The challenges posed and opportunities presented by the Fourth Industrial Revolution

ABOUT THE FOURTH INDUSTRIAL REVOLUTION

The IET conducts a regular survey of UK engineering employers to gauge the state of skills in the sector. In 2017, we took the opportunity to ask employers about the Fourth Industrial Revolution also known as Industry 4.0.

Less than one in ten (just 7% of the 800 employers surveyed) had actually heard of the term Industry 4.0, underlining the fact that we need a better name for a movement which will transform our manufacturing sector in the coming years.

That said a greater majority of businesses (78%) believed that digital technologies and automation will advance rapidly in the next five to ten years. Only 30% of employers had firm plans to introduce or extend their use of digital technologies in the next three years.

Industry 4.0 is the application of digital technologies within manufacturing plants to improve products, processes and profits. Powered by data, analytics and connectivity, Industry 4.0 is enabling manufacturers to increase productivity, resource efficiency and customisation, through the deployment of an expanding suite of technologies which includes additive (3D) manufacturing, applied visualisation (including VR & AR), artificial intelligence, automation and robotics.

Whilst people productivity has been at the heart of our education and skills system, the IET’s view is that we need to do more to adjust the skills system and skills policies to ensure we grab the massive advantages offered by Industry 4.0 technologies.

The IET would be delighted to have the opportunity to present further details to the Education Select Committee on the points raised herein.

POINTS OF INQUIRY

1. The interaction between the Government’s industrial, skills and digital strategies.

   1.1 Government strategy provides an excellent starting point for politicians and policy makers to come together with citizens, organisations and businesses to bridge the gap between education and industry. Whilst different departments are responsible for individual strategies e.g. BEIS (Industrial Strategy), DfE (Skills) and DCMS (Digital), there is public ambition to see concerted ‘joined up action’ by and across Government. Locking in close
and detailed inter-departmental collaboration, perhaps on a core, sub-set of objectives, is vital.

1.2 Given these strategies separately exist, at the present time; there is opportunity for Government and industry to provide regular updates on delivered outcomes flowing from each of these strategies.

1.3 Strategy needs to be time-based and provide specific, dated milestones against which objectives, costs and benefits can be periodically measured. Industrial strategy, education and digital infrastructure should be treated in the same way as other strategic, national investments such as defence, health or transport. A long-term view is required. This necessitates cross-party collaboration and agreement over several Parliaments.

1.4 The UK has much to be proud of in respect of the success of its science, technology and engineering sectors. It is well-placed to attract, inspire and create new hi-tech companies to locate here.

2. The suitability of the current curriculum to prepare young people for the Fourth Industrial Revolution?

2.1 In the IET’s 2017 Skills Survey, 46% of the 800 employers surveyed reported difficulties in the skills supply in the external labour market when recruiting; with 71% reporting that many candidates had academic knowledge but lacked workplace skills. Such findings are consistent with previous IET skill surveys (and similar studies commissioned by other organisations).

2.2 What industry needs from the education system is a diverse talent pool, young people who can solve problems and who can readily apply maths, computing, science and humanities knowledge and know-how to deliver societal and technological benefit. The ability to think, to learn, to solve problems, to be inquisitive, entrepreneurial, proactive and creative, these are the qualities which enable pupils to thrive in the life and in the workplace. We need an education system which inspires these skills and attributes, where vocational success and academic success are held in equal measure. What has yet to be achieved is the provision of a blended training and education system.

2.3 The core curriculum subjects for Industry 4.0 are computing (mandatory at all key stage levels), maths (essential for developing skills in understanding data), science, design and technology. Add in creativity and social skills and we have a winning recipe for Industry 4.0.

2.4 Bringing together the skills in school to achieve this will bring greater benefit. We cannot explicitly teach the Industry 4.0 skills of tomorrow as the pace of technological change means anything we teach today will be obsolescent, but teaching children to be inquisitive and solve problems based on the core STEM and humanities subjects will make them resilient to the pace of technological change. Ultimately, we will need today’s young people to create the Fifth Industrial Revolution of tomorrow.

2.5 Ensuring that every young person can benefit from a broad and balanced education is crucial in the formation of future engineers. It is only through this that young people will have the
knowledge, skills and creativity needed to meet our future ‘Grand Challenges’. The IET is concerned that current accountability measures for schools – at both primary and secondary levels – are, in some cases, limiting young people’s access to a broad range of subjects, including the arts. This is of particular concern when we know that engineers of the future will be working increasingly in multi-disciplinary environments and teams.

2.6 The future world of work will become increasingly more interdisciplinary, which requires more opportunities and mechanisms to transfer and assimilate different areas of knowledge and skills in education and work. This could be achieved in schools by increasing the value of teacher-led projects which allow students to understand how the knowledge and skills they learn in one subject can be applied to others, and to real life.

2.7 Concerns remain over recent readjustment of the school design and technology (D&T) curriculum. Intended to reflect the technical knowledge and skills required by leading employers, the subject has seen pupil numbers plummet in 2017 with only 166,000 students opting to take the subject at GCSE. This compares with over 333,000 ten years ago. Government support to fund CPD training for teachers and recruit new teachers would provide a tremendous boost at this time.

2.8 Disciplines do change and the curriculum needs to change. However, recognition of the massive resources in time, effort, money required to bring in new curricula is essential. Crucially, stable curricula would create space to innovate and enable more time and money for teachers to focus on teaching and learning. That said, more teachers need to be recruited and they need to be supported by an increased level of long-term government funding for relevant CPD for all STEM teachers.

2.9 The introduction of the T-level qualification in engineering and manufacturing, scheduled for 2021, is a welcome addition, as are proposals for a nationwide network of DfE-backed Institutes of Technology, albeit time is of the essence.

2.10 New degree apprenticeships are an inspired addition and entry route into engineering careers enabling students to earn while they learn. A mass marketing campaign on social media, TV and radio is vital to attract young people and ensure the take-up of places is fully subscribed. Ideally, such a campaign should celebrate engineering and manufacturing careers and promote to young people the incredible opportunities for personal development, promotion and earnings potential.

3. The impact of the Fourth Industrial Revolution on the delivery of teaching and learning in schools and colleges?

3.1 Industry and the professional engineering institutions have a big role to play in supporting schools to promote engineering through such initiatives as STEM Ambassadors (over 30,000 nationwide). Government could play a crucial role in attracting more businesses to support such schemes through the provision of financial incentives. One way of doing this could be through the equivalent of R&D tax credits for participating employers who provide registered Ambassador Hours.
3.2 Encouraging stronger links between local schools and businesses can only help in fostering better understanding about industry and engineering careers. IET activity in this space includes the organisation of an annual ‘Engineering Open House Day’.

3.3 Increased and improved dialogue between colleges and universities would benefit young people and industry alike, helping to co-ordinate industry skills, training and development requirements. Many colleges lack basic equipment and latest machinery and technology to teach engineering and manufacturing courses. This is essential if we are to develop the calibre of education and students, industry needs. There is a huge role here for suppliers, OEMs and industry here.

4. The role of lifelong learning in re-skilling the current workforce?

4.1 In the IET’s 2017 Skills Survey, 65 of employers with 250 or more employees identified a skills gap in their existing engineering and technical workforce as a difficulty they may face over the next three years.

4.2 Lifelong learning is a cultural bedrock of industrial success, in what is a rapidly evolving environment. However, the UK is generally poor at embracing this when compared with peer-group, competitor economies. There are lessons to be learnt from Germany, Scandinavia and the USA in this regard.

4.3 The speed of innovation in the Fourth Industrial Revolution means that the skills workers have may rapidly become redundant. Individuals will have to engage in life-long learning to remain employable, and mechanisms must be in place for their retraining. This will allow individuals to achieve fulfilling and rewarding careers, enable companies to find the talent they require, and contribute to the success of the UK economy.

4.4 How can the UK develop a variety of channels to re-skill our existing workforce in order that they can continue to make a meaningful contribution to the workforce? We have heard some reports of companies contacting their retiring employees to explore the possibility of them returning to work, such is the shortage of skills in some industries. As workers come up towards retirement, there may be opportunities for employers to provide more flexible options for such workers enabling them to contribute and participate in the business through part-time working, coaching and mentoring younger workers etc.

4.5 People learn in different ways. Accordingly, retraining programmes need to be capable of being delivered in ways which meet the learning and life styles of older workers. This will create demand for new centres, facilities and delivery systems. Universities, HE and FE providers could provide valuable resource in meeting these needs e.g. a return to an ‘evening class’ culture, extending school and college opening hours to facilitate more adult education.

5. Place-based strategies for education and skills provision; and

5.1 As students move through their educational careers towards employment, awareness of and engagement with local and regional industries is very important. Apprenticeship training, FE and HE provision will harness local opportunities. Encouraging young people to learn and
earn and contribute to their local economy will help to improve the current imbalance of the UK’s regional economies.

5.2 Centres of excellence in technology supported by industry are needed across the country to encourage more businesses to start-up and grow, and to help nurture links between education and industry. A national technology map identifying the locations of such centres of excellence, the new Institutes of Technology, the Catapults, the research and university centres would provide an invaluable resource. Some regions have several such centres already. Every region should have at least one fully equipped, centrally funded and proactively managed technology centre on its doorstep. In particular, Government-backed national assets such as the Catapult centres could be encouraged and resourced to adopt regional delivery programmes.

6. The challenges and opportunities of the Fourth Industrial Revolution for improving social justice and productivity.

6.1 Only 2% of the 269 businesses planning to introduce or increase the use of digital technologies in the IET Skills Survey 2017 reported that the impact of digitalisation on demand for engineering and technical staff would lead to a decrease in staffing. Indeed, 49% of these businesses anticipated taking on more staff as a result of digitalisation.

6.2 Our skills survey especially highlighted the range of high-quality careers at all levels within engineering and technology. The largest gaps are found in the “shortage of engineering or technician skills at a technician or skilled craft level” with 74% of businesses telling us they lacked skills at this level. This is despite salaries within the profession being higher than the national average and the industry having good overall rates of security of employment. The industry has a large capacity to provide stable employment, which the IET believes has the potential to address issues relating to social justice.

6.3 Jobs in the new economy of highly digitalised manufacturing industries will be very different to many jobs of today with mundane, repetitive, low-wage manual labour likely to be replaced by robotics and automation. However, jobs which involve creative, social interaction and physical dexterity will prove much more difficult to automate. Such tasks are likely to remain with humans, in the immediate future.

REFERENCES

The IET Skills & Demand in Industry (2017)
https://www.theiet.org/factfiles/education/skills2017-page.cfm

The IET Engineering Open House Day
https://tv.theiet.org/?videoid=12027

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