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WorldSkills UK Engineering
Industry Roundtable Report 2019:

The skills implications of Industry 4.0

Introduction

Engineering in the UK, like many other sectors, is in the middle of a digital transformation triggered by the increasing use of data and digital technology. New roles are being created and existing roles are shifting to incorporate new requirements and expectations. WorldSkills UK convened representatives of the engineering sector and leaders from technical education to discuss the skills implications of this transformation. Having previously concluded that a tech-mindset could be the most important 'qualification' that a young person starting out in engineering would need, this second roundtable asked delegates to discuss what the implications would be for engineering skills training in the future. This report provides a summary of the discussion that took place and the key conclusions.

A tech mindset is the engineering qualification that matters

WorldSkills UK first brought together a group of senior leaders from the engineering and skills sectors in Summer 2018 to discuss the impact of technology developments on engineering skills. They concluded that:

- **Technology should be embraced as a disruptor:** Giving employees the freedom to innovate and move beyond traditional career-driven models towards lattice careers is vital

- **Qualifications must keep up with technology:** Creativity, the application of knowledge and the ability to move between disciplines will be as important as traditional qualifications to a career in engineering

- **Information exchange is crucial:** Industry and education need to convene more regularly to enable better understanding of shared challenges at a leadership level, when time and resources are constrained

- **Seeing is believing:** Young people need hands-on experience of new technology in engineering to get them interested in a career in engineering

- **Science fiction to science fact:** Young people from all backgrounds need to be attracted to science and engineering, and traditional perceptions challenged to help with recruitment

A similar group of engineering and skills experts met for a second time in November 2018 to discuss what the skills implications of moving to Industry 4.0 are, answering questions such as: how can the education sector best deliver the skills and training to support the engineering sector as it goes through systemic technological change, what sort of flexible qualifications will be needed, and should practitioners be empowered to commit time and resource to exploring new approaches?

Two case studies provided some thought-provoking answers to these questions.

Industry 4.0 from vision to reality, Babak Jahanbani, Managing Director, Festo Didactic

Babak Jahanbani, Managing Director at Festo Didactic, Festo's training and consulting arm, delivered a presentation on how Industry 4.0 is more than just a technological development. Changes in production and the adoption of automation technology have a great impact on people and the education they require as well as on corporate structures and processes. An all-inclusive solution incorporating technology, people and education is the key to making a success of Industry 4.0. Babak Jahanbani outlined how these three elements can come together:

- **Technology:** Tomorrow's production systems will be based on decentralised intelligence and autonomous mechatronic modules. Ongoing automation of processes will be made possible by further digitisation and networking. Festo is working on basic technologies and intelligent components that will serve as the foundation for Industry 4.0 production systems

- **People:** These advanced trends in production will have a significant impact on industrial processes and particularly the people who work in manufacturing processes. Festo believes that people and technology will be more interconnected in complementary ways through these processes. Employees will play important added value roles as idea generators, developers of new products and work processes, problem-solvers and decision-makers within these manufacturing networks that consist of virtual and mechatronic production sequences

- **Education:** Festo is putting its extensive practical experience of digital production into comprehensive training programmes, modules and content that will prepare qualified and junior employees for current and future technology changes in the workplace. These changes will require employees who are Industry 4.0 specialists with interdisciplinary skills for example uniting class mechatronics with good IT knowledge and strong social skills. Babak believes that greater co-operation between industry and educational institutions will be vital in ensuring the sector has the Industry 4.0 skills it needs for the future

Festo's example shows that industry leaders are already planning the training that is needed for 4.0, but that significant change is yet to come.

An all-inclusive solution incorporating technology, people and education is the key to making a success of Industry 4.0

Complementary skills and competencies, Dr Lina Huertas, Head of Technology Strategy for Digital Manufacturing, Manufacturing Technology Centre

Dr Lina Huertas explained that as technology changes the nature of engineering, employees would need a different skill set enabling them to operate in highly collaborative environments, adapt to an ever-changing technological landscape and that roles would require high levels of initiative and drive. The ideal skill set for digital manufacturing can be considered in terms of complementary skills and key competencies as set out in the MTC's table below.

Dr Huertas' table demonstrates that it is possible to classify the skills needed for Industry 4.0 which may point towards a common industry approach to preparing young people for a career in industrial digitalisation.

Complementary skills	Systems thinking and architectures
	Design thinking and problem-solving
	Business transformation
Competencies	STEM background
	Adaptable
	Lifelong learner
	Entrepreneur
	Collaborator

The ideal skill set for digital manufacturing can be considered in terms of complementary skills and key competencies

Source: Digital Manufacturing Technical Skills Description, Manufacturing Technology Centre

Industry 4.0 needs people as well as technology

Industry and skills experts discussed the impact that new technologies are having on the production chain in terms of qualifications, skills and people.

- The UK is missing out by not having a consistent Industry 4.0 recognised qualification. Germany is already well ahead in terms of building a holistic and integrated education model that reflects technological change. Investment and jobs will be lost to Germany and Japan which already have the skills talent pipeline that employers are looking for

- The Made Smarter Review, which recommended up-skilling a million industrial workers for digital technologies to be successfully exploited, should help make the case for why skills training and development in the UK needs to change rather than stoking fear about job losses due to automation

- There are pockets of good practice where a joined-up approach to Industry 4.0 is taking place eg WorldSkills UK is partnering with Siemens and Sheffield Hallam University through the Industrial Control competition, while Festo is pioneering partnerships with UTC Sheffield, Toyota and Middlesex University, helping industry and education by up-skilling teachers and students in new technologies

- Siemens has established a Digital Academy – a sponsorship scheme and summer programme in partnership with Sheffield and Newcastle Universities intended to prepare high-potential undergraduates for a future career in industrial digitalisation

- Experts agreed that companies will increasingly focus their recruitment on competencies, transferable skills or the idea of a tech mindset. Although employees are likely to have lattice careers, firms will still need to demonstrate that an individual has been trained to perform a job. Qualifications will therefore have to change as the job changes, with less of a focus on technical elements and more on value-added competencies. Engineering firms will need to invest in people managers who can facilitate this change in hiring and career development

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Conclusions

- Models of good practice are emerging across the country but are not well-known. The benefits of Industry 4.0 won't be realised without much further collaboration between education and industry with co-delivery and co-investment models

- Human resources departments will need to look carefully at incorporating mindsets and competencies alongside qualifications in recruitment models

- WorldSkills UK will work with industry partners to create a digital experience for young people so that more of them can see what a career in engineering is like throughout the year

- WorldSkills UK skills competitions must be adapted to bring out the creative side of engineering alongside technical skills, given how digital technology is changing roles in engineering

- Industry 4.0 needs to reach teachers and schools, with eye-opener sessions for educators who aren't close to industry

Actions

WorldSkills UK is keen to build on these discussions by fostering greater collaboration in the sector and by helping to ensure that young people are prepared with the right mindset and skills to meet the demands of an industry that stands to gain a lot from using digital technologies and applications.

- We are committed to continue to inspire, prepare and inform the next generation of engineers through our competition infrastructure and careers platforms, by testing and showcasing world-class standards in support of the development of a truly excellent technical and professional education system. This will include:

  - Highlighting the developments and opportunities available in the engineering sector through dedicated content at WorldSkills UK LIVE

  - Piloting new competitions such as Rail Technician; BIM; Cyber Security and Cloud Computing

  - Discovering how other countries are tackling similar challenges and sharing that knowledge

- WSUK will offer partners the opportunity to use its new mindset training programme for their apprenticeship schemes, which will help apprentices develop a resilient, flexible and problem-solving mindset

WorldSkills UK is determined to use its expertise in technical skills excellence, developed over decades of experience in global skills competitions and from its unique network of international skills experts to help the UK build a world-class technical education system. Throughout 2019 WSUK will be engaging its valued partners in business, education and governments to discuss new research and to develop innovative ways that technical education in the UK can support gains in productivity for the benefit of the economy and society. If you would like to get involved, please email **eroberts@worldskillsuk.org**

About WorldSkills UK

What we do: We are an accelerator for young people in the start-up phase of their careers. This means we inspire more young people to take up apprenticeships and technical education; we champion their success; and we accelerate their personal and professional development.

Why we do it: To change the national conversation so that apprenticeships and technical education are seen as prestigious career routes for all young people.

How we do it: Through experiential and digital careers advice; skills competitions, and mindset and productivity training.

e: accelerate@worldskillsuk.org

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Web: worldskillsuk.org

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