

In partnership



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Skills needed for the safe adoption of emerging technologies in engineering

Executive summary

The RSA

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Executive summary

This report aims to identify the skills needed for the future of engineering and safe adoption of emerging technologies. It also explores how actors in the engineering skills system can work together to ensure that a diverse range of learners and workers are able to develop these skills and thrive in the future of work.

The world of engineering is undergoing considerable transformation, subject to changing demographics and with an increasingly global, competitive workforce, alongside seismic technological changes. These emerging forms of technology present both opportunities and challenges with regards to worker safety, environmental safety, and cyber security. To respond effectively to these changes, the engineering sector needs a workforce trained not just in emerging technologies but also in how to adopt them safely.

Future skills

Skills category	Summary of new skills needed for the safe adoption of emerging technologies
<p>Technical:</p> <p>skills relating directly to specialist engineering knowledge and capabilities.</p>	<ul style="list-style-type: none"> • Interdisciplinary approaches to work, especially among team leaders • Cross-cutting knowledge of programming languages • Specialist knowledge and tools relating to data analysis and data management • Specialist technical knowledge relating to specific forms of technology • Specific design skills such as computation geometry and circuit design
<p>Digital:</p> <p>skills relating to digital knowledge and capabilities.</p>	<ul style="list-style-type: none"> • Knowledge of specific programming languages and proprietary languages • Design skills requiring specialist knowledge of digital tools • Machine learning (ML) and deep learning (DL) skills to ensure safety and security
<p>Safety:</p> <p>skills relating directly to safety knowledge and capabilities.</p>	<ul style="list-style-type: none"> • Safety requirements will be closely linked to digital skills (above) • Competency in real-world testing and experimentation, including 'ethical hacking' to stress-test vulnerabilities • The ability to conduct risk assessments and skills in risk management, as well as more specialist knowledge in relation to specific technologies • Knowledge of how to safely intervene in human-machine interactions • Specialist knowledge with regards to regulatory compliance, certification and documentation processes
<p>Transferable:</p> <p>general skills that could be adapted to other professional contexts, engineering or otherwise.</p>	<ul style="list-style-type: none"> • Systems thinking, analysis and evaluation to integrate new technologies into the industry • Entrepreneurial skills to spot value-adding opportunities • Knowledge of and ability to anticipate sustainability and safety implications • A continued (and currently under-served) need for practical skills (such as assembly, welding and soldering)

Recommendations

Foundational skills and mindsets – for policymakers, schools and colleges:

- Safety-related components of the digital, technical and transferable skills learnt in school should be embedded in school curricula.
- Greater efforts are required to build the pipeline of computing teachers, as well as drawing on capacity and expertise within the technology sector to ensure up to date pedagogy and content.
- School pupils should be exposed to not only a broader range of disciplines for longer, but also to the practice of combining multiple disciplines.
- There should be greater investment in transferable 'meta-skills'.

Further, higher and professional training – for further and higher education providers, local and national policymakers:

- Professional training should embrace agile and lifelong forms of learning, including skills passports and digital badging, and skills bootcamps.
- Ensure improved access to upskilling opportunities, especially among underrepresented groups.

Organisational culture, support and opportunities – for employers and the sector:

- Responsibility for safety skills development should rest at an organisational level, recognising the role of culture in determining safety behaviours and incentivising in-house development of skills.
- Improve incentives for safety training, for example by making it more accessible and desirable to individuals and organisations. Incentives also need to be strengthened through the role of regulators and continuing professional development (CPD) requirements to maintain registration.
- Build learning and organisational cultures which are open to challenge and agile to change.

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