

Handing down the Jump Leads

“Engineering is important to the economy of the United Kingdom.”

A simple statement, but one which cannot be denied. One might be tempted to leave the argument there: the benefits of engineering to the United Kingdom’s (UK) economy are many, visible to any person who has a grasp of British economics.

But this simple statement does both engineering and the UK a disservice. To say that the discipline of engineering is merely important to the UK economy is to forget that for nearly two centuries, from the first spark of the Industrial Revolution to the ‘scrapping’ of the sector in the last quarter of the 20th century, engineering *was* the UK economy. It should not be forgotten either that up until the middle of the 20th century, the UK was the largest economic force in the world – the only economic superpower. Clearly, up until recent times, the UK engineering sector was fuelling the economy of the world.

The facts that engineering was the main – or even sole – historical contributor to the UK economy, and that the UK economy was once the largest in the world, are not coincidental: they are causally linked. The Industrial Revolution, which began in the UK, was the steam-powered driving force behind the UK economy from the late 18th century onwards, and led to the UK becoming the most powerful, most productive and wealthiest empire in history. As he had done ever since he left the trees of Africa, mankind was using his ingenuity to engineer a better lifestyle for himself – and just as Africa was the cradle of life for humanity, the UK was the cradle of life for industry.

Fast-forward to the present day, and we see that the economy of the United Kingdom – in relative terms – is not the Goliathan powerhouse it once was. The UK is now only the 6th largest economy in the world in terms of nominal GDP¹. Two world wars, the economic and technological expansion of other nations – namely the industrial expansions of the United States and Germany in the late 19th century – and the fluctuating politics of the late 20th century shifted the UK’s economy from one centred on engineering (research and manufacturing) to one centred on the services sector. The engineering sector of the UK has shrunk to such an extent that it now accounts for only 20% of GDP.

¹ ["Report for Selected Countries and Subjects". World Economic Outlook Database, October 2013. International Monetary Fund.](#)

Is this the end for the engineering sector in UK economics? Does the future of our economy rest solely on the shoulders of the services and financial sectors?

I think not. Our engineering sector today contributes just shy of 800 billion pounds to the UK economy². Nearly three quarter of a million people are employed in automotive manufacturing, with a further 250,000 working in electrical- and electronics-related companies. Parts for nuclear reactors, cars/vehicles and electrical appliances were our second, third and fifth highest produced commodities in the manufacturing sector in 2012³. Clearly, engineering as an economic force is not dead. However, the output of the manufacturing sector has declined substantially in the 21st century⁴.

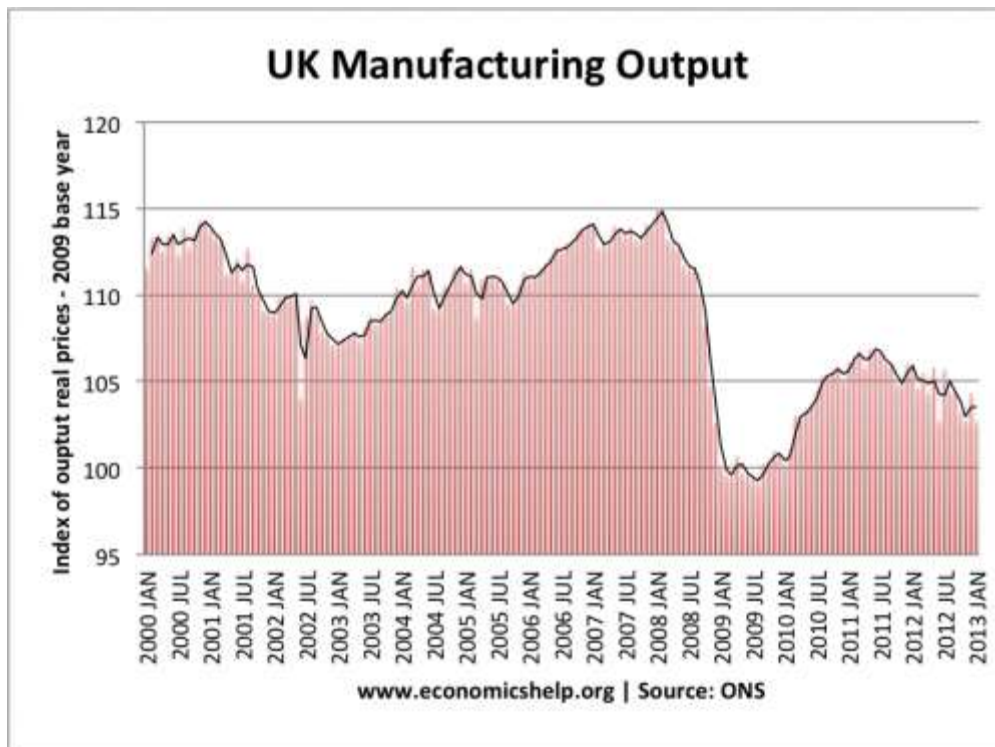
Rank	Product Description	% Share 2012 YtD
1	Mineral fuels and oil	16
2	Nuclear reactors and parts	14
3	Cars / Vehicles	10
4	Pharmaceutical products	7
5	Electrical appliances	7
6	Precious metals / jewellery	5
7	Organic chemicals	4
8	Optical and surgical instruments	4
9	Aircraft	3
10	Plastics	3
11	Iron and steel	2
12	Beverages, spirits and vinegar	2
13	Chemical products	2
14	Articles of iron or steel	1
15	Other products	1
16	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	1
17	Works of art, collectors' pieces and antiques	1
18	Books, newspapers, pictures and other products of the printing industry; manuscripts, typescripts and plans	1
19	Articles of apparel and clothing accessories, not knitted or crocheted	1
20	Rubber and articles thereof	1

Products Manufactured in United Kingdom³:

² http://www.engineeringuk.com/_resources/documents/Where_do_Engineering_Graduates_Go_Dec_09.pdf

³ <http://www.economicshelp.org/blog/5083/economics/what-does-the-uk-produce/>

⁴ <http://www.economicshelp.org/blog/7132/economics/uk-production/>



Decline of UK Manufacturing in the 21st Century⁴.

Historically, the UK was most economically sound when engineering had a strong influence on the economy, when the country was at the cutting-edge of technological advancement. The question is: how do we as a nation rehabilitate engineering? Let me propose the following: we should concentrate more investment into promoting engineering to a generation of ‘*potential* engineers’, in the hope that an increased number of people in the sector will boost its economic power. Let us examine why investment of this type is as important as the investment in research conducted by *current* engineers. The influence of Higher Education Institutes on inspiring schoolchildren and undergraduates towards the engineering discipline will be scrutinized; some ideas as to how this process could be improved will be offered.

Let us consider the various ways society could invest in the engineering sector, starting with current engineering projects. The number and variety of manufacturing and research projects being conducted across the UK, in a myriad of different fields, is phenomenal. The Pelamis Wave Energy Converter, the Bloodhound SSC supersonic vehicle, the JET magnetic confinement fusion reactor, and the Skylon SABRE air-breathing rocket engine are a few such examples. Some projects may have directly foreseeable practical applications and future economic value. These projects could probably be categorised as “targeted research” projects: research conducted with a specific goal in mind.

This type of research has clear benefits, namely that the research is efficient and has clear goals, but also poses dangers. Targeted research is inflexible; it does not have the capacity to accommodate tangential discoveries, ones which could be critically important to future engineering. The very nature of research means it is difficult to tell in advance which innovations will lead to important discoveries and which will lead to dead ends; which projects will result in world-changing, economically-viable products, and which will result in failures. Though useful, it is unwise to invest too much in targeted research, as it will create an inflexible engineering sector.

Is the alternative to invest in *all* engineering design and research projects currently being carried out in the UK? Ideally, yes. Investing in as great a variety of engineering projects as possible would maximise the sector's chances of producing ground-breaking new technologies that would have huge economic value. But we have only a finite amount of resources to invest. Although desirable, it is not viable to invest in all engineering projects: the resources simply are not there.

We have established that although targeted research is useful, depending on it to produce results risks missing out on unforeseen breakthroughs. However, it is economically unviable to invest in every single project and piece of research currently conducted in the UK. How do we solve this paradox? Where else could society invest to maximise the engineering sector's economic return?

What follows is the keystone to this essay. Instead of ploughing all our investment resources into current engineering projects (essentially investing in graduates and above), we must instead invest in promoting engineering to society – and especially towards harvesting its younger members. Promoting engineering as a viable career path is a sure-fire way to increase the number of people employed in the sector. There is a direct correlation between the number of people employed in the engineering sector, and the chances of this country producing ground-breaking research. For this reason, there is a national imperative to encourage people to become involved in engineering and manufacturing. Only when this country is leading the way in these fields can we expect to reap the rewards of our investment in the engineering sector. The way in which to maximise this output is through trying to broaden the engineering discipline – by encouraging people to become a part of it. Let us examine this idea further, starting with how engineering is perceived in modern UK society.

The perception of engineering in this country, as a discipline and career, is poor; especially for a nation which has produced many of the finest engineers and many of the greatest feats of engineering in history. On the Continent, the very

term “engineer” has a rather different meaning compared to the United Kingdom. In mainland Europe, engineering is seen as a profession on a par with that of medicine, dentistry or law. In the UK, “engineer” has different connotations: the role is perceived to be one which requires less qualification; one whose workload is comprised of repairing and fixing the old and the broken, instead of designing and building the new and the dynamic. A misconceived notion persists in our society: that to be a mechanical engineer is to be a mechanic. We know the two are very different. The reasons for this misperception are down to the declining influence engineering has in the UK economy. This perception must be changed. Engineering needs to regain its sex appeal.

UK engineering needs a jumpstart. The sector has stalled, but it has not broken down. A revolution of sorts is required, one which reinforms the nation about the importance of the role engineering has played and is currently playing in our country’s economy.

Enter the Higher Educational Institution. The task of Higher Education as an entity is to hand down the information required for students starting out in their chosen profession, and, speaking personally, it performs this task well. But there is another, equally important role of Higher Education: inspiration. Higher education must not only seek to educate the student body (both current and prospective) but must also inspire these students to pursue engineering not just as a degree but a career.

Universities, industries with placement opportunities – all manner of higher educational institutions – must do more to encourage prospective students to study and/or seek work in the engineering and manufacturing sector. Start off young. Engineering must be presented as a potential career path from the earliest age. Consider the professions primary school children aspire to: doctor, astronaut, teacher, nurse – one of these careers may have been your dream job at that age. Where is the engineer on that list? The number of children under 10 who even know engineering exists as a career must be minute. Changing this simple fact would revolutionise the engineering discipline. This can be achieved through greater public awareness of the importance, and crucially, the versatility of a career in engineering. Young children need to appreciate the power and the potential that an engineer wields: the ability to design and create entirely new products, to change the world, must be attractive to children! Higher Education has the capacity to inspire these youngsters. Holding presentations, Q&A sessions, and tours of facilities. These are all possible strategies that higher

education institutions could employ to ensure that young people are not only aware of the idea of engineering as a career, but are actively pursuing it.

Furthermore, according to one source⁵, over a quarter of students graduating with a degree in engineering move into fields unrelated to that degree. Universities must invest resources into ensuring that current students are continually inspired to stay within the field post-graduation. The practicality of the degree must be reinforced regularly to remind students that what they are learning is not esoteric and irrelevant, but important to their field. Context in all activities is one key to locking the students mind on a future in engineering.

The problem posed at the start of this essay was not an engineering problem, but a socio-economic one. Engineers find ground-breaking ways to tackle seemingly intractable problems, and this attitude must be applied to the UK economy. This essay began by analysing how key the engineering sector of the UK was in the past, and the reduced role that it plays in the modern age. The conclusion reached was that engineering is one of the most important components of the UK economy, and a stronger engineering sector will without doubt lead to a stronger, more robust economy. It was realised that investment in the sector is continually required, but that targeting investment at specific research projects was dangerous – it left little flexibility in the sector, leading to a lack of innovation and the possibility of missing out key breakthroughs. This essay recommends a different strategy: investing in a younger generation. The generation of *potential* engineers. Diverting time and money into educating, and more importantly, inspiring children (especially those of primary school age) and teenagers to pursue careers and degrees in engineering is a sure-fire way to renew the power and reputation of the engineering sector. It is paramount that this enthusiasm is maintained throughout a potential engineer's degree, so as to maximise the possibility of graduates moving into careers within the sector. Once our engineering sector has been jump-started, its power in the UK economy will grow, and this country can return to what it is best at: leading the world.

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⁵ <http://www.theguardian.com/news/datablog/2013/jan/30/university-applications-subjects-age-gender-country>