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Business, Innovation & Skills Committee
Inquiry into the Government's Industrial Strategy

Submission on behalf of the Engineering Professors' Council

The Engineering Professors' Council (http://epc.ac.uk) represents the academic engineers in the UK, with 81 university engineering faculties as members comprising over 6,500 academic staff. It is a "nominating institution" for the purposes of the Research Excellence Framework (REF) and four panellists from REF2014 sit on its governing Committee, which also numbers a Vice President of the Royal Academy of Engineering, a President of the Institute of Measurement and Control and an immediate past President of the Institution of Civil Engineers, as well as four universities' pro Vice-Chancellors.

We enclose our written submission to the inquiry, outlining the role that engineering plays in any UK industrial strategy, and, in particular, the role of the teaching of, and research in, engineering.

We would be pleased to elaborate on any on our response if invited to do so.

Yours sincerely

Professor Stephanie Haywood

President

Submission

1 Introduction

1.1 A healthy environment for engineering is critical to any industrial strategy for the UK. It is often said that a quarter of UK jobs are directly related to engineering, however, we regard this as an understatement. It is hard to think of any industry that does not depend on the products of engineering either as a central part of its activity or as a necessary precondition.

Tech giants like Google and Facebook could not exist without computer and electrical engineers. Entrepreneurial success stories like Innocent Drinks could not exist without the work of engineers in manufacturing techniques and packaging. Infrastructure such as transport, utilities and cities could not exist without the work of engineers in every field. Medical and biomedical engineering are crucial to developing a broad range of instrumentation used in modern medicine and to bring technological innovation to the field of medicine and healthcare. Even creative industries such as music, television and the arts rely on a host of engineers to turn artistic ideas into saleable, distributable products.

Without fostering the UK's engineering strengths, it is meaningless for the Government even to talk of an industrial strategy.

1.2 Fostering engineering means supporting the education and training of engineers and developing a fertile environment for innovation through research and the transfer of knowledge from the lab and the drawing board into commercial application.

This means that, central to the Government's industrial strategy must be an underlying strategy to support engineering in our universities in the short, medium and long terms. This strategy should:

- include the supply of well prepared graduates who can become well educated employees;
- support continuing professional development of engineers in academia and in industry;
- and support the sustained accretion of expertise and facilities in universities.

1.3 With this in mind, we have confined our submission only to the Committee's questions on which the EPC takes a collective position.

2 "Question 4. What tensions exist between the objectives of an industrial strategy and the objectives of other policies, and how should the Government address these tensions?"

2.1 The EPC believes that the policy for the UK to exit the European Union is potentially damaging to the UK's wider industrial strategy, creating unnecessary risks to our export economy and, in particular in the contribution that can be made by both engineering and academia.

2.2 As part of the arrangements for Brexit, in order to support its industrial strategy, the Government must ensure that research funding continues at existing or expanded levels. Ideally, this should mean continued access to EU research funding (as currently enjoyed by Norway and Switzerland), because the opportunity to work with colleagues across Europe provides particularly strong opportunities for research with commercial and export applications. (This is not *instead of* working with research departments in non-EU nations, but a particular extra opportunity that may be lost if the Government does not make suitable equivalent arrangements as part of Brexit.)

2.3 Brexit also threatens the contribution that engineering can make to the industrial strategy if the free movement of staff and students is compromised. Many of the researchers, academics and students that make the greatest contributions to the impact of the work conducted in UK university engineering departments come from overseas, particularly other EU nations.

2.4 Similarly policies on immigration – either of staff or students – if they were to limit the opportunities of academics and researchers to come to British engineering departments, will stand in opposition to any industrial strategy that must have engineering strength as its basis.

2.5 This also means that engineering students and staff should be given opportunities to remain and work in the UK. Otherwise, the strengths of the engineering teaching and research in UK universities will serve only to improve the skills levels of competitor nations as we will find ourselves exporting UK-educated engineers. (As has been mentioned elsewhere, without radical steps to promote STEM in schools – and engineering in particular – the UK will struggle to fill student places in engineering departments at just the moment when it should be expanding numbers.)

3 "Question 5. What are the pros and cons of an industrial strategy adopting a sectoral approach?"

3.1 Whatever position the Government adopts on the question of sectoral approaches, the EPC believes that it would be wrong to classify either engineering or education as 'sectors' in this context. Given that the health of both is a precondition to industrial success, engineering education and research should be see as *infrastructure* – an essential element of the supportive environment.

3.2 To this end, we support the Government's efforts to improve the teaching of STEM subjects in schools and to extend these efforts further. In particular, in order to create a talent pipeline as part of the industrial strategy, the Government should provide further incentives to ensure teachers of STEM subjects, particularly at A level and equivalent, are themselves specialists in STEM disciplines. Moreover, to encourage this in the context of better financial rewards in other sectors, the Government must explore ways of ensuring teachers in the physical sciences are incentivised to join the profession and are subsequently rewarded and recognised in ways that are commensurate with their skills and training.

3.3 Better teaching of STEM needs to go hand in hand with encouraging more young people to pursue and persist in their STEM education – particularly young women, who, when they do follow a STEM pathway, are all too often steered away from physics and engineering towards biology and medicine.

Recent research by Prof Kel Fidler et al[i] demonstrated that engineering courses have a problem of student demand – in effect, every student who wants to study engineering can get a place to do so – not a problem of supply.

3.4 A sectoral approach will require a better focus on addressing skills shortages. This means:

3.4.1 encouraging students to make informed career choices using labour market information and projections.

3.4.2 providing funding to educational pathways based on skill shortages.

Engineering departments in universities are a key example of the pathways that require better support and there are some examples of some positive initiatives.

For example, HEFCE has protected the teaching grant paid to universities for some disciplines including Chemical Engineering. However, the list of such 'SIV' disciplines is informed as much by lobbying as by labour market needs. Also the available funds are rarely adequate for the extra costs involved in running teaching-intensive courses such as engineering that also require specialist equipment.

Engineering departments are then critical in both initial and continuing education of the workforce to address the rapid advance of technology and required knowledge and skills.

3.5 The expansion of apprenticeships – and in particular, higher apprenticeships and degree apprenticeships – is a welcome effort to address skill shortages. However, there are widespread concerns about the quality of apprenticeship programmes. It also remains to be seen whether there will be sufficient demand among young people to feed the apprenticeships talent pipeline. To this end, it is important not only to support better informed choices for young people, but also to incentivise employers to support meaningful degree apprenticeships.

The Apprenticeship Levy is a welcome policy in this regard, but the Government needs to explore more proactive ways to reward employers that develop popular and effective learning models in association with educational establishments. The 2016 IET skills survey[ii] reported that over half of the employers of engineering and IT staff do not know how the Apprenticeship Levy can benefit their organisation.

It is important to develop good metrics for the assessment of quality of apprenticeships. For example, one possible indicator of quality might be the proportion of apprentices from a programme that achieve full degree-level qualifications.

3.6 The number of engineering departments in universities has expanded in recent years and excellence in teaching and research is now found in a wide variety of institutions. This regional approach responds well to the needs of apprenticeships, the needs of students, the needs of local labour markets and local industries. In the context of developing an industrial strategy, it would be a mistake for Government to focus too much attention on a limited number of universities with a historically strong track record and fail to recognise the breadth of expertise in academic departments across the country.

3.7 As well supporting engineering education and research, the industrial strategy should explore measures to promote innovation through knowledge transfer. For example, the Government should explore ways of supporting research that may have a commercial potential, but only over a time frame that may make it less attractive to private sector investment. HEFCE's programme of 'Catapult centres has been a useful initiative, but if central funding for higher education is placed under any pressure, programmes such as these – which directly support the industrial strategy – are likely to be threatened.

3.8 Knowledge transfer can also be encouraged through supporting closer links between education and industry. The creation of University Technical Colleges, the expansion of industrial placements and Knowledge Transfer Partnerships[iii], and the Catapult centres[iv] are all examples of initiatives that have supported these closer relationships.

[i] http://www.raeng.org.uk/publications/reports/thinking-like-an-engineer-implications-summary
[ii] http://www.theiet.org/factfiles/education/skills2016-page.cfm
[iii] http://www.ncub.co.uk/ktp/the-power-and-reach-of-the-ktp-model.html
[iv] https://www.catapult.org.uk/