

Response to the DfE Transport Labour Market and Skills Call for Views and Ideas

What is your organisation's work ?

1. Enginuity is a not-for-profit organisation, with over 60 years of experience supporting engineering and manufacturing employers with their current and future skills needs. Enginuity works across the Engineering and Manufacturing sectors including some key ones for Transport such as Rail, Automotive and Aerospace. Enginuity (formerly SEMTA) has a long history of working with employers, policy makers and colleges/training providers in the sector to ensure a joined up approach to skills and workforce development.
2. Blending technology with our deep engineering skills knowledge, we develop disruptive and innovative solutions to help employers find new and diverse talent, retain, upskill and reskill their existing workforce.
3. Credentials include:
Skills Miner – award winning gamification
<https://youtu.be/UJKv8ZU78OE>
Careers Converter – retraining tool underpinned by data science to identify transferable skills from one sector to another
[Career Converter - Cell and Gene Therapy Catapult \(enginuity.org\)](#)

Question 1: What skills does the transport sector need in the future?

4. This is a challenging question to answer and 'the future' could have different meanings to different parts of the sector for example Aerospace works to much longer lead times than say Automotive. It is important to recognise that the sector includes not just the manufacture of product but also the ongoing maintenance and repair of product and the manufacture, installation and maintenance of infrastructure.
5. There are various technology roadmaps produced by professional bodies, IoTs, etc, that provide some detail around the types of industry-specific technology needs from now until approx. 2040, but it is difficult to know exactly what skills such a wide sector will need in the future but there are some themes and subject areas that are emerging as common including:
 - 1 Electrification
The Faraday Institute has sponsored the development of a National Electrification Skills Framework which provides a focal point for cross sector activity and builds on the work of the Emerging Skills Project
 - 2 Hydrogen
Hydrogen, in production, distribution, storage, infrastructure, and mass-market adoption.
There are several strategic challenges across the value chain that will need to be overcome to produce and use hydrogen at scale in the UK and there is a need for a coordinated approach to identify the skills that will be required both within and across sector. role. Employers report great difficulty in sourcing the skills needed in this area both within the UK and across the

world, there is also a lack of existing training available within the UK apart from a few universities

3 Digitalisation

Digital skills will be required across the work force from a basic level through to experts in particular domains such as cyber security and AI. The sector of connected and autonomous vehicles is one where this can be clearly seen but also an increasing need for usage and storage of data across most businesses drives specific skills needs

Productivity – An ongoing challenge for all sectors is to maximise the productivity of their workforce, not only from a cost perspective but also to contribute to sustainability

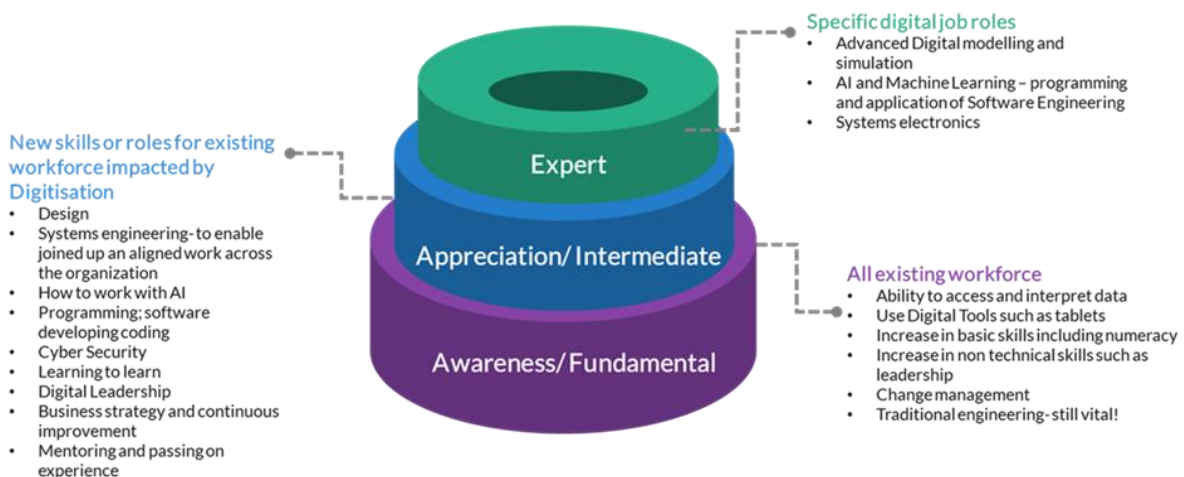
4 Meta skills

These are the enabling skills that all employees need to be ready for the ongoing changes that today's ever changing world of work demands, they include creativity, resilience, problem solving and innovation. In a sector where the future is not known and is likely to be ever changing these skills become ever more important

6. Enginuity have been working with the High Value Manufacturing Catapult on the development of the Skills Value Chain and specifically Skills Foresighting which links technology and other business drivers through capability requirements to skills and competencies required by the workforce. The skills Foresighting undertaken as part of the DfE funded Emerging Skills Project (<https://emergingskillsproject.com/>) gives a useful level of detail about future skills requirements against different technology challenges. Work has been undertaken to date across various sectors and the example below shows an extract from the work with Automotive & Aerospace:

- **Automotive Sector at OEM Level:** Modelling & Simulation, Legacy Data & Models Interlopability, Digital Thread, Virtual Certification, Cyber Resilience, Manufacturing data integrated into the Design & Engineering Process
- **Automotive Sector at Component Supplier Level:** Legacy Data & Models Interlopability, Data Capture / Data Reliability, Automated capture and incorporation of data into the Design & Engineering Process, Cloud Transformation, Connectivity
- **Aerospace Sector:** Ultra-high-bypass-ratio gas turbine engines, Hybrid electric propulsion systems, All electric propulsion systems, Zero emission propulsion system technologies, Modelling/simulation of propulsion systems, Aerostructure design, Industry 4.0, Material Development, Modelling/simulation of complex systems
- One area where skills gaps will be prevalent is in **Electrical Energy Storage** (Cells and Packs, Chemistries, Construction, and Industrialisation for mass-market adoption)

- **Electric Machines** (Electric machine architectures, integration, thermal management, materials, and manufacturing innovation)
 - **Power Electronics** (Propulsion technologies, inverters, DC-DC converters, on-board charger, driving costs, performance improvements)
 - **Lightweight Vehicle & Powertrain Structure** (Vehicle platform architecture, mixed materials, future LCA-capable materials)
 - **Fuel Cells** (Fuel cell stacks, fuel management)
7. Much of the above requires industry-level innovation, and this is where the need for industrial digitalisation technologies and Industry 4.0 come in. Nowadays, vast amounts of data can be captured and used to shape every stage of a product's lifecycle; design and validation are increasingly done in virtual environments, with software doing much of the heavy lifting autonomously, giving engineers more time to innovate. These technologies also have some significant skills investment, and this extends to all parts of the transport sector.
 8. It is worth noting that there are several points of crossovers between Low-Carbon / Net Zero and Industry 4.0 / Industrial Digitalisation.
 9. Enginuity and HVMC have been working with BEIS and the Made Smarter commission to look at skills needs in this sector and the diagram below gives a summary of the level of requirements. It shows that the sector not only needs 'experts' who specialise in a particular role e.g. Data science but also a general level of awareness of data and the ability for some of the workforce to be able to use Data



10. Any consideration of future skills also needs to consider workforce supply as well, both Brexit and the pandemic have had an impact on workforce supply, the result has been a smaller pool of potential applicants for vacancies as well in some sectors a reduction in the available workforce either due to relocation or early retirement.
11. Early retirement has a potentially negative impact for the workforce and there is concern regarding the loss of knowledge within specific sectors. Enginuity is

currently piloting an approach using Game based learning to capture and share knowledge.

12. Access to skills in the future will be a mix of recruitment of new entrants as well as upskilling the existing workforce. Successful upskilling through shorter course delivery will depend on the experience of the incumbent, the size of the organisation they operate in, and potentially where that organisation sits in their supply chain.

Question 2: How can Qualifications and training be made more accessible?

13. The current education and training system could be seen to catering well for new entrants, whether they be apprentices or graduates but is not well set up to cater for the upskilling of the existing workforce. The system works on the notion of full qualifications rather than a unit or modular basis. Training providers are also generally set up and funded to deliver qualifications rather than modules or CPD. There is also no recognised system of accreditation or recognition at a modular level and there remains a lot of work to do to ensure that employers and employees can access micro credentials.
14. Skills bootcamps are often seen as a 'one size fits all' solution and whilst they can be seen as an effective upskilling methodology for those not currently in employment they not recognised by the sector as a tool for upskilling.

Question 3: Attract young people & career changers

15. In the case of newer technologies, it is not always clear what the skills and roles are that will be required and even when known there is often a lag between the need from early adopters and the response from the education and training sector.
16. Enginuity has been working on a data tool that can identify common skills across occupation and job roles, which allows us to show roles which have cross over skills and can also identify the missing skills, which in turn can be used to develop curriculum and learning content.
17. In some role e.g., Digital, the Engineering and Manufacturing sector are looking to recruit the same skills sets as every other sector and are often disadvantaged by both wage rates (this is particularly relevant for SMEs) but also the perception of the sector and its attractiveness to digital professionals for example.

Question 4 and 5: Barriers to further increasing diversity

18. It does highlight the complexity of the subject and the complex interplay between ethnicity, class and social status, all or some of which can influence an individual's career choice and/or progression.
19. There appears to be little engineering specific research about the perceptions of potential entrants about the engineering sector and their perspective on the barriers to entry from a BAME or socio-economic perspective. A lot of the available research is at a UK level and isn't sector specific. The Royal Academy and Engineering UK have both undertaken some good/useful work but neither have come to definitive conclusions, but both do provide good foundations to build on.

20. There is also sometimes a mismatch between the wider research into STEM which can focus heavily on science rather than a more vocational approach which may suit engineering, it appears the Royal Academy work has a predominant focus on Higher education and graduate entry which whilst important doesn't necessarily address the issues at Apprentice or school leaver entry level.
21. There is a crowded landscape of outreach activity mostly of a generic STEM nature or focussing on gender, the activity that is focussed on ethnicity or socio economic group is reaching small numbers and is based around tightly funded individual projects with little or no evaluation of impact.
22. The research flags a potential debate around the optimum age at which young people should be targeted and highlights the majority of initiatives (there are some exceptions such as Primary Engineer) are targeting young people at the age of 14 + at which point decisions and choices are mostly made.
23. The other aspect that emerges is around the work that remains to be done from an employer perspective ranging from diversity training and awareness, building mentoring schemes through to an overhaul of recruitment systems and processes. This is not only an issue for individual employers but one for the sector based around the reliance on exam grades an indicator of potential. Engineers and the engineering workforce of the future will need different characteristics such as an interest in data and digital technologies and less interest in 'fixing' things hands on
24. The Royal Academy pilot aimed at 'Improving employment opportunities for diverse engineering graduates' is a good example where even when there has been evaluation, the full impact isn't known as the barriers are deeply rooted in the culture of engineering & individuals' perceptions.
25. The DfE's 'Unlocking talent Fulfilling Potential' plan beings by recognising that there is no simple solution and no silver bullet the answer to driving diversity is complex and multi layered.