

Hardtech and High-Value Manufacturing

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Chair: Gavin Costigan
Chief Executive, The Foundation for Science and Technology

Speakers: Peter Marsh
Founder, Made Here Now
Will Butler-Adams OBE
Chief Executive Officer, Brompton
Katherine Bennett CBE FRAeS
Chief Executive Officer, High Value Manufacturing Catapult
Dr Edmund Ward
Head of Advanced Manufacturing and Resources, Department of Business, Enterprise and Industrial Strategy

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PETER MARSH started by defining “Hardtech” as using one or more technologies to make tangible products and “Manufacturing” as adding value to materials. Globally, manufacturing employs 350 million people, approximately 10% of the available workforce, and it accounts for 15% of global GDP (and 10% in the UK).

Manufacturing requires a workforce with a high level of skills, high levels of capital, and significant use of technology. Productivity is higher than in many service industries, as are wages given the skilled staff.

Britain was the biggest manufacturing nation in the world at the end of the 19th Century with around 20% of total manufacturing output. By the 1950s it was 10% with 7-8 million employees, and now we have 2½ million employees and are the 9th highest in terms of output. This leads to a perception and narrative about Britain’s decline in manufacturing – with some nostalgia for previous industrial heritage. There is a resulting lack of understanding about 21st century manufacturing, which in fact tends to be high-tech and in much smaller companies.

Sales of all manufactured goods in 2021 in the UK were around £400B, of which 40% is Hardtech. Around half of this Hardtech might

fall into sectors typically thought of as advanced manufacturing (such as electronics and biotech) and the other half fall outside this but are still Hardtech – companies such as Renishaw and Brompton.

WILL BUTLER-ADAMS noted that there was a lack of understanding of engineering and manufacturing, and that action was needed with politicians, universities and parents.

Politicians don’t understand manufacturing. Companies may make very cheap products in bulk using extremely sophisticated equipment. Brompton makes bikes, but has an incredibly sophisticated factory and integrated supply chain that is extremely responsive to demand. It is not just the product at the end but everything in between, and the UK is really well placed to do this with multifaceted research, university collaborations and talented people.

The teaching of engineering in universities is an important factor. Mr Butler-Adams’ own experience was of poor quality teaching from staff who were incentivised to do research, not teaching, the majority of whom had never worked in an engineering company and actually made things. Things have improved since that time but there is a way to go –

universities need to inspire and excite about a career in engineering – or else engineering graduates will go to work in banking or consultancy.

Parents have a view about what engineering is, driven partly by advertising of plumbers, mechanics, technicians and others as “engineers”. They don’t want their children studying for three years to be on the floor with a monkey wrench. We need to recapture the word “engineer”. One idea might be to set up a voluntary code with large corporations to phase out the use of the word for these other roles over a period of say 5 years – which would need buy in from politicians and companies.

He concluded by noting that there was much to do, but Brompton is an example of what can be done. It’s ambition and determination - apply that nationally, we can smash it out the park.

KATHERINE BENNETT began by describing the High Value Manufacturing Catapult - seven centres of innovation, founded just over 10 years ago and funded through Innovate UK. The purpose of the Catapult is to de-risk innovation, and to help companies transform their performance and move products and processes to market. The Catapult has supported 22,000 companies since formation and is Europe’s largest advanced manufacturing capability.

Climate change and the Net Zero challenge will be a significant challenge for high-value manufacturing but also an area where it can help generate solutions, and strengthen our national resilience. In the Catapult, this could include creating commercialisation, scaling up more low carbon and sustainable options for industry, and helping to find better ways of measuring and reporting environmental inputs across the whole product lifecycle. This support has helped make the Catapult a magnet for inward investment.

Sustainable steel and the future of the steel industry are live topics, and the Manufacturing Technology Centre in Coventry is working with the construction sector, a big user of steel, working with experts in composites and additive manufacturing to try and help the steel industry improve their situation.

The Ventilator Challenge during the pandemic was another example of manufacturing industry responding quickly to a national challenge.

Another example is offshore wind, where a huge amount can be done to develop and design more environmentally friendly aspects of the Sustainable blades. The UK has real expertise in high value design, which is not as well-known as it should be.

DR EDMUND WARD noted that manufacturing was not a single departmental issue, and that a whole government approach was needed. He showed a slide with a diagram illustrating the innovation ecosystem taken from the Government’s Innovation Strategy. What we want is growth, jobs, health and societal welfare. Innovation helps us get there, but that needs several elements, including technology, finance, ideas and companies to drive them. Some small innovative companies can make a difference – others can when and if they are able to scale up.

Government’s role is to provide the enabling framework. Sometimes they get it right and sometimes they don’t and need to improve. Currently BEIS supports the advance manufacturing sector, where the UK has some real strengths. These include talented people, generous R&D tax relief, access to venture capital, business growth and knowledge transfer. The UK has more than 25% of the Unicorn companies across Europe. The Government is committed to long term public investment in R&D, and the UK has a strong IP regime. As we look to improve, we are starting from a strong base.

A big challenge going forward is Net Zero, and Government has done a lot to set out the parameters. The recent report from Chris Skidmore¹ notes the costs and opportunities of getting to Net Zero. There are big challenges, and with that, big opportunities in high value manufacturing for things that will make us more resource efficient, and more energy efficient, and that will enable us to switch to different fuel systems.

The Government has an overall Innovation Strategy and separate strategies within that overall framework, such as for quantum technologies. Manufacturing is a key element of these. ARIA is a new element of government support at the higher risk end, complementing existing centres and Catapults.

Government support is leading to zero emission aviation and improvements in electric vehicles, with innovation leading to improved products and processes. But companies need to know that technologies exist and how to deploy them, and in some cases need funding to do so. Government can help with the enabling environment, and to de-risk investments.

IN THE DISCUSSION PERIOD, the first suite of questions saw the panel asked about what the right minimum level of gross margin should be, about how to bring all the elements of industrial strategy together, and about what the Government’s role should be to ensure we have the skills we need.

In response the panel noted the importance of gross margin, and how it varied by sector (with high volume manufacturers tending to have smaller gross margins and high value manufacturers larger ones). They also noted that manufacturers are increasingly doing more than manufacture – such as being distributors, brand owners and retailers, and that drives a better understanding of your customers, which can help reach higher gross margins.

Government has a role bring groups together (companies, universities, catapult centres etc) – regardless of whether or not there is a specific document setting out an “Industrial Strategy”. Driving improvements in productivity is a key part of this.

On skills, the panel mentioned that in the UK there was a lack of ambition for being creators, makers, innovators. To change this needs a cohesive plan, and it needs to start with inspiring children at primary school. This is not a short-term fix, but recent government initiatives on T-Levels and apprenticeships will contribute.

The second set of questions focused on gap reporting (what are we not yet making in the UK that we should be?), and whether UK industry has the appetite to change what they manufacture; practical solutions to solve skill shortages; and getting more women into engineering.

In response, the panel noted that gap reporting was a key role of government, who could signal where there is a case for investment, and develop strategies for strategically significant products and materials. But for some existing companies, they should seek to extract the full value of their existing innovations rather than moving to other products.

On skills shortages, some large employers collectively putting money into advertising the engineering profession could help. Companies also give time to staff to volunteer in reach-out activities. Academies and professional bodies are involved in highlighting the issue of teacher shortages.

More needs to be done on diversity, for example getting more women on boards of companies. As most decisions on expenditure are made by women, companies need to get more women into their companies to better understand their customers. But there is a shortage of women engineers coming through, more need to be inspired whilst in education.

Asked for some final reflections, the panel noted some previous advice on how to be a successful manufacturer in Britain – firstly that you don’t need to invest technology, you need to be able to transfer it and use it; secondly that you need a global outlook; and thirdly you need to recruit and retain good people. Another point was that we can leverage what is an important priority for the population (e.g. making the world greener) and inspire the next generation to study STEM subjects to contribute to solving them. Case studies can help with this. And Government can be clear on what these big agendas are, and what the UK really needs.

Gavin Costigan

1. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1128689/mission-zero-independent-review.pdf