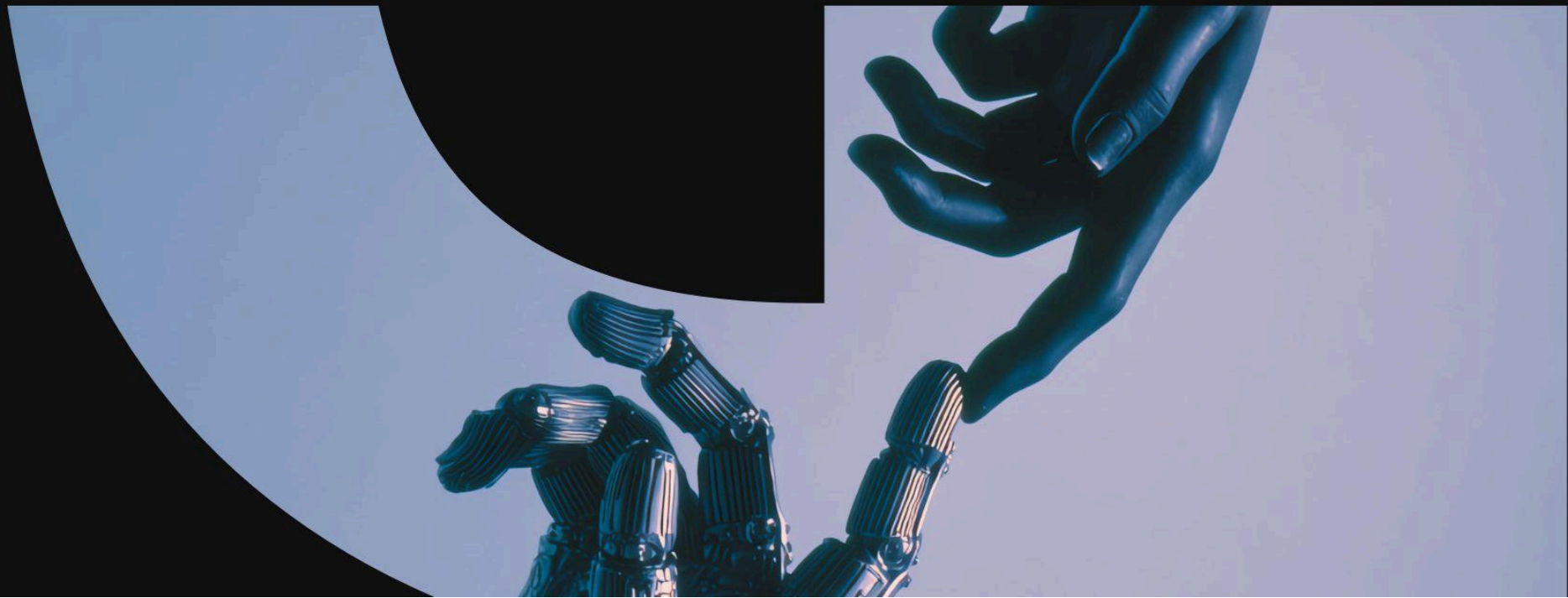
Transformative Technologies

sciencewise



How can public discussions help shape the agenda of Transformative Technologies?

Transformative technologies are described as disruptive, foundational innovations that fundamentally alter existing paradigms, industries, and human potential. Key areas of interest include next-generation nuclear energy, and quantum systems. As an area of increasing government interest and financial investment in the UK, innovation has the potential to impact upon society in profound ways. However, the transformational potential means there is a need to consider how investment, adoption and deployment are done in a societally responsible and ethical manner.

To ensure that transformative technologies benefit society and that the social and ethical risks are properly regulated, there is a need to start the conversation with the public early on.

UKRI's Sciencewise programme has run public dialogues on transformative technologies including solar radiation modification and the future of flight.

To build on the conversations spearheaded by this work and the growing momentum behind engagement in the transformative technologies sector, in January 2026 Sciencewise brought together leaders from UK universities, research funders, civil society, and policymakers **to discuss how the UK public can shape the transformative technology agenda, in particular in relation to research funding, governance and policy.**

In this roundtable discussion, professionals discussed how the scientific community could start a more open and inclusive discussion with the public about the investment principles and research priorities underpinning transformative technologies, meaningfully considering tensions and challenges as well as potential benefits. Many comments and views expressed were about the nature of public engagement generally and are relevant to different areas of research and innovation.

Key messages

1. Transformative Technology funding uses a high-risk high-reward model which has the potential to contribute to the declining trust in institutions. Funding models within this space are speculative and centred on investing significant amounts of money on innovation at the early stages where there is an expectation many projects will fail, but a few may be transformative. The use of public funds in scientific areas which have the potential for impacts upon society in disruptive ways, and on timescales more rapid than previously conceived, also carries the **risk of contributing to an ongoing declining trust in institutions**.

2. There is an increased need to ensure public perspectives are incorporated from the start. As the transformative technologies research ecosystem operates on a global scale, there is a need for the public dialogue community to think about their projects on that level too. The distribution of funds, impact of programmes, and research collaborations in this sector are more skewed towards a global approach. **Considerations of global contexts** in public dialogue and engagement must be a priority.

3. A **shift in mindsets** is still needed towards the value of public engagement as being centred upon impacting and shaping more socially responsible governance of research areas in contrast to top down models which can be perceived as tokenistic. With many decision makers within the sector inclined to ask for public engagement at the end of innovation and development timelines, there is limited opportunity for the public to input into decision making.

4. There is a need to build a **better coordinated system between the Transformative Technology research funders and the engagement community** to ensure social responsibility is grounded in ensuring trustworthiness of decisions, regulation, and priorities. There is also a need for the sector to **better evidence outcome driven impact** showcasing how people's involvement and feedback can influence research and innovation.

Transformative Technologies: current context

Innovation in science and technology is seen as being critical to ensuring the UK's economic growth and prosperity, and addressing societal challenges.

In the UK, recent years have seen an increased demand and interest for a high-risk high-reward (HRHR) approach in research funding, with the creation of the Advanced Research and Invention Agency (ARIA) and funding schemes such as BBSRC's transformative tech call or NERC's pushing frontiers. These programmes support innovative projects that have a significant possibility of failure but also the potential for groundbreaking discoveries that could fundamentally change a field and pave the way for leaps forward, progressing research and development. Since the creation of the US agency DARPA in the 1950s, HRHR research funding models have been adopted in the USA, but are still new in a UK context where funding culture and public acceptability towards risk in investment differs.

These potentially disruptive technologies could have major implications for society and its future, fundamentally altering business models, societal norms and scientific capabilities. They also, by definition, have unpredictable returns and a high risk of failing to fulfil their potential.

Many HRHR research funding mechanisms are increasingly based on or heavily inspired by venture capital (VC) models. While traditional academic research funding often prioritizes low risk and incremental progress, VC-style research funding is designed to foster disruptive innovation by accepting a high probability of failure in exchange for potential breakthrough, transformative outcomes.

Despite this, given the investment of public funds into models of research funding with high risk of failure, it is important to consider public engagement as a significant element of agenda setting in the responsible development of early-stage technologies.

How does declining trust in institutions affect how publics participate in dialogue?

Public trust in government institutions is at a record low and continues to decline.[1] The primary purpose of public dialogues is to impact the trustworthiness of decisions. Participants highlighted that declining trust in institutions however impacts the willingness for the public to engage in dialogue processes, and the effectiveness of participation. The need to consider society as a stakeholder in the decision making process was pointed out as important. Simultaneously, one of the key challenges brought forward was gaining senior buy-in in a resource and time-pressured environment, crucial to foster support for the implementation of any changes recommended as a result of findings.

Previous work has demonstrated trust can be affected by a range of factors. NESTA's AI Social Readiness project,[2] as well as many projects run by the Ada Lovelace Institute.[3] Motivations and financial investment profiles, institutional affiliations and long standing reputation are some factors amongst many identified.

Trust in researchers and research institutions was highlighted as being important in this dynamic. Participants highlighted that without sufficient public engagement there is a risk transformative technologies might exacerbate declining trust. Dialogue was considered a minimum, but true co-design with impacted communities is often seen as more legitimate, and can impact upon how researchers chose to conduct their work, as well as what to prioritise. Public dialogue efforts were advocated for as starting points for longer term work within sectors.

The opportunity for public engagement at early stages of research

In the context of Transformative Technologies, most funds are distributed through a 'high risk/high reward' approach. With a high chance of failure, and many being emerging technologies, the discussion between funders and engagement professionals highlighted a gap that needs to be addressed by the engagement

1. British Social Attitudes 41 | Damaged Politics?, NatCen.
2. AI Social Readiness, NESTA
3. The Rule of Trust, Ada Lovelace Institute

community to better articulate the need for bringing the public along the innovation journey away from value laden principles and more towards economic and societal arguments. Participants highlighted that the journey to implementation or adoption was long, and a lack of institutional buy-in for early public engagement was rooted in the views of senior stakeholders and decision makers who felt the time for engagement is once products reach application stages. Even in instances where funders have a high level of freedom, the justifications for public engagement are unclear and often purely value-driven, with policy levers to encourage early engagement being limited. Those in the room with public engagement backgrounds pointed out that quite often the scope is decided early on and there is only space for final tweaks when the public are consulted at application and adoption stages.

Participants highlighted the need to use different approaches at different stages and at different grades of potential controversy, for example ensuring the public engage in higher levels of decision making and engagement in areas where potential for controversy is high. As the conversation developed, the importance of public engagement literacy for the broad research and innovation ecosystem was revealed as a key missing element, and an area where work is needed. Many funders and decision makers have a gap in their understanding of the purpose and value of public engagement at different stages in the technology development life cycle. Participants highlighted the lack of guidance on organisations and programmes which provide support.

Business models, motivation and industry: impact upon institutional trustworthiness

Within models of technology development, funding models which have been adopted as high-risk high-reward take inspiration from venture capital approaches leading to many questions on business models, and in particular who profits. Participants highlighted that the origin of much of the research which falls under transformative technology calls tends to be an idea by the research funders with limited opportunity for deliberate thought into applications, use cases, nor impacts upon society. They tend to catalyse blue skies research with agendas centred on the application of technology within society and its transformative potential but

commercialisation is not often a part of the conversation from the start, even if the aim and final outcome is financial benefit. There is an increasing tension as more of this investment is fed into markets outside the traditional public research sector, most commonly start ups.

Participants explored the emergent nature of innovation funded through high-risk high-reward funding mechanisms as having heightened potential for concern which might arise related to dual-use. Participants pointed to evidence which suggests the public are more likely to trust innovation and research when conducted by public institutions such as universities and less trusting of research conducted by commercial organisations or conducted for commercial interest such as university spin out companies.

A broader scale is required

On topics where research is conducted and funding is distributed globally, there is a need to consider complementary dialogues internationally and/or one dialogue on a continental or global scale. Dialogue processes have grown in scale over recent years, and in the case of innovation and/or research funding which impacts other countries, participants felt it important to ensure perspectives of these groups are brought into the conversation, in particular shaping research governance models which embeds public values. Furthermore, when research is done in collaboration with other countries where public trust in institutions might be low, research funders in the room highlighted the heightened awareness of potential concern amongst the community in their own decisions. There was recognition that considerations of engagement should be a part of due diligence processes when working on an international scale. UKRI's Trusted Research and Innovation framework[4] successfully outlines ways in which research can be conducted with integrity and under strong ethical frameworks. Participants highlighted a gap in work being conducted in this space, and the need for more support in this area.

There is a need to consider the role and value of broad scale dialogue efforts. Participants noted that despite AI being a part of a solution, there are many sensitivities and potential for mistrust in AI

4. Trusted Research and Innovation Framework, UKRI

and publics. Participants highlighted that a broad scale dialogue incorporating primarily online mechanisms potentially alongside the use of other novel technologies might not provide legitimacy due to mistrust in the process and lack of rigour. This was considered particularly true when evaluating processes from an inclusion lens. Participants voiced concern that engaging 1000 participants with similar social backgrounds and/or political views and interests does not add much to the dialogue compared to 100 people of similar demographics and positioning along the political spectrum.

In contrast, participants did highlight the value of longitudinal engagement – dialogue conducted over long periods of time, typically more than a year. They emphasized the importance of understanding people's evolution of views both when presented with information, but also as they speak to others within their networks.

Focussing on systemic change over dissemination

Participants expressed a desire for the impacts of public engagement to be centred on ensuring systemic changes are achieved, as opposed to simply producing outputs to be used within dissemination and communications. In the case of Transformative Technologies, there is heightened risk of public backlash to decisions due to their disruptive nature and the speed in which they have the potential to be implemented or applied. Public engagement is not simply about understanding where the public are, but also ensuring they have a say when the scientific approach and mechanism of research funding is changing.

Participants felt this helped in legitimising processes and ensuring the purpose of public dialogue and engagement is repositioned in the minds of decision makers. ARIA's climate cooling programme[5] was highlighted as a positive case study. The contributors explained that while public engagement was mandated for outdoor experiments from the outset, some projects did not include funding for engagement activities in their initial grant applications. With reflection on public concern, the programme team realised that dedicated resources and investment was needed to support teams to undertake this work.[6] In particular, the programme team embedded learnings from

5. Climate Cooling Programme, Advanced Research and Invention Agency
6. Exploring Options for Actively Cooling the Earth, Advanced Research and Invention Agency

ongoing engagement that some funded teams were already doing. The contributors shared that they value public engagement as they have found it to be useful in both managing risk and bringing affected communities with them, as well as valuing their knowledge base to help inform the technical aspects of the experiments. Furthermore, an oversight committee has been developed for ethical governance.

Power asymmetries were brought forward as an important focus to ensure outcomes were prioritised. A case study highlighted included RAEng citizen panels to be set up across the country so that people can have a voice in what the academy does. Standing panels, popular in Belgium[7], were seen as useful in having views into people's insights more regularly.

Failing to engage: what are the risks?

Participants outlined the risk of not engaging. There is a lack of resources and time for funders to engage with the topic constructively in an ecosystem with many competing priorities. Long term resilience of investments was a high concern and without the public on board, potential for reversals in policies and spending decisions, as well as long term lack of adoption of innovative products are high. Participants also pointed out a need to consider the level of conversations and national or international level public dialogue simply being a starting point. In vast areas such as AI or Engineering Biology, there often needs to be follow up and a continuous dialogue with the public after large scale public dialogue processes are complete to ensure legitimacy and transparency in future work, as well as being able to dig deeper into sub-topics.

Participants ended the discussion with consideration of what better investment decisions look like. They brought up the value of considering the public as a stakeholder through questioning who gets to decide what better means.

7. Institutionalising Deliberative Democracy, Bertelsmann Siftung

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About Sciencewise

Sciencewise is a UKRI funded public engagement and public dialogue programme that supports government departments and other public bodies to listen to and act on diverse voices, to shape policy and priorities.

Important benefits of the programme include:

- Helping decision makers to formulate policy with a deeper understanding of public views, concerns and aspirations;
- Supporting high quality, best practice public dialogue; and
- Bringing credibility and independence to government-led public dialogue projects.

Since 2004, Sciencewise has supported over 80 public dialogue projects on often controversial technologies and cross-cutting issues of societal change, from AI, gene editing, and climate technology to low-carbon growth and the future of food production. The programme is run in a partnership between UKRI and a consortium led by democracy charity Involve, with the British Science Association (BSA) and National Co-ordinating Centre for Public Engagement (NCCPE).