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WorldSkills UK Engineering Roundtable Report:

A tech mindset is the engineering qualification that matters

July 2018

Introduction

This roundtable event was conceived out of a need to develop a future-facing perspective on the engineering industry exploring new technology and the implications this has for skills training and development. WorldSkills UK, as a partnership between governments, industry and education, decided to convene this discussion to look at how we prepare young people for this future.

Context

A changing economic landscape and the introduction of new technologies will transform the skills needs of the workforce. Digitisation has already opened up new possibilities for collaboration and production for the sale of goods and services, while robotic technology and automation are making significant advances throughout the engineering sector. Although the speed of technological disruption has fuelled anxieties and headlines about the future, including predictions such as the 'end of work' or the 'robot age', the precise speed of automation, and its broader impact, is uncertain.

Up to 30% of British jobs are at high risk of automation by the 2030s and 44% of workers with low education are at risk of automation by mid-2030s (PwC).

Transportation and storage and manufacturing are estimated to have the highest share of existing jobs that could potentially be automated by the 2030s at around 52% and 45% respectively. The PwC report emphasises that for individual workers, the key differentiating factor is education.

As we see new technologies emerging, there is a need for us to rethink how we develop teaching and training expertise to prepare for the future, keep pace and help develop these skills in young people. This could include exploring new integrated technology and engineering disciplines or the upgrading of teachers' subject knowledge with these new technologies.

Addressing these challenges is key to help grow the confidence of investors and send a strong signal that we are preparing the workforce for the future, which will help maintain the investment in existing operations and attract further investment.

Over one-third (36%) of investors globally, expect the UK's attractiveness to deteriorate over the coming three years — identifying accelerating digital skills development as vital to position the UK for future success (Ernst & Young Annual Attractiveness Survey).

Before the roundtable participants considered four key questions:

- **Leadership:** Historically the onus has been on employer-led leadership in innovation and investment in new technologies. What role is there for more skill sector leaders to proactively engage with industry leaders to help prepare for the future?
- **Productivity:** Are enough UK businesses critically appraising how this technological change can transform their production and manufacturing arms. How can the UK use these technologies and strengths to improve productivity and competitiveness?

- **Perception:** How do we create a positive narrative around creating opportunities for many new and highly skilled and well paid jobs, and give more young people a sense of optimism about future opportunities?
- **Pathways:** As engineering and technology begin to converge more and more, how will new integrated disciplines such as engineering and computer science be effectively distilled into new career or education pathways? How do we upskill teachers to teach these students and keep them in the profession for the long term?

Embracing the reality of technological change

Joe Bates, a lead in new technologies from Atkins (a member of the SNC-Lavalin group), delivered a thought provoking presentation on the key drivers for technological change in the engineering sector: processes, technology and people. Taking delegates through the historical shift that Atkins had gone through with technology - from its use of computer aided design (CAD), to 3D modelling to virtual reality and AI object recognition - he raised the importance of not discarding tried and tested processes, but rather using them as a foundation to both build on and challenge traditional approaches.

Central to adapting to this change has been the ability of the organisation and its employees to critically appraise 'what we think we know versus what we actually know'. Employees in today's engineering workplaces, will have to develop a mindset that is constantly adapting to change. The rate and path of technological change is not stable and will ebb, flow and change direction. Joe proposed that qualifications are less important that an adaptive mindset in today's shifting workplaces.

Joe concluded that fully embracing the new reality of change is vital for us to understand and capitalise on the latest technologies. The big question was how can business and education take leadership in preparing the next generation of engineers? The onus should be on everyone, from the individual, to the employer and educator to increase the level of comprehension of new technologies and how young people should prepare for them. Doing so will increase the pace of change in the industry and education and help work towards a better prepared and appropriately skilled workforce.

The right mindset is the most important qualification you can get

The group then held a critical discussion about the culture in which businesses develop employees and how open they are to technological change. There was a clear theme that we need to create a broader cultural and mindset shift in the workplace to help drive change.

Robert Skae from Siemens noted the importance of employers creating greater opportunities for their employees to innovate, by encouraging them to develop their own ideas, discuss these with their management teams and then take the ownership in bringing these to life. Theory suggests that this can significantly increase employees' engagement and productivity. Charlotte Horobin from EEF highlighted the need for a culture change to embrace new ways of working, including a keen focus on the importance of managing mental health challenges as a result of change - addressing these can improve productivity by 10%.

The conversation then turned to how education is preparing young people for technological change. The conversation reflected on how the UK education system has been viewed as an 'exam factory' that is not preparing young people for the modern workplace in which the ability to recall information is becoming less and less important, compared with the need to prepare young people for the dramatic socio-economic demands of the digital age[1] by focusing on the application of knowledge as well as its acquisition. This point is given real weight by the fact that employers are emphasising in their recruitment processes, the need for mindset and creativity in young people over their qualifications. Joe Bates from Atkins is more interested in basic programming skills and a creative mindset than traditional engineering qualifications.

The group considered how recent reforms, particularly around apprenticeship standards can be used as examples of how we can innovate. Angela Joyce from Warwickshire College Group discussed feedback from employers who have identified that young people on apprenticeships who are learning on the job are found to be more solutions-orientated and more innovative than other graduates. Angela also shared that businesses are increasingly interested in the college group's school of art for its creativity and seek to blend and integrate this way of thinking into the engineering curriculum, with some best practice currently occurring between the games and automotive sectors.

Institute of Directors Report - 'Lifelong learning reforming education for an age of technological and demographic change.'

The UK education system began to take shape in 1858, and featured mass public examinations based on pupils' ability to recall information and apply standardised methods. This remains essentially the same way we educate today.

The expansion of the internet means the labour market no longer rewards workers primarily for what they know, but for what they can do with what they know.

UK education policy is at risk of turning our schools into 'exam factories' still teaching method and recall, the easiest skills to automate.

Schools must refocus on the application of knowledge rather than simply the acquisition of it, to boost the level of soft skills in future generations.

In the 21st century, education doesn't end at school and businesses must play their part. The focus must be on in-work training and providing a career lattice, rather than a career ladder, where employees can develop by doing a range of different roles, gaining experience, developing new skills, and tapping into alternative networks.

[1] https://www.iod.com/Portals/0/PDFs/Campaigns%20and%20Reports/Employment%20and%20Skills/Life%20Long%20Learning%20Report.pdf?ver=2016-09-14-124014-230

Leading the change: taking responsibility and changing perceptions

One of the key leadership discussions was about how to prepare young people for new and divergent career paths. It is no longer about defining career success as a linear climb to the top via a ladder. The ladder's one-size-fits-all approach assumes employees are more alike than different, and want and need similar things to deliver results and therefore can contribute to suppressing innovation and change.

The group discussed how engineering graduates who come through a structured education programme can be inhibited when it comes to technology and innovation. This refers to an emphasis amongst graduates on linear career progression as a sign of success, as opposed to seeking creativity in roles to help drive innovation. Siemens encourage their employees to view their future career development more as a climbing wall than the traditional career ladder, promoting 'lattice careers'. This is the concept where the hierarchical structure of the corporate ladder governing how information flows and whose ideas matter needs to be challenged and broken down.

This links to a bigger systematic change which is emerging in some parts of the education system and the integration of different subject disciplines as technology advances. We see this with the likes of Festo - the electrical automation company - and its education partner Middlesex University driving forward the integration of engineering, computer science, cloud computing and cyber security as the technology for mechatronics is rapidly evolving from a semi-manual process to a systems based approach.

How we ensure there is effective leadership amongst employers and educators to deal with this change has been critically considered by the Made Smarter review [2].

Made Smarter review

Lack of effective leadership of industrial digitalisation in the UK:

- There is no clear narrative setting out what the UK already does well or the significant opportunity for UK industry – and the country – from the faster development and adoption of industrial digital technologies IDTs.
- There is no cross-sector national leadership providing market-focused strategic vision, direction, and co-ordination, so that the UK can maximise opportunities and set out a clear approach and offer for foreign investors.
- Without that clear vision and narrative the UK is failing to inspire current and future workers with a vision of how they can secure high-quality jobs in a thriving part of the economy.
- The UK has centres of technical expertise, including world-class research centres and the Catapult network, but its capability is fragmented with no coordination for the effective diffusion of these technologies.

[2] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/655570/20171027_MadeSmarter_FINAL_DIGITAL.pdf

The group agreed while effective leadership and collaboration on this topic is crucial from leaders in business and education, that these types of conversations can be resource and time intensive to facilitate. Effective business models and models of change and innovation are not being shared enough between colleges and employers so there is a real need to convene these conversations to share and publish best practice more frequently.

Turning to the issue of how we improve the perception of engineering amongst young people, the group discussed the issues the sector had been grappling with for a number of years, such as social barriers, lack of diversity and stereotypes. There is a unanimous agreement that young people can only become enthused by engineering through being able to experience it. Charlotte Horobin from EEF noted the glass ceiling in the minds of students and how their counterpart organisation in Germany encourages young people have a go at using equipment and software to grow enthusiasm. Building on this we should also be using the new entrants we are training for the future and those people who have retrained to become our role models for future generations moving into engineering.

Any time of real change is both exciting and daunting. Business and education needs to work together to create a narrative that paints a positive picture for the future, ensuring that young people are both enthused and informed to make the decisions that will equip them to meet the UK's need for engineers at all levels across this diverse and innovative sector.

Conclusions

Given the wide ranging discussion, there was a very clear sense that we need to reimagine engineering and this will require leadership and innovation from industry and education. The scale of the reboot needed was acknowledged, in terms of how we prepare young people through more creative education processes which are aligned with more innovative thinking at work. From the discussion we drew the following practical conclusions and actions:

1. **Technology as a disruptor:** We need to embrace technology change by breaking down existing workplace practices, and developing new attitudes towards innovation. This requires leading organisations to create an environment in which employees are able to behave and think more creatively. Giving employees the freedom to innovate and move beyond traditional career-driven models and embracing lattice careers is vital.

2. **Qualifications vs mindsets:** We need to encourage creativity and the application of knowledge in the education system and encourage young people to move between disciplines as new technologies emerge. As a result, qualifications must keep up with this pace of change and reflect the experience and creativity employers are seeking.

3. **Convening more information exchange is crucial:** We need to convene conversations between industry and education more regularly to enable better understanding of shared challenges at a leadership level, when time and resources are constrained.

4. **Seeing is believing:** We need to give young people the hands-on experience of new technology in engineering to truly enthuse them, and consider ways of doing this digitally.

5. **Science fiction to science fact:** We need to continue to challenge perceptions, to enable young people to be themselves and take the lead, with young people helping to shape the 'science fiction future' to a 'science fact' present reality and in turn support employers with their recruitment processes to make them more attractive to more young people.

Next Steps

- WorldSkills UK and partners will publicise and share the report with networks and key stakeholders.
- WorldSkills UK will host a follow up event with partners at WorldSkills UK LIVE, which will look at how we can push forward the conclusions of the report as a group.
- WorldSkills UK will implement the 'seeing is believing' philosophy on technology through a dedicated area focused on inspiring young people through the Year of Engineering and Industry 4.0.
- WorldSkills UK will work with partners to reflect the change in new integrated disciplines in the competitions we run and share this best practice across the sector.
- We will continue the conversation online with stakeholders through video, social media and blogs using the hashtag **#WSUKTalks**.

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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.

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eef The manufacturers' organisation

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