Industrial Strategy

CaSE response to House of Commons BIS Committee Inquiry, September 2016

Summary

CaSE welcomes the renewed focus on industrial strategy. It is not yet clear what the government means by industrial strategy however as the details are developed, there are some principles that will be central to success. We believe that the industrial strategy must be long-term, it must be ambitious, it must be cross-government, and must be built on the cornerstone of science and innovation.

Although this consultation doesn't reference Brexit, the industrial strategy could be a powerful tool for mitigating some of the anticipated negative impacts on the sector and helping to ensure that the UK remains an attractive and world-leading place for science and innovation. Stability provides long-term confidence to researchers, innovators, businesses and investors. An industrial strategy with commitments that stretch beyond the current political cycle could contribute to making the UK attractive for industry as a place to locate, invest and grow. The government must engage closely with businesses to understand what is currently working and integrate this into the new strategy.

Science and innovation should be the cornerstone of the industrial strategy because it is an area of UK competitive strength, with the potential for contributing to the creation of quality jobs, economic growth and bringing wider societal benefits across the UK. For real progress, now is the time for the government to send a signal of intent to the watching world and set out ambitious, long-term investment in science and innovation as part of their industrial strategy.

Ensuring the UK has the skilled people it needs will be essential to the success of any industrial strategy. One aspect of this is the focus on apprenticeships. BEIS must work together with the Department for Education to ensure that apprenticeship targets, funding, scheme rules and programmes are shaped to ensure this substantial funding and effort aligns with the aims of the industrial strategy. The role of immigration must also be considered alongside developing the skills base in the UK. Companies, universities, charities and research institutes alike see the ability to retain, access, move and attract skilled people as an essential pillar of securing a positive outcome for science as the UK leaves the EU. Negotiations and domestic policy must work together to create a migration system and environment that actively supports science, research and innovation.

About CaSE

The Campaign for Science and Engineering (CaSE) is the leading independent advocate for science and engineering in the UK. CaSE believes the UK government should support a healthy and flourishing science base in which all parts of this integrated system are well funded and performing optimally. We welcome the opportunity to feed into this inquiry because a long-term, cross-government industrial strategy built on the cornerstone of research and innovation is an important contribution towards that aim. CaSE works to ensure that the UK has the policies, funding and skills to help science and engineering thrive. It is funded by around 800 individual members and 100 organisations including businesses, universities, learned and professional organisations, and research charities. Collectively our members employ 350,000 people in the UK, and our industry and charity members invest around £19.3bn a year in R&D globally[1].

[1] Figure calculated in November 2015 from latest available data

Context

On reshaping her Government, the Prime Minister marked a change in policy regarding Industrial Strategy by including it in the title of the Department for Business. CaSE welcomes the renewed focus on industrial strategy. From speaking with members, this was broadly a welcome change from the uncertainty created by the lack of clarity since May 2015 as to whether and how the government were continuing with the industrial strategy set in motion under the Coalition Government.

In his early speech at the Royal Society, the Business Secretary, Dr Greg Clark drew on his experience of developing the Science and Innovation Strategy in 2014 stating that the principles of excellence, agility, collaboration, place and openness "are principles that have an application beyond science policy and will help inform the development of the new industrial strategy.[2]" In CaSE's response to the publication of that strategy in 2014, Sarah Main offered three further principles that were missing; stability, ambition and resilience[3]. These are equally important to consider in developing an Industrial Strategy. Indeed, it was very welcome to hear Dr Clark set out the importance of stability in his recent speech on the strategy[4].

A major factor influencing the context within which an industrial strategy is developed is of course the UK's vote to leave the EU. However, we were pleased that the Prime Minister voiced her government's commitment "to ensuring a positive outcome for UK science as we exit the European Union[5]." This will not only require a positive outcome in the negotiations but must be complemented by the domestic policy environment, of which the industrial strategy could be a shining light for science and engineering.

Leaving the EU will present enormous challenges right across the spectrum of science and engineering, including industry. The sector's clear priorities in the negotiations relate to people, funding and regulation. And cutting across all three of those is the importance of collaboration. These are covered in more detail in our response to recent Science and Technology Committee inquiries in both the Commons and the Lords[6]. Although this consultation doesn't reference Brexit, the industrial strategy could be a powerful tool for mitigating some of the anticipated negative impacts on the sector and helping to ensure that the UK remains an attractive and world-leading place for science and innovation. To do that**, the industrial strategy must be long-term, it must be ambitious, it must be cross-government, and must be built on the cornerstone of science and innovation.**

A strategy built on the cornerstone of science and innovation

Dr Clark, has already stated in response to a question on the industrial strategy that "science is a national strength and will form a major part of the strategy"[7]. We believe this is well justified, and would go a step further. **As an area of UK competitive strength, with the potential for contributing to the creation of quality jobs, economic growth, increasing productivity and bringing wider**

[2] https://www.gov.uk/government/speeches/new-ministerial-team-to-develop-industrial-strategy
[3] http://www.sciencecampaign.org.uk/resource/caseresponsescienceandinnovationstrategy2014.html
[4] https://www.gov.uk/government/speeches/the-importance-of-industrial-strategy
[5] http://www.bbc.co.uk/news/science-environment-36915846
[6] http://www.sciencecampaign.org.uk/resource/Commons-S&T-committee-post-Brexit-inquiry-submission.html
[7] Questions to the Business, Energy and Industrial Strategy Secretary, in response to a question from Ed Vaizey MP on Tuesday 13th September 2016

societal benefits across the UK, science and innovation should be the cornerstone of the industrial strategy.

Investment and support for science and engineering is essential for the future of the UK as a high-tech and knowledge-based economy. A wide range of industries, from manufacturing and agriculture to digital technology, rely on science and engineering to innovate, grow, and create high-value jobs[8]. Innovation was responsible for half of all UK labour productivity growth between 2000 and 2008, with 32% of that attributable to changes in technology resulting from science and engineering[9].

R&D and human capital are universal drivers of productivity[10]. Looking at some of the R&D intensive sectors, they have considerably higher Gross Value Added (GVA) per worker compared with the average across the UK. For instance, the R&D-intensive pharmaceutical sector has one of the highest GVA's per employee, with £155k in 2014[11]. Over the last five years, aerospace sectors have together increased their productivity by 30% – compared with just 4% across the rest of the UK economy[12].

The UK cannot compete on cheap labour, capital reserves, or natural resources. As the UK seeks to re-establish its place in the world, more than ever we must instead play to our advantages in research and innovation. In an increasingly competitive global economy, these will be the drivers of future innovation, productivity gains, and high-value job creation across the UK.

The UK Government's Industrial Strategy provides a timely opportunity to create a long term framework to support a thriving business and innovation environment built on the UK's competitive strength of its research and innovation base.

R&D investment

The UK's low public R&D investment is a lost opportunity, risking the breadth and depth of UK science excellence with implications both for the absorptive capacity of firms and on our ability to benefit from global investment in science and innovation[13]. Further reducing the UK's public investment in R&D would also send a very damaging signal to investors.

Business is already the largest investor in UK R&D, accounting for £19.9 billion of expenditure in 2014, representing 65% of total expenditure on R&D performed in the UK. The pharmaceutical industry was the largest business investor at £3.9 billion, computer programming and information service activities was second at £2.4 billion and the automotive industry was third at £2.3 billion[14]. These are global industries choosing to invest in the UK. And at present the UK is an outlier in the proportion of its funding for R&D that comes from overseas sources.

Our industry members tell us that the strength of the UK's research base is a defining attractor. The most direct evidence of this effect in the UK is that multinational pharmaceutical firms locate their

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[8] The Science Council, The current and future UK science workforce, 2011

[9] Estimating the effect of UK direct public support for innovation, BIS, 2014

[10] "On the Robustness of R&D" , Kul, Khan and Theodorodis, Journal of Productivity Analysis, vol. 42 (2014), 137-155

[11] CaSE analysis of ONS Annual Business Survey, 2016

[12] ADS evidence submitted to the BIS Committee Productivity Plan Inquiry (2015)

[13] Insights from International Benchmarking, BIS analysis paper, 2014

[14] http://www.ons.gov.uk/economy/governmentpublicsectorandtaxes/researchanddevelopmentexpenditure/bulletins/ukgrossdomesticexpenditureonresearchanddevelopment/2014#expenditure-on-rd-performed-in-the-uk

laboratories near to universities with excellent chemistry research[15]. Across sectors, access to expertise and world class facilities are repeatedly cited as key attractors along with the international reputation of the UK's research and innovation institutions.

Government investment in R&D has fallen both as a percentage of GDP and as a percentage of total Government spending in recent years[16]. The commitments by consecutive governments have provided relative protection and stability to the science budget and capital investment in BIS amid wider government funding cuts. However, continuing 'stability' in domestic public R&D investment will result in a sharp drop in the level to which our research base is funded following Brexit.

Overall, the UK is a net contributor to the EU, but it is a net receiver of EU funding for research; receiving €8.8bn between 2007 and 2013 compared to an indicative contribution of €5.4bn, a net gain of €3.4bn. Moreover, the importance of EU funding to research is growing, with half of the increase in UK university research budgets over this period coming from EU government sources. In an environment of financial strain it is clear that the EU has provided a valuable source of funding for the sector[17]. It is possible to participate in EU programmes as a non-member state, however the amount of funding received by all non-member states combined does not equal the current level of funding received by the UK. Only 7.2% of the research funding awarded by the European Union and the European Research Council has been allocated to non-member states in the last decade – a total of €3.5bn – mostly to Norway and Switzerland[18].

Therefore, for the UK to receive even a fraction of its current level of EU funding following Brexit would be a substantial shift in the balance of research funding going to members and non-members. It is also politically improbable that continuing EU member states would agree to a non-member state being a net receiver of funding for research as we are now[19]. The scale of the investment shortfall will become clearer as EU negotiations develop, but at present UK receives around £1billion a year in competitively won R&D funding from the EU. Increased domestic public investment is therefore needed in order to stand still.

The government has a role to play in taking early-stage risks because the private sector will not, particularly where there is a long lag time from investment to benefit and where the benefit returns broadly across society more than to the investor. Over the long-term, taking these risks enables the creation of private sector jobs in entirely new markets, as well as delivering societal benefits. The science budget is such a risk and a bold commitment to our future prosperity.

Greg Clark has already stated that the government "must provide the research funding to keep us out in front.[20]"For real progress, **now is the time for the government to send a signal of intent to the watching world and set out ambitious investment in science and innovation as part of their industrial strategy.**

This would have beneficial knock-on effects. Research shows that Government investment in R&D 'crowds-in' further private sector investment as well as other productivity boosting effects such as contributing to raising the level of the skills base in the UK, boosting human capital. Research

[15] The Economic Significance of the UK Science Base, Haskel et al for CaSE, 2014
[16] http://blog.sciencecampaign.org.uk/wp-content/uploads/2015/04/CaSE-RD-investment-briefing-April-2015.pdf
[17] http://www.sciencecampaign.org.uk/resource/CaSEEPCEUReport2015.html
[18] Digital Science, Examining the implications of Brexit for the UK research base, 2015
[19] The Role of EU membership on UK science and engineering research, CaSE, 2015
[20] https://www.gov.uk/government/speeches/the-importance-of-industrial-strategy

commissioned by CaSE has shown that every £1 of public investment in R&D raises private sector output by 20p each year in perpetuity[21].

An economic analysis paper published in 2008 on the optimal level of national R&D investment concludes that between 2.3% and 2.6% of GDP "maximizes the long-run impact on productivity growth and is the key to sustained productivity and technology improvements that are becoming more and more necessary to modern economic growth"[22]. A more recent 2014 BIS analysis suggested the UK should aim for 2.9%, the average of our competitors, commenting that "they do not appear to get poor returns on their investment"[23].

To put that level of investment in monetary terms, if the UK were to invest 3% of GDP in R&D, one would expect[24] a third of that to be from the Government, equalling approximately £8.8 billion per year more than is currently invested. This demonstrates that the level of investment in the UK science base could rise substantially without reducing return on investment. The impact of reaching this level of overall investment on the UK's research capacity and output would be transformational. For perspective, the Francis Crick institute at St Pancras will be Europe's largest research institute and has cost approximately £700 million in total.

A cross-government strategy

For the industrial strategy to be truly effective it must have buy-in across government. For instance, industry repeatedly articulates that access to skills is a defining factor in their growth and success. Education, skills and migration policy in the Department for Education and the Home Office must therefore work together to support industrial strategy aims. This works both ways, ensuring that industry play their part in contributing to education and training. Similarly, the aims of the industrial strategy must be reflected in the priorities for the Prime Minister and the Department for Exiting the EU in the Brexit negotiations. This can be extended right across government when considering different industrial sectors, from health, agriculture and transport to defence and the creative industries.

In keeping with the cross-government nature that we believe is essential for the success of the industrial strategy, the Small Business Research Initiative (SBRI) is one example of an initiative that would provide a way to harness the government machine as a whole to support the growth of science and technology based employment in the UK. The SBRI aims to improve the success of small R&D-based businesses in obtaining contracts from government bodies. It enables Government to play an active role in industry policy by harnessing the competitive process, rather than trying to pick individual winners[25]. At present it has patchy uptake across government departments. Therefore as part of the Industrial Strategy the Government could require that SBRI is recognised by all government departments and actively used to increase procurement efficiency and support innovation. The Government could also set a new target rate for government R&D contracts per

[21] 'The Economic Significance of the UK Science Base: a report for the Campaign for Science and Engineering', Haskel, Hughes and Bascavusoglu-Moreau, April 2014

[22] http://www.sciencedirect.com/science/article/pii/S0040162508000383?np=y

[23] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/277090/bis-14-544-insights-from-international-benchmarking-of-the-UK-science-and-innovation-system-bis-analysis-paper-03.pdf

[24] Based on international splits between business and public R&D

[25] http://insight.jbs.cam.ac.uk/assets/Main-report-Creating-markets-for-things-that-dont-exist.pdf

annum going to SMEs[26] and where possible, the program should focus on firms that can prove they will spend on innovation.

There must also be coherence within the Department for Business, Energy and Industrial Strategy (BEIS). Our members span right across the science and engineering sector and in the past they have raised concerns about a disconnect and fragmentation of support for research, innovation and development. BEIS must ensure that the changing landscape and architecture for research and innovation that will result from the Higher Education and Research Bill, and the new strategy for UKRI that will likely follow, are joined up with the industrial strategy. This will help ensure that there is a cohesive strategy for innovation across the whole spectrum of technology readiness levels (TRLs), from concept to product.

A long-term, ambitious strategy

Stability provides long-term confidence to researchers, innovators, businesses and investors. We therefore welcome Greg Clark's comments stating that "an explicit commitment to a sustainable industrial strategy is to aim for stability and predictability". An industrial strategy with commitments that stretch beyond the current political cycle could contribute to making the UK attractive for industry, injecting some much needed stability and reducing some of the additional uncertainty facing companies in light of Brexit.

Building on what is already working well is another way to provide some much needed stability. Although the government is developing a new industrial strategy, they are not starting from scratch. There are some successful structures and programmes in place, including some that sprung from the Coalition Government's industrial strategy, with some still in their very early stages. For instance, initiatives such as the Aerospace Technology Institute and Advanced Propulsion Centre were launched less than three years ago but came with commitments of seven and ten years respectively. In the 2014 Industrial Strategy progress report, John Cridland, then CEO of CBI said "much has been accomplished in the last year but we have barely scratched the surface of what is achievable in the next 30 if the structures now in place are allowed to develop" [27]. The government must therefore engage closely with businesses to understand what is currently working and these aspects should be integrated into the new industrial strategy. This will ensure that the substantial investment of time and money from both government and industry into these kinds of initiatives and structures is not wasted but effectively and efficiently used.

Skills

Science and engineering is a national success story to which every part of the UK contributes and benefits. The science base is as strong as the people in it, not just the institutions and equipment they use. Developing the UK's skills base is a long-term endeavour and there is much work to do. Echoing findings of countless past surveys, the 2015 CBI/Pearson skills survey found that among engineering, science, and hi-tech firms, nearly half (44%) report difficulties in finding experienced recruits with the right STEM skills, particularly high-level STEM skills[28]. This is reflected in the Home Office's Shortage Occupation List where 75% of roles are in STEM[29].

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[26] NESTA 'Buying Power? Is the Small Business Research Initiaitve for procuring R&D driving innovation in the UK?'June 2010 http://www.nesta.org.uk/library/documents/Buying_Power_150610.pdf

[27] Industrial strategy, Government and industry in partnership progress report, 2014

[28] http://news.cbi.org.uk/reports/education-and-skills-survey-2015/education-and-skills-survey-2015/

[29] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/423800/shortage_occupation_list_april_2015.pdf

The Royal Academy of Engineering and Big Innovation Centre estimate that demand for new workers will average 104,000 STEM graduates and 56,000 STEM technicians with NQF Level 3 and above skills in each year between now and 2020[30]. Based on this prediction, the Social Market Foundation (SMF) estimates that there is an annual shortfall in domestic supply of around 40,000 STEM graduates[31]. To close this shortfall with domestic employees, the number of UK STEM graduates would have to increase by around a half. The SMF also points out that this shortfall does not take into account the expected increases in demand for STEM skills that will arise from the Government's mission to promote science and engineering as a strategy to rebalance the economy.

In its international benchmarking study, the Department for Business Innovation and Skills found that the UK's science and innovation system is hampered by weaknesses in its STEM talent base[32]. Failure to meet demand for engineering skills alone is estimated to cost the UK £27 billion a year from 2022[33]. The STEM skills shortage is a major impediment to economic growth. Tackling it could support a wider range of UK citizens to benefit from, enjoy, study and work in science and engineering to help meet our country's own skills needs, provide fulfilling careers for individuals, and well-paid jobs benefiting families, communities and the economy.

Aspects of an industrial strategy will aim to drive competition within the UK and also internationally. However, developing the skills base is an area of the industrial strategy where collaboration, particularly within sectors, could be beneficial. How will the government ensure that this collaboration is facilitated?

Vocational education

In his speech at the Institute of Directors, Greg Clark said "we must make sure that vocational education – especially in engineering and technology – plays a much more prominent role in our country than it has for many years now; and that employers have a decisive role in making sure that skills training is meeting the needs they have to fulfil their order books." Looking specifically at apprenticeships, we support the government's ambitions to create more high quality apprenticeships, and to improve skills across the economy.

STEM apprenticeships can offer great employment and progression routes for young people, allowing them to become productive workers. In general however, those taking apprenticeships experience lower funding, greater complexity, and more variability in quality than university students[34]. However, despite the focus on improving apprenticeships in recent years, STEM apprenticeships have become less popular since 2011 and too few young people are choosing the vocational route into a STEM career[35]. Of the 440,400 apprenticeships started in 2013/14, 65,190 (14.8%) were in STEM. And in overall numbers, there has been a decrease in people taking STEM apprenticeships, down from 70,100 in 2011/12.

These apprenticeships are also not offering training at sufficiently high levels to maximise employer or worker benefits. In 2013/14, only 270 higher level engineering, science or maths apprenticeships were started. The numbers of people going on to finish and qualify with a higher apprenticeship is much lower again, with only 30 in 2013/14. The reality is this route is not yet a viable alternative for young people finishing school and looking for a route into a high quality science and engineering

[30] http://smf.jynk.net/wp-content/uploads/2013/03/Publication-In-The-Balance-The-STEM-human-capital-crunch.pdf
[31] http://smf.jynk.net/wp-content/uploads/2013/03/Publication-In-The-Balance-The-STEM-human-capital-crunch.pdf
[32] https://www.gov.uk/government/publications/science-and-innovation-system-international-benchmarking
[33] http://www.engineeringuk.com/Research/Engineering_UK_Report_2015/
[34] https://www.gov.uk/government/publications/state-of-the-nation-2013
[35] Analysis by CaSE. Data sourced from the Further Education data library, Skills Funding Agency and Department for Business Innovation and Skills (accessed July 2015): https://www.gov.uk/government/statistical-data-sets/fe-data-library-apprenticeships

career. There is the opportunity to change that with the Government's commitment to creating more apprenticeships, including degree apprenticeships. However, it is a broadly held view that in its current form the apprenticeship levy will not help deliver these aims, with many, including CaSE calling for a delay in the implementation of the levy until it is fit for purpose.

There is still an opportunity for the government to closely listen to and work with industry, charities and other stakeholders to ensure apprenticeships policy and funding support the aims well-articulated by Dr Clark. **BEIS must work together with the Department for Education to ensure that apprenticeship targets, funding, scheme rules and programmes are shaped to ensure this substantial funding and effort works together with the aims of the industrial strategy.**

Immigration

The role of immigration must also be considered alongside developing the skills base in the UK. Companies, universities, charities and research institutes alike see the ability to retain, access, move and attract skilled people as an essential pillar of securing a positive outcome for science as the UK leaves the EU.

Much is at stake. Across all sectors, around 6% of employees in the UK are from the EEA[36]. Science and engineering tends to be far more international than the average. A quarter (26%) of academic staff in UK universities are non-UK nationals[37]. In 2013/14, there were more than 22,000 academic workers (12% of the total) from outside of the EU and more than 29,000 from within the EU (16% of the total). Looking specifically at those working in STEM, the percentages are slightly higher, with 13% from outside the EU and 17% from within. The numbers are more difficult to aggregate across industry, however, sectors that are particularly dependent on workers from the EEA include tech start-ups where up to 40% of founders are non-UK EU nationals[38], or in manufacturing, where over 10% of employees are from the EEA[39].

There is fierce global competition for talented people and an active transfer market of scientists, engineers and technicians across the world. Therefore as the UK goes through a period of substantial uncertainty and change there is no room for the UK to be complacent in assuming that global talent, including UK nationals, will continue to see the UK as an attractive place to work or study. Instead **negotiations and domestic policy must work together to create a migration system and environment that actively supports a healthy science and engineering sector.**

Immigration was a major feature of the EU referendum debate, we therefore recognise that this will be a major area of consideration and contention as negotiations develop. We also know, from the example of other nations, that the way in which the UK decides to manage migration will have knock on effects to other aspects of the UK's relationship with the EU including trade, access to research programmes and funding. An overly restrictive migration policy was therefore one of the major risks raised at a recent CaSE discussion forum on transitioning out of the EU, because of the impact it would have on access to talent and how it could lead to a narrowing of the funding, collaboration and trade opportunities open to UK-based individuals and organisations in future. It is therefore impossible to divorce migration policy from building a strong and successful industrial strategy and

[36] http://www.smf.co.uk/publications/working-together-the-impact-of-the-eu-referendum-on-uk-employers/
[37] Engineering Professors' Council analysis of HESA data from the Higher Education Database for Institutions (HEIDI), accessed September 2015
[38] Evidence given to the GLA Budget and Performance Committee by John Spindler, Capital Enterprise (29/9/16)
[39] http://www.smf.co.uk/publications/working-together-the-impact-of-the-eu-referendum-on-uk-employers/

this should be carefully considered by BEIS along with colleagues across government as the strategy and negotiations develop.