and the lack of appropriate courses for some of the newer technologies. I would be keen to hear whether you might want to expand on those or whether you think there are other factors. Secondly, I would like to raise something that our previous industry witnesses have made quite a lot of. They felt the apprenticeship levy is too restrictive, and I would be very interested in your views on whether it should be more flexible, so that it could be spent on retraining for green skills or modular skills updating for existing stuff, as Dame Judith has perhaps hinted at, rather than just the full conventional apprenticeship approach.

#### Department for Education Apprenticeships in Manufacturing Group

17. The Department for Education has established an Apprenticeships in Manufacturing (AiM) Group to attempt to address some of these issues. AiM has the support of employer groups and the National Manufacturing Skills Taskforce.

#### Match-making to balance supply and demand

18. AMRC provides a match-making model that needs to be replicated across the country. We should make a start by providing support to proposed industry-led initiatives. For example, the apprenticeship clearing house pilot being developed by the Solent Apprenticeship Hub, the Royal Navy Maritime Enterprise Zone, UCAS, and Enginuity to address apprenticeship shortages among SMEs.

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<sup>10</sup> <https://www.ucl.ac.uk/systems-engineering/study/apprenticeships>

### Use of gamification for smarter recruiting

19. Gamification can be an effective tool to reach people who are challenging to engage by more traditional approaches. Enginuity has done considerable work in this area, with a specially created game used to encourage individuals from less privileged backgrounds to identify the explore their engineering skills. Using these types of games in recruitment is a way to avoid screening out people who may struggle with written application processes and tests but have an affinity for gaming.
20. Enginuity is also using gaming earlier in the pipeline to inspire and engage young children. Skills Miner, an educational game using the Minecraft platform, provides an accessible way for children to uncover engineering skills through gameplay and exploration.<sup>11</sup>

### Modular qualifications

21. Government and industry need to work in partnership to increase the availability in engineering and manufacturing of modular, employer-led, flexible training for upskilling. This would support the efficient provision of upskilling and retaining using career transition tools, such as those being developed by Enginuity. It is critical, therefore, that the Lifelong Loan Entitlement supports modular learning.
22. A really good example is the units developed as part of the HVM Catapult's Emerging Skills Pilot programme.<sup>12</sup> The HVMC was funded by the Department for Education to work closely with Institutes of Technology to develop high quality modular training courses focused on upskilling employees for work in smart manufacturing.
23. The programme delivered more than 50 one-to-three-day units covering electrification, digitalisation, additive manufacture, and advanced materials. The units can be used as the basis of a standalone short course or contribute content to a longer programme of learning and qualification. Each unit is provided as a 'course in a box' containing lesson plans, learning materials, supporting notes, etc.

### Apprenticeship Levy

24. The apprenticeship levy is still too restrictive, which is evident in the continued underspend, with an estimated £3.3 billion of levy funding returned to the Treasury over the last 3 years.<sup>13</sup>
25. There are some obvious changes to be made, such as increasing the transfer limit from large companies to SMEs and enabling levy funds to be used more flexibly to provide other types of training. There is also an opportunity to be more imaginative. The considerable underspend could be targeted to support key

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<sup>11</sup> <https://enginuity.org/innovation-lab/skills-miner/>.

<sup>12</sup> <https://emergingskillsproject.com/>

<sup>13</sup> Nick Linford has argued recently that the underspend is actually £2 billion over 4 years. <https://apprenticeshipdata.co.uk/first-transparency-win-for-adi-underspend/>

national priorities for example, such as the industries and workers who will deliver net zero.

### Remedial English and mathematics

26. Some of our young people have been failed by the education system and leave school without functional skills in English and mathematics. Businesses increasingly need to provide remedial mathematics and English education to apprentices, which is disincentivising them to take on apprentices from deprived areas. These are the young people who we, as a society, most need to engage with, motivate, and bring into meaningful and fulfilling work.
27. However, businesses should not have to, and in many cases simply cannot, take on this burden alone. The Department for Education, and its equivalents in the Devolved Authorities, should support businesses to meet the cost of this remedial education.

#### Q51

Can you tell us what role you think [T Levels] will play in the education system going forward? Are you concerned that there is too much policy churn in the vocational training system and what effect that might have? Relative to that, can you tell us what you think about the quality of careers advice available to students? We have been receiving written evidence that there is quite a lot of concern out there about the quality of careers advice and the awareness of the various training opportunities that exist for learners, not just in their early careers but right through their careers. What more can we do to ensure that people are aware of the breadth of options available to them? It appears to be getting more and more complicated.

### T Levels

28. The Engineering T Levels which were launched recently are a good development. However, engaging effectively with employers will be key to their success. Make UK and Engineering UK released a very helpful report<sup>14</sup> in October setting out how we can meet the estimated 30,000 to 43,500 industry placements which will be required in Engineering and Manufacturing. The government and the Department for Education should give every consideration to implementing the recommendations set out in that report.
29. There is also an important opportunity which needs to be fully explored for the government to partner with membership organisations and the industry's sector connector, Enginuity, to promote Engineering T Levels to employers.

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<sup>14</sup> <https://www.makeuk.org/insights/reports/unlocking-talent-ensuring-t-levels-deliver-the-workforce-of-the-future>

## STEM careers advice

30. There are a wide range of useful materials on how to improve the provision of STEM careers advice in schools and colleges,<sup>15</sup> but we still are not getting it right. Enginuity commissioned research by CHILDWISE<sup>16</sup> which shows that only 30% of STEM teachers regularly incorporate information about possible STEM careers into their lessons, with 51% occasionally and 19% rarely doing so. In addition, 41% of those teachers felt they did not know enough to help students who asked for advice about a career in engineering.
31. Most children (aged 11-14) surveyed by CHILDWISE said they knew only a little (46%), nothing at all (36%), or did not know (10%), about careers in engineering, with only 8% knowing a lot. 63% said they would not be interested in a career in engineering, with concerns about its being boring, as well as too hard, too dirty, and not creative or well paid enough.
32. This is consistent with research by Engineering UK which found that among young people (aged 11 to 19) only 43% knew about apprenticeship options and 37% about T-Levels. While among young people aged 13 to 19 only 41% knew the subjects needed to become an engineer.<sup>17</sup>
33. These results are even more significant when we consider that CHILDWISE found that children make decisions about their future careers at a surprisingly early age, with 37% of surveyed children (11-14) knowing, and 45% having some idea of, what sort of job they wanted to do when they were older.
34. We have to consider carefully whether the STEM careers resources we are using are thoughtfully enough designed to be inspiring, engaging, and accessible to a diverse range of children. We also need to consider whether they are being targeted effectively at the right age groups, with the CHILDWISE research suggesting we need to start STEM careers advice in the latter years of primary school<sup>18</sup>, and whether they can be used as standalone resources by teachers who do not have access to, or sufficient training to make use of, wider STEM careers resources.

## This is Engineering

35. The *This is Engineering* programme<sup>19</sup>, led by the Royal Academy of Engineering, is a great example of an initiative making a positive and measurable impact. *This is Engineering* is a campaign to bring engineering to life for young people and give more people the opportunity to pursue a rewarding and well-paid career which gives them the chance to shape the future.

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<sup>15</sup> See, for example, [Engineering UK, \*Securing the future: STEM careers provision in schools and colleges in England\*, June 2021.](#)

<sup>16</sup> Enginuity/Childwise, *Research Report*, August 2022.

<sup>17</sup> [Engineering UK, \*Levelling up engineering skills: widening opportunities for young people\*, 2020.](#) The study also shows significant variations in levels of knowledge across the country.

<sup>18</sup> The importance of teaching engineering in primary schools is widely acknowledged; see, for example, [Engineering Kids' Futures](#).

<sup>19</sup> <https://www.thisisengineering.org.uk/more-info/about-us/>



36. The campaign provides a wide range of accessible and engaging information on engineering careers, such as inspirational profiles of engineering heroes and current engineers and a virtual museum of engineering innovation, with a focus on exciting, cutting-edge industries. The campaign's website also offers accessible guidance on the educational and vocational pathways into engineering careers.

Q52

We have heard a lot about the potential of degree apprenticeships to better reflect the combination of academic work in the university and on-the-job training. Do you think this is a good idea? What more could the Government do to encourage degree apprenticeships?

37. Employers often find that graduates leave university with no work experience or, in many cases, even an understanding of what workplaces are like. Degree apprenticeships are proving valuable to employers in overcoming this and are, for many, filling the gap left by the polytechnic sandwich courses. A number of employers in the engineering sector have increased their employment of degree apprentices rather than graduates as a result.

Q53

I would like to follow up on an answer that came right at the beginning, about comparison to international performance. What I would like to pick up on is our understanding of the fundamental evidence. How good is the data we have on skills shortages in the UK? Where are those skills shortages? What are those skills shortages? How well do apprenticeships and qualifications adapt to the changing needs of industry? How is it decided when a new apprenticeship is needed?

38. The data on skills shortage is currently not good enough. However, there are grounds for confidence that this situation will improve. There is a considerable amount of work going on to improve our understanding of skills shortages including work by the Unit for Future Skills, based in the Department for Education, and the Local Skills Improvement Plans, many of which include engineering or advanced manufacturing in their scope. Enginuity is currently developing a suite of tools for the engineering and manufacturing sectors which will help stakeholders develop a much better understanding of skills needs, including in specific geographical areas.
39. The apprenticeship and technical education system needs to be flexible so that it can take full advantage of this better and more timely data by responding and adapting rapidly to introductions of technology and changing skills needs.

Q54

Dame Judith, right at the start you mentioned the dearth in women and girls, and ethnic minorities, in taking up apprenticeships. Robert, how are T-levels performing in terms of recruiting women and girls? They are the pipeline, as you mentioned.

40. The Engineering T Levels were launched recently, so there is no data on their take-up among females. However, based on the experience with STEM apprenticeships, we have to assume that, unless we start to do better, the outcome will be disappointing.
41. As noted above in the context of apprenticeships, these barriers to participation by under-represented groups are present at all stages of the pipeline. Simply put, we need much greater energy and imagination in this space with effective, engaging, and inspiring interventions at all stages of the pipeline.