CSTI BRIEFING NOTE

DEVELOPING NATIONAL EMERGING TECHNOLOGY STRATEGIES: HEADLINES

CSTI Workshop Series

This briefing note outlines the headline lessons learned from, and emerging practices in, developing national emerging technology strategies. It reflects the views and insights from policymakers, academics, and industrialists that attended a 'Lessons Learned and Emerging Practices' workshop held in London on 10th January, 2017.

A number of national emerging technology strategies have been developed in the UK, including in synthetic biology, composites, and quantum technologies. Several are also currently being developed, including in additive manufacturing, laser-based manufacturing, and smart infrastructure and construction. These particular strategies were selected as a representative sample to focus on in the workshop because they represent strategies that both have been and are in development, and because the technologies they are strategising for: are different types of technology (e.g., production technology vs a material), are at different stages of maturity (e.g., have been exploited to varying degrees), and involve different compositions of actors (e.g., greater vs fewer existing industrial firms). The workshop assembled and gathered insights from government, academic, and industrial personnel associated with these and other strategies.

Many emerging technology strategies (ETS) are community-led initiatives. Generally, they aim to explore an emerging technology and its potential applications, and inform and guide government, academic, and industrial activities to support its development and deployment in new and existing products, processes, and services.

The workshop considered the following specific topics:

» Context, purpose, and scope of national emerging technology strategies
» Governance and management of national emerging technology strategy development and implementation
» Evidence gathering, analysis, and drafting the strategy
» Implementation and influence

> **"Various** technology-based communities in the UK really are very good at getting themselves together and developing a common direction. The number of countries that come to see how we do it is telling. However, we need to create an environment where this can be done well every time and where we make the most of our efforts."
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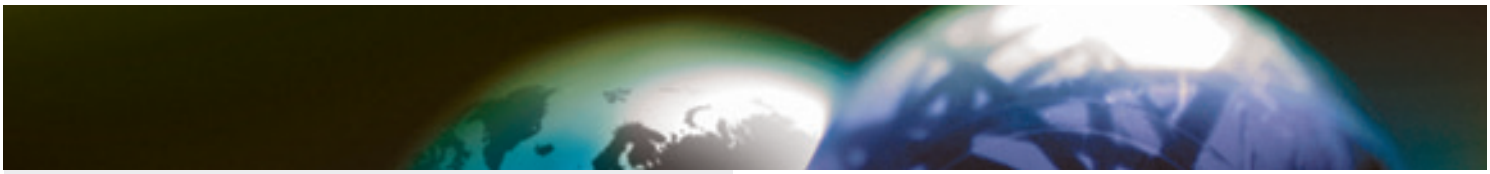
> **Professor David Delpy, former Chief Executive of the Engineering and Physical Sciences Research Council**

These strategies are relevant and pertinent for the UK Government's industrial strategy announcements, in particular the Industrial Strategy Challenge Fund; for the continuing evolution of UK Reseach and Innovation; and for government policy relating to emerging technologies.

Key messages

- **There is no guidance available in any condensed and explanatory form for those who wish to commission, or those tasked with creating, an ETS.** There is, however, a demand for such guidance, especially about how to design and implement an ETS in a way that is sensitive to its context and that has a positive impact.
- **The context is critical to the nature of any ETS, to the tasks it must deliver and the way that it meshes with the needs and aspirations of its research and industrial stakeholders.** The maturity of the technology and the maturity of the industry supply chains in which they will be deployed are key determinants of the purpose, structure, and content of an ETS.
- **Exercises aimed at developing ETSs need to place an emphasis on convening the community.** An emerging technology may require deployment by industries where the community is yet to be formed, where clearly defined structures, supply chains, and power balances have not yet been established. In such cases, the creation of the ETS plays a key role in convening researchers, technology developers, and industrial partners in ways that accelerate the establishment and evolution of the industry and the location of key value adding activities. The group that creates the ETS may simultaneously be a central decision fora and catalyse industry development.



- **Convening is still important if the emerging technology is likely to be deployed in an existing industry.** An emerging technology may be deployed in established industries, potentially many in parallel. In these cases established industry communication channels may align de facto industry leaders and opinion formers. Where this is the case, the process of creating an ETS must engage such people. An ETS can open up new opportunities to build relationships and communication between industries by helping to span sectors.
- **The crafting of an ETS is valuable in its own right and is broader than, but includes, 'the published strategy'.** This is especially important in instances where the strategy envisages capabilities being developed in one sector/cluster that can create further value by cascading to other sectors/clusters.
- **An ETS needs to present a vision to which key stakeholders can subscribe and implement.** A vision provides direction, but needs to be flexible enough to enable those delivering the strategy to adapt their plans to circumstances, to available funding, and to the changing priorities that are inevitable over the lifetime of an ETS.
- **Creating an ETS requires strict expectation management and where it cannot be managed, it should be set up to generate discussion about what is needed.** An ETS will never meet everyone's expectation of what a strategy is or what it should contain. Expectations should be managed through stakeholder engagement. Where this cannot be managed, those developing the strategy should use it to generate a conversation about what needs to be done and how the strategy might evolve. This is often the case in a 'strategy document', which – because of its static, explicit nature – often invokes a response from relevant actors.
- **An ETS must have the hallmarks of legitimacy to succeed.** It must have a clear rationale for its existence and clear backing from the opinion formers and leaders in government, the research community, and the industrial community. The formulation of future action must have demonstrably engaged with the people who have to make it happen. Furthermore, an ETS must be underpinned by data which is sound and of demonstrable provenance, and it should support the arguments that justify the actions and the feasibility of the vision.
- **Hard data on which to build a strategy is often difficult to come by for emerging technologies.** By definition for an emerging technology, forecasts will be of low certainty and potentially 'hyped'. Furthermore, most sources of data and information will have their own agenda. However, because one of the key roles of an ETS is to support decision making, ensuring a robust underpinning data set is critically important to the value and credibility of the strategy. The data embedded in such ETS documents (or their appendices) are often recycled for other purposes for years to come, making data provenance vital.
- **The format of a publication describing an ETS matters.** It must have a brief summary, preferably skilfully diagrammed, so it can be quickly absorbed and promulgated by senior and busy stakeholders. That summary must set out the primary vision and the key elements of the strategic actions required. Supporting this summary, the core of the strategy document should lay out a menu of actions required to deliver the strategy.
- **The development of a strategy will often entail the creation of a leadership forum; in other cases there may already be an appropriate body within industry.** This leadership body can become a single point of contact that can interface with a diverse group of stakeholders, can become a vehicle for coordinating activity and convening audiences, and typically becomes the obvious candidate to lead strategy implementation.
- **As the implementation phase begins the 'leadership body' needs to change.** It continues to have important roles advising, steering and acting as an advocate but the operational management role is best delegated to a clearly accountable function. This mirroring of the corporate roles of 'board' and 'chief executive' clarifies the split of function and enables greater agility and effectiveness in management of funding and delivery of the strategy.

For programme information
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The Centre for Science, Technology and Innovation Policy
Led by Dr Eoin O'Sullivan, the centre carries out applied research exploring what makes national innovation systems effective at translating new science and engineering ideas into novel technologies and emerging industries.

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This document should not be taken as representative of the opinions of any individual attendee, except where cited otherwise.