

RESPONSE TO PROFESSOR JOHN PERKINS' REVIEW OF ENGINEERING SKILLS:

THREE POTENTIALLY FATAL FLAWS

INTRODUCTION

*'Infrastructure is the backbone of the economy, vital to growth and generating jobs now and in the future'*¹. Infrastructure systems not only enable economic growth, but also provide our modern communities with the services they need in order to function, ensuring national security and public health and wellbeing. *'Over the centuries, the UK has had a great record of investing in world class infrastructure to underpin economic growth'*²; however, in recent decades this approach to infrastructure investment has changed to become uncoordinated and insufficiently targeted to support sustainable development and economic growth. This has had a detrimental impact on the ability of these infrastructure systems to provide a sufficient level of service to our ever-expanding communities, with Ofgem warning of a potential energy crisis and blackouts by 2015 if significant investment in infrastructure is not supplied now³. The impact of this lack of infrastructure investment has been highlighted in many reports, including those by the Council for Science and Technology⁴ and the Institution of Civil Engineers⁵, and has recently prompted Government to reconsider infrastructure funding strategies. The 2013 National Infrastructure Plan⁶, acknowledged as a priority for government funding in the latest Autumn Statement¹, has recently been commissioned by the Government and sets out the funding provision for both short-term and long-term UK infrastructure projects. Within the Plan there is provision for over £100 billion worth of public funding for projects, including £50 million for a redevelopment of the railway station at Gatwick Airport and investment of £5 million to convert public sector car fleets to electric vehicles. However, these plans cannot be implemented without skilled engineers, from a variety of specialisms and backgrounds. Indeed, engineers will be needed to solve many growing problems, both in the UK and abroad, including: adaptation to climate change impacts, increasing lack of raw materials, increasing population growth and an aging population, amongst many others. Engineers not only provide the expertise to solve these problems, but also have the skills capable of challenging traditional methods and 'thinking outside the box' to develop ingenious and innovative new solutions.

Considering the importance of engineers to the UK economy and the previous global impact of British engineers, including Isambard Kingdom Brunel, George Stephenson and William Armstrong, it could be assumed that the UK has a healthy growing population of engineers. However, in his Review of Engineering Skills⁷, Professor John Perkins states that many *'employers are likely to experience increased difficulty in recruiting when the economy picks up'* due to a lack of UK engineering graduates and that, to solve this problem *'some employers are working their current staff harder'* and relying on engineers from abroad to fill the gaps. Professor Perkins also states that the UK's economic recovery could be 'constrained' by a lack of engineering skills, indeed the UK Government's plan to stimulate the economy, involving large investment in infrastructure projects, may not come to fruition due to a shortage of engineers.

Professor Perkins includes several recommendations in his report aimed at increasing the profile of engineering amongst young people and inspiring the next generation of engineers, including supporting current curriculum reforms with high quality teaching and a coordinated outreach and engagement with schools. A 'call to action' is also included in the report, to bring '*engineering employers, the profession and educators together*' with the aim of shaping the future of engineering in the UK. However, whilst Professor Perkins' Review and 'call to action' highlights the potential benefit that more engineers will have on the UK economy and suggests methods for attracting young people towards engineering, the call fails to highlight three potentially key aspects which could greatly increase uptake in engineering and need consideration if this call is to succeed.

1. LACK OF DEFINITION AND AWARENESS OF AN 'ENGINEER'

The definition and role of a medical doctor or lawyer is relatively simple for many young people to describe; however, the definition of an engineer can be difficult to establish, due to the diversity of the role and the numerous engineering specialisms. Even the Oxford dictionary definition of an engineer as '*a person who designs, builds, or maintains engines, machines, or structures*' or '*a person who controls an engine, especially on an aircraft or ship*'⁸ is fairly ambiguous and open ended.

In 2007, the Royal Academy of Engineers commissioned a report to assess the public's perception of engineers and engineering⁹. They found that, whilst 94% of people thought that engineers make a good contribution to society, 80% of people also thought that there are so many types of engineers that it is confusing for the average person to understand and 59% of people hardly knew what engineers do. As such, the engineering profession must consider the image that it is portraying of 'an engineer' to the general public and especially young people, some of whom will form the next generation of engineers. For instance, in many British Gas advertisements, an engineer is portrayed by a 'guy in a boiler suit' and in recent media coverage surrounding the Christmas floods as a 'guy fixing power cables' (Figure 1); whilst, these are two roles that an engineer can take, they are not the only ones and efforts must be made to iterate this point.

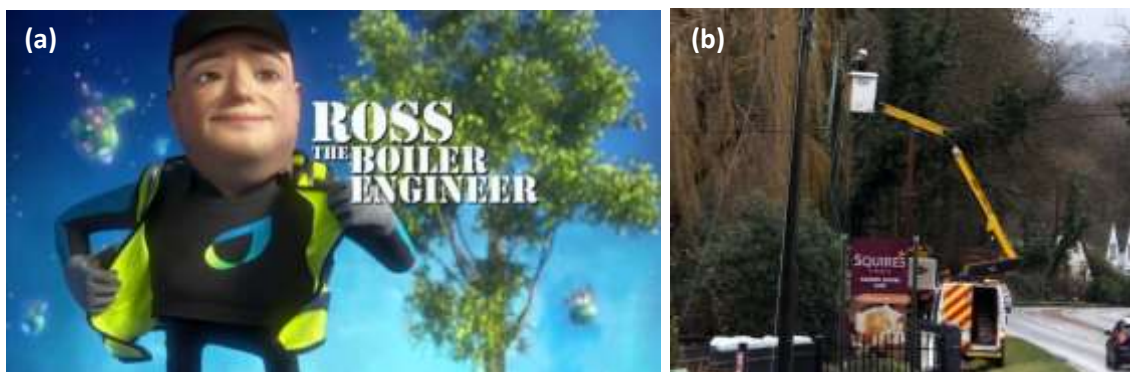


Figure 1: Two images of 'an engineer' as portrayed in (a) many British Gas advertisements¹⁰ and (b) recent media coverage¹¹.

In the same report, the Royal Academy of Engineers also found that the majority of the general public associated the word 'engineer' with 'mechanic' or 'mechanical' and only 2% of people associated an 'engineer' with 'bridges', 'trains' or 'technical'. Such a view of engineering should be worrying and 'ring alarm bells' within the profession, as young people, who will be the future generation of engineers, cannot be expected to choose a career in something which they perceive to

be unclear, undefined and ultimately poorly understood. Therefore, efforts must be made now to engage with the general public and address this issue and the most useful tool in promoting engineering must surely be the media and increased media coverage.

2. LACK OF MEDIA VISIBILITY

In his report, Professor Perkins states that '*the engineering profession continues to suffer from widespread misconceptions and lack of visibility that deter young people*'⁷ and, in particular, female students from choosing a career in engineering. Professor Perkins highlights the efforts of the Royal Academy of Engineers and EngineeringUK to bring engineering institutions together, forming 'Tomorrow's Engineers' to coordinate community outreach and engagement in schools. However, in this current digital age, with the advent of social media, it is no longer enough to simply engage with students in schools; efforts must be made to utilise media to increase the profile and visibility of engineers. For example, the number of students enrolling on A-level Physics courses has risen over the past few years and is partly attributed to the 'popularisation' of physics through television programmes such as *Wonders of the Universe* (Figure 2) and has been termed the 'Brian Cox effect'¹². It is not only physics that has received this level of media attention, with architecture being the subject of television programmes by George Clarke (*The Restoration Man* and *George Clarke's Amazing Spaces*) and Kevin McCloud (*Grand Designs*), and, whilst aspects of engineering have been used in the program *Engineering Connections* presented by Richard Hammond, it has not received sustained media interest.



Figure 2: Popular television programmes (a) *Wonders of the Universe*¹³, (b) *George Clarke's Amazing Spaces*¹⁴, (c) *Grand Designs*¹⁴ and (d) *Richard Hammond's Engineering Connections*¹⁶.

To understand the reason behind the lack of females in engineering, thought should be given to the perception of engineers and also the number of female role models. The use of male presenters to front engineering (and related) television programmes, such as those previously stated, only strengthens the view to many young people that engineering is not a career for women. In an age of gender equality, this cannot be acceptable. Therefore, the engineering community should be challenged to not only increase the opinion and profile of engineering through increased media

coverage, but also to provide female role models to show young people, and also their parents and teachers, that engineering is a diverse and rewarding career which is accessible to all.

3. CONSTRAINED EDUCATION SYSTEM

The current education system in England requires all young people to stay in some form of education until the age of 18. This is a recent increase from the age of 16 and it is widely believed that this increase will encourage more young people to continue to gain qualifications post-GCSE, whether 'traditional' A-level or vocational.

The 'traditional' route for many engineering disciplines is higher education, usually provided by a recognised (and chartered) university. However, to be eligible to study for an engineering degree, a student must first have the correct A-level, or equivalent, qualifications and to study for these qualifications there are often entry requirements, usually specific GCSE qualifications. Currently, young people are required to choose their preferred GCSE subjects at the age of 13/14, and then A-level subjects at 15/16. With many young people unaware of the entry requirements to a university degree, or indeed that there are entry requirements, they may unknowingly be excluding themselves from their desired career path at the age of 13/14. Whilst Professor Perkins' report suggests long-term methods to encourage these students into engineering and provide them with the information they need regarding potential career paths to achieve this, there will be a significant delay until the effects of this intervention are felt (up to 7 years). Therefore, more must be done in the short-term to ensure there is not a deficit of engineers until these interventions take effect.

This can be achieved by engaging with students who are currently studying for their GCSE and A-level qualifications and supporting them if they have not made the 'correct' choice of qualifications, but are interested in a career in engineering. Currently, these students do have the opportunity to study for additional qualifications if they have not met university entry requirements; however, many young people are dissuaded from doing so by other career options which keep them in the same year group as their peers, or may be unable to take additional qualifications as many colleges and Sixth Form Academies give priority to 'first time' students, or for financial reasons. The engineering community, including universities and employers, must ensure that these students have the opportunity to study for additional qualifications and support them throughout.

CONCLUDING REMARKS

It can be concluded that engineers are vital to today's modern society and may be the key in driving the economy forward through these difficult times. Whilst Professor Perkins' report suggests many possible methods to raise the profile of engineering and attract more young people to consider engineering as a career path, it has three main shortcomings. Firstly, there is currently a lack of definition as to what constitutes an engineer and what engineers actually do. If more young people are to be attracted to this career, this problem must be addressed first and foremost. Secondly, there is a lack of media coverage surrounding engineering and in particular a lack of role models to enthuse young people to study this area. Finally, many young people may be turning away from a career in engineering as they did not choose the correct qualifications to study at the age of 13/14. This must be addressed in the long term through engaging with students from an early age, so they can make informed decisions about their future and, in the short term, by providing routes for these

students to study for additional qualifications to allow them to meet the entry requirements of many universities.

There will always be a need for engineers in the UK and indeed the world, whether it is now or in the future and we must ensure that in the UK we are capable of producing engineers at the pinnacle of the profession, without change now we will not be able to achieve this.

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