Delivering a UK Science and Technology Strategy: consultation response by the Institution of Engineering and Technology

About the Institution of Engineering and Technology (IET)

The IET is one of the world's largest engineering institutions with over 158,000 members in 150 countries. Our aim is to inspire, inform and influence the global engineering community to engineer a better world. We are a diverse home across engineering and technology and share knowledge to engineer solutions to global challenges like climate change. With our roots in electrical engineering, we have been championing engineering solutions and the people who deliver them for 150 years. The IET provides independent, impartial, and expert advice, spanning multiple sectors including Energy, the Built Environment, Transport, Manufacturing and Digital. On behalf of the profession, the IET strives to inform and influence government on a wide range of engineering and technological issues. The organisation's membership spans a broad range of professional knowledge, and regularly offers unbiased, independent, evidence-based advice to policymakers via several channels. We believe that professional guidance, especially in highly technological areas, is critical to good policymaking.

Introduction and summary

The IET welcomes the opportunity to respond to this consultation by the House of Lords Science and Technology Committee on delivering a UK science and technology strategy. The UK has a very strong, competitive science base, however it can improve its capabilities in technology and translation. The research sector is a system of systems that is impacted by policies in a range of areas. A strong educational base and links with industry are crucial but we must also ensure that the UK works collaboratively on a global scale and learns from others who are strong in this area. The UK is financially efficient within its science sector and this should be retained.

- The government should focus on its technology strategy and in particular translating science into a product.
- The strategy must think of the whole system, including education, local policies, and foreign affairs.
- There should be simplification of the system and number of organisations involved in setting the strategy. Key challenges for the UK should be identified as part of a consortium of academia, business, and policy makers.
- The government should support global companies to remain based and grow in the UK.
- Policies should favour collaboration, international cooperation, and networking between researchers.

The UK as a science superpower

The idea of the UK as a strong scientific base has been discussed before, so it is important to learn from history and retain what has worked well in the development of the UK science sector. There is no clear definition of what it would mean for the UK to be a science superpower today. It must

depend on what targets the UK is looking to achieve and what the scale of ambition is. This could be comparative to other countries, for example, achieving a position of top 3 in the global rankings, measurement of exports or economic impact, or in terms of levelling up local areas to establish regional areas of strength such as Cambridge, Bristol, or Dundee. Regardless of which goals are set, it must be measurable and cross-sector. On the whole the IET considers that the UK could already be viewed as a science superpower internationally, however it lags behind as a technological superpower, so there is still progress to make. **The UK can learn from other countries that are making advancement in the science and technology sectors and international collaboration is key to success.**

Whole systems thinking

Science is a complex system of systems. There are a range of interconnecting policies that facilitate a successful science and technology strategy. There must be a strong industrial sector, successful university sector, and sufficient research infrastructure. It requires a world leading education system to develop and encourage STEM (and medical) skills from an early age to ensure that there are individuals there to support the science base now and in the future. **The UK must ensure that it is making careers in these areas attractive to a diverse range of people and valuing creativity and collaboration.** Broader skills are also important, for example, to translate science from academia to businesses. In addition, businesses should support whole career development for employees and include upskilling the workforce in their strategies. **The UK also needs to make it attractive for highly skilled international workers to work in the UK.**

Local policies also have an impact. Areas of scientific strength, for example Cambridge, Dundee, or Oxford, are a combination of having relevant businesses and consultancies in an area of a strong academic scientific base, so that products can quickly be translated to market. Councils and investment in local infrastructure also have a role to play in these areas to ensure that they are as successful as they can be.

The infrastructure and facilities that are available in the UK is an important consideration. Hypothecated funding to ensure that equipment and buildings are maintained and brought up to the necessary standards will underpin successful science. Public sector research establishments can provide central capability at crucial times but do not provide the same function as other research institutes. They should instead be better connected to other research organisations to establish partnerships.

Funding for both research and infrastructure should also be as stable as possible, even if the policy and strategy is periodically reviewed. A large pool of researchers should have the opportunity to apply for research funding.

Complexity of the system

A key area for improvement for the UK science base is to simplify the number of organisations, particularly within government, that oversee the strategy. There could be one body to oversee strategic priorities from government which then delegates allocation of specific funding (as UKRI currently does). **There should be cooperation across government departments to identify challenges that need solutions.** Often confidentiality can be a barrier to communication of key challenges.

It would be beneficial in this process to bring together government, business, and academia from the outset so that feasibility is factored in. Policy can be then set in response to this collaboration which will then ensure strategic objectives are met with consideration of society and business. This approach will also incentivise joint investment from industry.

Public procurement can play a key role in the strategy, particularly with the opportunities provided by a national health service.

Haldane principle

The Haldane principle is important and has been fundamental to the UK's scientific environment for many years; peer review is an important part of the UK's success. However, there are other principles that need to work harmoniously with it. It is also important to ensure that science is supporting the objectives of the UK as a whole, for example with relation to net-zero or ensuring synergies are aligned where appropriate. Businesses also often know what is at the leading edge of science so are useful for priority setting. A combination of bottom up and top-down priority setting is needed as there is a push and pull of information and ideas about what is needed for scientific and technological advancement.

Technology and translational science

There needs to be a better framework for collaboration between academia and industry, with intellectual property being one of the often-cited problems. The process is often lengthy which reduces impact of the work.

As shown by DARPA, intervention can accelerate technology in some areas but it is clear that it is not a broad solution. It is most effective where there is a clear timeliness to success. It is unlikely to be as effective in basic science and large-scale projects.

Access to resource remains a key challenge to companies who wish to develop ideas. Often there will be a successful prototype and early adopters, but it will struggle to take it to the next step and scale. The translational funding gap remains an inhibiting factor to the UK being not just strong as a science base but also as a technological power. **Greater support is needed in this crucial stage of development, but clear criteria must be met to ensure that the product is viable before investment. It must not take a blanket approach to funding to ensure that it can achieve value for money.** Often companies look beyond the UK when they should be supported to develop and build the business with UK ownership. There should also be a greater focus on identifying where there is market failure and evaluate how and if it can be resolved, taking into account consumer drivers.

Incentives for government shares in companies to ensure they remain in the UK once successful should also be considered. Successful companies are largely global, but it still is important where they are based.

Brexit

Since the UK left the EU, researchers have found that one of the biggest impacts on the science sector has been difficulties collaborating with other researchers within the EU. Mitigations have helped this but networking and collaboration between researchers is fundamental to the UK being

world leading. Focus should be given to opportunities for supporting international collaborative research and attracting scientists and engineers from across the world to work with and within the UK.

Interdisciplinary research

There are clear benefits to supporting interdisciplinary research however it is not the solution but a facilitator to a strong science base. It can help to overcome particular barriers for a project in some circumstances. The balance of interdisciplinary research is about right but scientists should continue to be trained in this approach.

Incentives

Success on an individual or local level can look different to what success of the UK looks like as a science superpower. It is important that policies reflect that in order to incentivise the highest skilled researchers or businesses, there needs to be a combination of incentives, for example, investment, shares, professorship, PhD, enterprise fellowships, or intellectual property. All of the pipelines of career development should be connected and transferable to allow for greater collaboration and investment (whether financial or otherwise).

Conclusion

In conclusion, the UK has a strong science base but it could be further strengthened in the area of technology, particularly translational research. A range of interconnecting policies are key to supporting a strong science sector, including support for development of STEM skills, levelling up local areas and supporting international collaboration.

The IET would welcome the opportunity to discuss the UK science strategy further. Please contact sep@theiet.org