Royal Academy of Engineering

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UK Innovation Infrastructure for Deep Tech Scaleups

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1. Executive summary

Executive summary: innovation infrastructure for scaleup and growth

The UK's shared innovation infrastructure is a significant national asset. It encompasses specialist facilities, equipment, technical expertise and supporting services provided by universities, Catapult Centres, Public Sector Research Establishments (PSREs), Research and Technology Organisations (RTOs), and commercial providers. Together, these organisations help deep tech companies progress from proof of concept through testing, validation, demonstration, piloting and early manufacturing. This infrastructure is particularly important for deep tech companies, which are typically more capital, research and time intensive than other technology businesses. Commercialising deep technologies often requires access to expensive equipment, specialist laboratories, pilot lines, testbeds, regulatory-grade processes and highly skilled technical staff before reliable revenues have been established. Building these capabilities in-house is often neither affordable nor practical, particularly for SMEs and scaleups facing constrained funding pathways, restrictions on the use of grants for capital expenditure and limited access to patient capital.

These infrastructure constraints form part of the broader scaleup challenge facing the UK and much of Europe. The UK's thriving early-stage deep tech ecosystem produces promising start-ups and university spinouts, supported by world-leading research-intensive universities and high-growth clusters in London and the Golden Triangle, Bristol, Liverpool, Glasgow, Edinburgh and South Wales, among others. However, these strengths are not consistently matched by the finance, infrastructure, skills, market access and other conditions required for companies to scale. As a result, some businesses move operations, manufacturing or ownership overseas, particularly to the United States, where greater capital and scaleup support may be available. The UK consequently risks losing a substantial share of the value created by its research base, including critical capabilities, supply chains, growth, productivity and high-quality jobs, as well as strategic advantage in emerging technologies.

Shared facilities help address this challenge by reducing upfront capital requirements and enabling companies to access capabilities as they progress through technology readiness levels (TRLs). They are particularly important at mid-to-later TRLs, where companies must move beyond laboratory proof of concept into validation, demonstration, piloting and manufacturing readiness. By providing specialist facilities and expertise, they generate evidence that builds confidence among customers, investors and regulators. In doing so, they bridge a critical gap between research and commercial deployment, where costs and technical risks increase but private finance may remain insufficient.

The benefits of innovation infrastructure extend beyond individual companies, providing horizontal support across sectors, regions and supply chains. These capabilities can bolster regional clusters, connect businesses with research institutions and supply chains, develop specialist skills, attract inward investment and enable knowledge exchange between industry, academia and government. Successful enterprises create demand for suppliers, talent and complementary services, helping to catalyse further business formation and economic growth.

Optimising the UK's innovation infrastructure is a critical opportunity to strengthen long-term growth, productivity and resilience. By helping more deep tech companies scale domestically, these assets can support the development of strategic capabilities, anchor high-value economic activity in regions across the UK, and increase the nation's ability to compete in a rapidly evolving technological landscape.

The evidence presented in this report shows that the UK's shared innovation infrastructure delivers significant value, but that companies and infrastructure providers encounter a series of barriers and tensions across the journey from discovery, to access, to utilisation. These challenges do not diminish the importance of the infrastructure network, but they do limit its effectiveness and the value the UK captures from the assets it has built. The following sections summarise the report's key findings on the challenges experienced by both users and providers of infrastructure, alongside the opportunities and recommendations for government, funders, infrastructure operators and industry to create a more coordinated, accessible and scaleup-ready system. Progress on the report's 23 recommendations should be reviewed in 12 to 18 months time from adoption.

More coordinated, navigable and strategic infrastructure

The UK has a broad and valuable network of shared innovation infrastructure, but it does not yet operate consistently as a coherent national system. Facilities are distributed across a range of different governance and operational types, each with different purposes, access models and ways of describing their capabilities. For deep tech companies, this can make it difficult to identify the right facility, assess its technical suitability and understand how to engage. Businesses often depend on existing relationships, informal referrals and knowledge of individual institutions rather than clear, joined-up routes through the network. These problems become more acute when a company needs to combine capabilities from several providers or determine whether a genuine gap in domestic provision exists.

Providers similarly lack a comprehensive view of complementary facilities, emerging company needs and demand across the network. Limited coordination and weak supply-and-demand signalling can result in missed referrals, underused capacity and, in some cases, unnecessary duplication. The absence of consistent data on utilisation, availability, condition and future demand also makes it harder for government and funders to decide where capabilities should be maintained, expanded or developed.

The Opportunity: Connect and communicate the existing landscape more effectively.

A dedicated national coordination function would provide clearer leadership, supported by sector-specific infrastructure roadmaps and regular analysis of capability gaps, demand and emerging technology needs. A central registry or connected discovery platform, using consistent and industry-readable descriptions of facilities, could help companies understand what capability exists, where it is located, what development stages it supports and how it can be accessed. Stronger referral arrangements between providers would help companies move through the network and access combinations of facilities, expertise and support without having to navigate each organisation independently.

Better data on capacity, utilisation and demand would also support more strategic investment. Government and funders could distinguish more clearly between capabilities that are genuinely absent, those that exist but are difficult to discover or access, and those requiring investment to remain technically relevant. This would help the UK direct resources towards areas of greatest economic and strategic value while making fuller use of the considerable assets already in place.

Read Recommendations 1-9 for improving coordination, visibility and capability signalling of the UK's innovation infrastructure system.

Agile access for dynamic deep tech businesses

Identifying a suitable facility does not guarantee that a company can access it at the right time or on workable terms. Deep tech SMEs and scaleups can face high or unclear costs, complex due diligence, lengthy grant processes and inconsistent approaches to contracting, intellectual property and data. These requirements often serve legitimate legal, safety and institutional purposes, but their cumulative effect can delay projects and increase transaction costs.

Pace is particularly important for deep tech companies operating within constrained funding pathways and narrow investor, customer and regulatory windows. Delays in testing, validation or demonstration can interrupt technical progress, postpone investment milestones, weaken customer confidence and allow international competitors to gain advantage. Larger businesses are generally better able to pay directly, absorb transaction costs and establish long-term partnerships. SMEs are more likely to depend on competitive grants or subsidised programmes, which can provide valuable support but may not align with immediate commercial and technical timelines.

The nature of industry-facing support can also vary. Some facilities provide integrated access to

equipment, specialist staff, project management and commercialisation expertise. Others primarily provide access to physical assets or operate through research-led collaborations. Companies can therefore find that nominally available infrastructure does not provide the continuity, specialist assistance or operating flexibility needed for iterative scaleup activity.

The Opportunity: Provide a more differentiated range of access and support models.

Collaborative R&D and grant-funded partnerships should remain available where they enable knowledge exchange, shared technical development and wider public benefit. Alongside these routes, providers should be supported to offer rapid initial scoping, short-cycle testing, confidential fee-for-service work and flexible access for companies that need to move quickly. Clearer pricing, service standards, intellectual property arrangements, eligibility requirements and indicative timelines would allow companies to plan with greater confidence.

Public funding and provider incentives should better reflect the circumstances of deep tech SMEs, including their limited ability to fund later-stage infrastructure access before revenues are established. More agile funding mechanisms, proportionate due diligence and targeted support for access costs could help promising companies engage without requiring every project to pass through a lengthy consortium or grant process.

Widening industry-facing support should not mean requiring every publicly funded or university facility to operate as a commercial service. Facilities intended to support scaleup should instead have explicit industry-facing missions, appropriate operating models and clear routes for business engagement. Improved referrals would allow research-led facilities to direct companies towards providers better equipped to deliver industrial-scale, time-sensitive or regulatory-grade support.

Read Recommendations 10-15 for improving flexibility, speed and fairness of access to the UK's shared innovation infrastructure.

Reliable delivery depends on sustainable, industry-ready providers

After securing access, deep tech companies must then be able to use facilities reliably, effectively and at commercial pace. This requires continuity of access, well-maintained equipment, iterative testing environments and specialist staff who can operate facilities, adapt processes and troubleshoot complex technical problems. Where staffing, funding and operating models are not designed for sustained industrial engagement, effective utilisation can remain uneven.

Many relevant facilities are based within research-intensive universities, where they make an essential contribution to research, teaching and early-stage innovation. Tensions can arise, however, when research-led facilities are also expected to support commercial scaleup without corresponding changes to their mission or operating model.

Challenges in technical support and equipment reliability present further challenges. Some facilities lack dedicated technicians and application specialists with experience of later-stage industrial processes, while skills shortages are particularly acute in sectors such as semiconductors and quantum technologies. Multi-user equipment may require repeated calibration and setup increasing costs and delaying outcomes. These operational pressures are reinforced by funding models that support capital investment more consistently than maintenance, consumables, upgrades and specialist staff. Short-term funding cycles make it difficult for providers to plan, retain expertise and keep facilities reliable and technically current. Inconsistent intellectual property, contracting and security arrangements can create additional uncertainty for companies and investors, particularly around data ownership, background IP and confidentiality.

The Opportunity: Align facilities more clearly with their intended purpose.

Universities, RTOs and national laboratories should distinguish between research-focused facilities and those with a substantive industry-facing role. Facilities targeting scaleups should have clear missions, accountable leadership and operating models designed around industrial availability, reliability and outcomes. Alternative governance arrangements may offer greater commercial responsiveness while retaining links to academic expertise.

Government and funders should provide long-term, predictable support covering the full infrastructure lifecycle, including maintenance, upgrades, digital systems and technical staffing. Providers should invest in dedicated technicians and application specialists, structured maintenance and calibration, and more predictable access for industrial users. Stronger collaboration and referral between facilities could also help providers share expertise, capacity and risk.

Finally, more consistent IP frameworks, template agreements and trusted security arrangements would reduce negotiation and build confidence. Commercial, IP-light access models should be supported where they can complement public provision.

Read Recommendations 16-23 for improving reliability, capability and the long-term sustainability of the UK's innovation infrastructure.

Turning national assets into a strategic advantage

The UK government's Industrial Strategy provides an important opportunity to strengthen long-term economic growth by improving our ability to turn world-class research and innovation into globally competitive businesses. Shared innovation infrastructure will be central to achieving this ambition. Its priorities should be translated into a coherent, long-term approach that identifies where the UK intends to build and retain strategic capability, how different facilities contribute collectively across the scaleup journey, and how public and private investment can align around areas of national comparative advantage.

Shared innovation infrastructure cannot, on its own, solve the UK's deep tech scaleup challenge. Companies also require access to finance, skilled talent, proportionate regulation, enabling infrastructure, suitable commercial space, procurement opportunities and routes to market. However, for many deep tech sectors, access to specialist facilities, equipment and expertise is increasingly a prerequisite for commercialisation, validation, demonstration, piloting and early manufacturing. Without these capabilities, many innovative businesses will struggle to scale regardless of their technological potential.

The UK already possesses many of the assets needed to support world-leading deep tech sectors. The challenge is not starting from scratch, but ensuring those assets operate as a more connected, accessible and scaleup-ready system. Done well, shared innovation infrastructure can reduce risk, crowd in investment, anchor supply chains, strengthen regional clusters and help retain the economic and strategic value created by UK innovation. It can become a platform for building sovereign capability in critical technologies, improving national resilience and creating the next generation of globally competitive companies. If government, funders, infrastructure providers and industry can work together to improve how facilities are discovered, accessed, utilised and sustained, the UK will be better placed to convert scientific excellence into growth, productivity, high-value jobs and long-term competitive advantage. If not, the UK risks continuing to generate promising technologies and companies while a growing share of their scaleup, manufacturing and value creation occurs elsewhere. The priority now is to build on the UK's strong foundations with the clarity, coordination and long-term commitment needed to help more deep tech companies grow and remain in the UK.

2. The critical role of innovation infrastructure

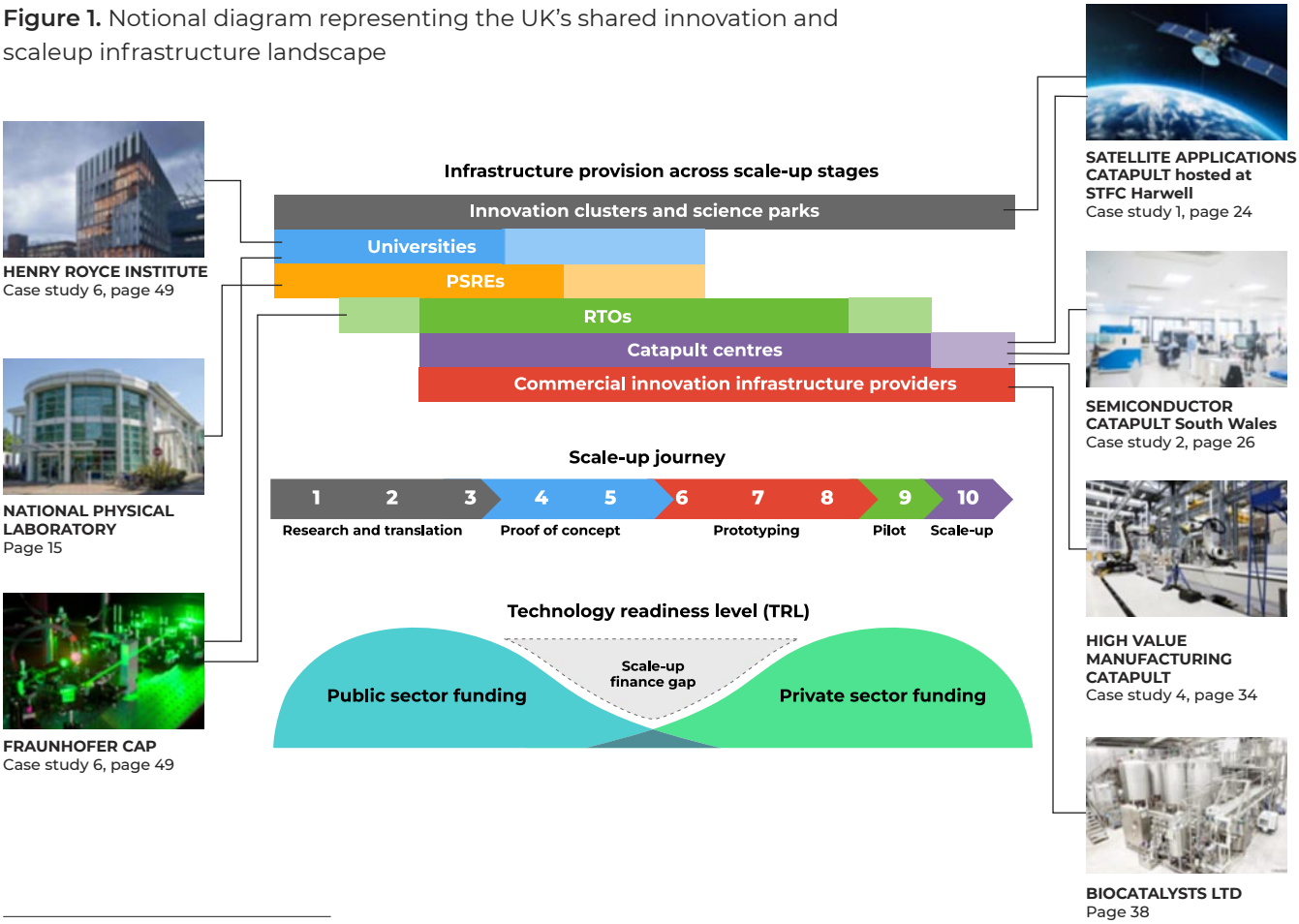
2.1. UK's network of shared innovation infrastructure

Shared innovation infrastructure in the UK refers to the national network of open-access facilities, equipment, skills, and expertise that can be accessed by businesses to help accelerate their commercialisation and scaling journey while critically reducing cost, risk and capital barriers.* These infrastructures facilitate the technical validation, demonstration, piloting and scaleup of industry's novel technologies, products and processes, bridging the path for innovations from proof of concept to market. [1]

The UK's network of shared innovation infrastructure is extensive and diverse. These organisations can vary significantly with respect to their governance, mission, operating models, capabilities, funding, access pricing, IP frameworks, specific TRL focus, geographical location and sector focus. The network spans shared or open access facilities operated by universities, Catapult Centres, Public Sector Research Establishments (PSREs), specialist Research and Technology Organisations (RTOs) and private commercial providers. Funding for these facilities ranges from private commercially funded operations to mixed models like the Catapults thirds funding model and more public grant funded national lab facilities. A simplified view of UK's landscape of innovation and scaleup infrastructure provision is given in Figure 1, with example infrastructures annotated.

The infrastructure landscape map illustrates how the different broad groupings of organisations support companies at various stages of technology readiness level (TRL), as well as through their scaleup journey and across the scaleup finance gap. The relative positioning of these broad groups is a generalisation, with important differences, nuances and outliers existing in many cases. The diagram's annotations showcase examples of innovation infrastructure, demonstrating some of these nuances in TRL support within groupings, as well as the overall diversity across the network.

Figure 1. Notional diagram representing the UK's shared innovation and scaleup infrastructure landscape



* Box 1 on page 19 describes the paper's scope and definitions in more detail, including project definitions for shared infrastructure, open-access facilities, and scaleup.

Figure 1 demonstrates the critical role that innovation infrastructure has in supporting companies who have progressed to the proof-of-concept phase and beyond (beyond TRL-3). Because of this focus, innovation infrastructure that exclusively supports start-up and earlier-stage businesses in the form of incubators, accelerators and grow-on spaces that typically focus on research and translational support are not included. These types of infrastructure can play an important role in supporting businesses to scaleup, but it is typically not their primary purpose.

There is no comprehensive map available of the UK's entire research and innovation infrastructure network, although there are several useful resources such as UK Research and Innovation's (UKRI) infrastructure landscape analysis,[1] and Department for Science, Innovation and Technology's (DSIT) Innovation Clusters Map.[2] Further details of past and current mapping exercises are provided in Box 2.

What does the UK's shared innovation infrastructure do and how does it support deep tech scaleups?

Across universities, PSREs, Catapult Centres, RTOs and private providers, shared innovation infrastructure varies in governance and business model but converges on a set of features that collectively bridge the high-risk gap from prototype to market. The summary below pairs these features with the outcomes they enable for deep tech SMEs and scale-ups, particularly beyond TRL-3.

2.2. Why deep tech?

Deep tech companies develop emerging and novel technologies in sectors like advanced materials, engineering biology, semiconductors, space, robotics, quantum and photonics.

Innovation infrastructure defining feature	What this enables for deep tech scaleups
Open access These facilities operate on fair access models that allow multiple users to utilise equipment and expertise without needing to build costly in-house capabilities. Fair access means that facilities operate under clear, transparent and non-discriminatory conditions that allow companies to use infrastructure on reasonable and proportionate terms.	**Reducing capital requirements** Shared access to expensive infrastructure, facilities and equipment can reduce the need for high amounts of upfront capital expenditure and de-risks the scaling process. Where fair access terms are available, innovation infrastructure can provide good value for money where the alternative is high-CapEx expenditure often without sufficient public or private investment. **Example:** The Henry Royce Institute is the UK's national centre for research and innovation in advanced materials with facilities across several sites and universities. It provides deep tech SME's shared access to state-of-the-art materials characterisation and prototyping equipment critical to testing, validation and demonstration that would otherwise be too costly and inconvenient to invest in.[3] For a majority of hardware developing deep tech companies, characterisation instrumentation available at the Royce is valuable across multiple TRLs.

Innovation infrastructure defining feature	What this enables for deep tech scaleups
Specialised facilities for late-stage R&D They host advanced laboratories, pilot-scale environments, testbeds and manufacturing lines that support higher TRLs, where businesses face the steepest costs and investors the greatest risks. Outside of technical provision, these facilities frequently provide specialist capabilities to support with readiness in accreditation, regulatory compliance and quality systems.	**Technical validation, demonstration and scaling** Innovation facilities allow critical access to specialised equipment, hardware and environments for the specific requirements needed by deep tech companies scaling their technologies and processes. Shared infrastructure is often necessary for successful navigation of late-stage R&D, beyond TRL-3 and market readiness (or the "valley of death"). Facilities are key to providing support with translation, demonstration, commercialisation and scaleup of deep technologies and includes the likes of demonstrators, pilot production lines, test beds and large-scale manufacturing facilities. Comercialisability, scalability, credibility, quality and regulatory approval of deep tech products are all areas that can be scrutinised by funders and investors continually throughout the growth of these businesses. Innovation infrastructure can allow for these factors to be demonstrated, accelerating entry to specific markets. **Example:** Space Solar, a deep tech SME developing satellites capable of solar power transmission relied on the Satellite Application Catapult's unique facilities on its commercialisation journey so far. **See case study 1**
Expert support and skills Beyond equipment, these organisations provide highly skilled technical staff, domain specialists and operational support teams who help companies interpret results, refine processes, and navigate technical challenges.	**Supporting network** Access to expertise, skills, networks, business support and collaborations are invaluable for deep tech SMEs, not only for the scaleup of their technologies but for the development of their own talent and skills base. **Example: See case study 6.**
Collaborative environment and clustering Co-location with research institutions and industry partners that enables cross-disciplinary collaboration and rapid knowledge exchange.	**Localised ecosystems** These reduce search costs, align suppliers and skills, and attract inward investment tied to anchor assets. **Example: See case study 2.**

These businesses build on the fundamental principles of engineering and science to create novel solutions and are capital, time and R&D-intensive. Being grounded in cutting-edge advances in engineering and science, deep tech offers solutions to the world's most complex environmental, economic and societal challenges.[4]

The UK, home to over 3000 deep tech companies, has strong foundations and growing strengths in many deep tech sectors and there are realistic opportunities for achieving comparative advantage in these cases. These sectors feature prominently among five of the Industrial Strategy's eight priority sectors (IS-8). Deep tech sectors represent high-

growth emerging areas that play a vital role in driving regional development, strengthening local supply chains, and creating jobs and wage growth. They also provide wider national benefits by developing critical technologies that support national security, energy security, health resilience and sovereign industrial capability. Helping these companies commercialise and scale is therefore both an economic opportunity and a strategic priority for strengthening the UK's long-term resilience and technological autonomy.

Recent analysis in the Royal Academy of Engineering's State of Deep Tech 2025 report highlights how these sectors underpin the UK's expanding deep tech start-up landscape, as shown in Table 1.[4]

The UK's deep tech start-up and spin-out ecosystem is world leading. Since 2019, UK deep tech start-ups have attracted $43.7 billion in venture capital (VC), placing it third globally behind the United States and China. The ecosystem now comprises over 3000 companies, with privately held start-ups collectively valued at $155 billion.[4] In Europe, where deep tech accounts for one-third of all VC funding, the UK leads the way. In 2024, the UK attracted $4.2 billion, followed by France ($3.0bn) and Germany ($2.7bn).[5]

However, the UK's scaleup challenge looms large for deep tech. The UK has so far struggled to capitalise on its early-stage success, having not yet replicated a similarly healthy ecosystem for supporting later-stage deep tech companies. Value capture on a

IS-8	Underpinning deep tech sectors	Number of VC-backed startups	Enterprise value
Advanced manufacturing	Advanced materials Agri-tech Novel batteries Space	560	$30.6B
Clean energy industries	Nuclear (fusion and fission) Hydrogen CCS	280	$9B
Defence	Drones and autonomous systems Combat air Directed energy weapons Complex weapons Maritime capabilities	66	$4.5B
Digital and technologies	Artificial intelligence Engineering biology Advanced connectivity technologies Quantum technologies Semiconductors Cyber security Robotics	1334	$256.2B
Life sciences	Drug development MedTech Novel medical devices and imaging	1382	$129.3B

Table 1. Deep tech sectors and start-up statistics amongst the IS-8.

significant level across deep tech sectors has been elusive, as companies with particularly strong scaling potential continue to move abroad either by relocation, foreign acquisition or through overseas IPOs. Recent headline examples include:

- **In June 2025, Oxford Ionics (quantum computing) was acquired by US sector leader IonQ for $1.075B.**[6]
- **In August 2025, OrganOx (MedTech) was acquired for $1.5B by global medical technology company, Terumo Corporation, headquartered in Japan.**[7]

This is not a new challenge. For more than a decade, the UK has produced globally significant technology companies, but has repeatedly struggled to retain ownership, strategic control and downstream value as they reach moments of rapid growth or global market relevance.

- **In January 2014, DeepMind, the London-based artificial intelligence company, was acquired by Google for a reported value of more than $500M. While the company has retained a major UK presence, the acquisition remains a prominent example of UK-origin frontier technology moving into overseas ownership at a formative stage of global AI development.**[8]
- **In July 2016, Arm Holdings, the Cambridge-based semiconductor IP company, was acquired by Japan's SoftBank for around £24B.**[9]

To translate early-stage innovation into long-term economic impact, government policy must ensure deep tech companies receive consistent support as they scale. Prioritising domestic scaleup growth will strengthen the UK's innovation ecosystem, increase spillover benefits across sectors, and enhance the likelihood of creating globally competitive 'superstar firms', as envisioned in the UK government's Modern Industrial Strategy (Industrial Strategy).[10] Anchoring successful deep tech companies in the UK can also generate a strong multiplier effect, creating demand for specialist suppliers, attracting talent and investment, and supporting the formation of dense technology clusters. Where sufficient critical mass is reached, these ecosystems can become self-reinforcing, catalysing further business growth, supply chain development and long-term UK competitive advantage.

Shared innovation infrastructure supports deep tech scaleups

The scaling challenge facing the UK's broader science and technology base has gained increased attention in recent years, including most notably by the House of Lords Science and Technology Committee, with an inquiry held on Financing and Scaling UK Science and Technology: Innovation, Investment, Industry. The inquiry's 2025 report[11] argues that the UK must act now with the implementation of comprehensive and bold policies to support scaleup companies and outlines key challenges in access to public and private finance, access to markets, access to talent and skills, and regulatory barriers.

The late-stage journey of commercialisation, demonstration, and then scaled manufacture are crucial for bringing new deep tech products to market. However, without sufficient and timely support, these stages can be difficult to navigate and are full of risk. Owing to deep tech companies being capital, time and R&D intensive, their experienced scaleup challenges and risk profiles are different from regular technology companies.

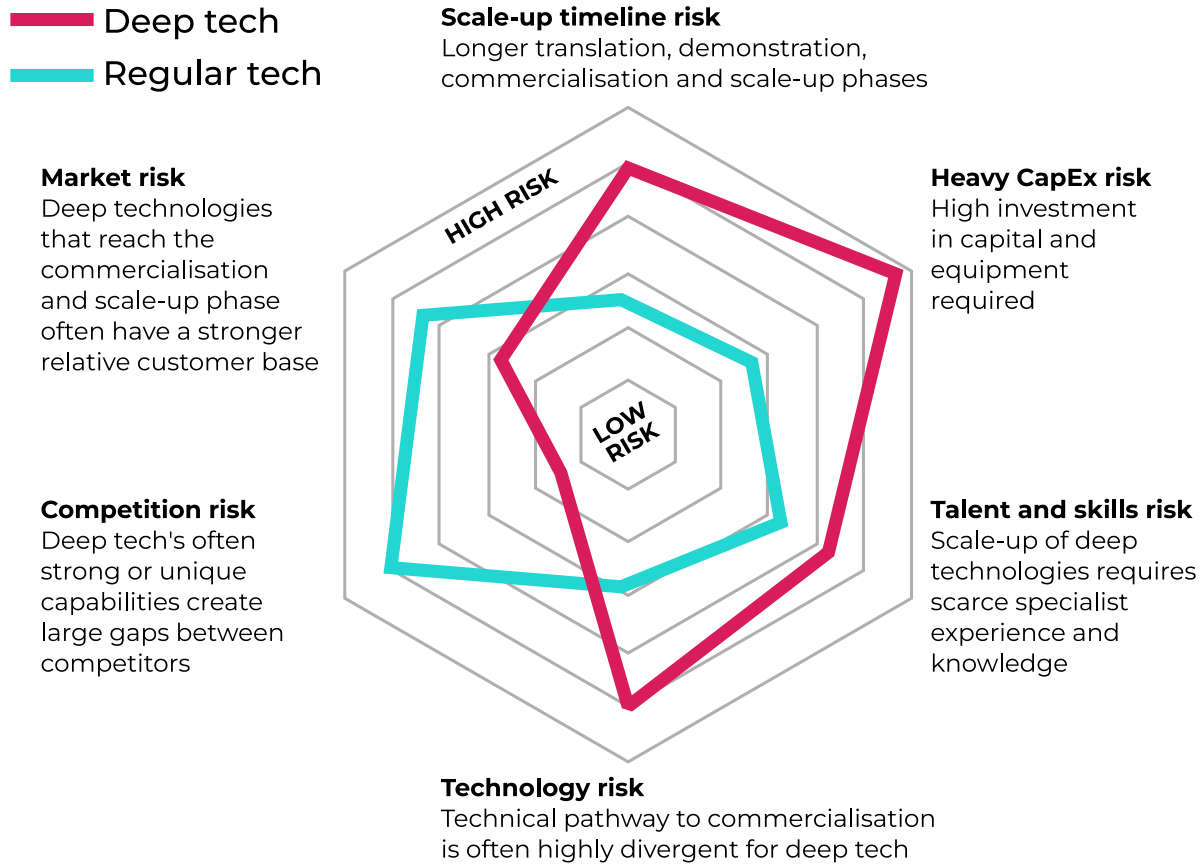
Access to sufficient scaleup or patient capital for deep tech companies to expand in-house remains limited. The capital investment needed for companies to scaleup and manufacture these technologies using their own equipment and facilities is often prohibitively expensive and difficult to fund in the UK.[12] Investment in expensive infrastructure and equipment is often restricted in public grant funding and regarded as too risky by private investors. Box 1 on the project's scope, describes in-house scaling challenges in more detail alongside infrastructure adjacent challenges frequently experienced across the deep tech landscape.

As a result, deep tech companies, particularly in CapEx intensive sectors like quantum, semiconductors, space, and engineering biology, often depend on shared innovation infrastructure to progress through later technology readiness levels (TRLs) and into scaleup and manufacturing.
The UK's vast and comprehensive network of shared innovation and scaleup infrastructure is an invaluable national asset that is instrumental to supporting deep tech companies navigate late-stage barriers and risks.

"Building our own infrastructure is difficult due to our grant funding restrictions. Cost is the biggest barrier here and we'd need new sources of money to address this. But equity investors are averse to spending on capital due to the high risks involved."
Engineering biology scaleup

Over three quarters of deep tech companies interviewed outlined challenges to scaling related to accessing either public or private funding.

Risk profile of deep tech and regular tech scaleups



The risks associated with deep tech businesses in the scaleup phase are felt more acutely than those in regular tech. The critical risks for deep tech companies at these stages are associated with **technology, timelines, talent and skills, market share** and **demand**. Often, most importantly, **heavy CapEx risks** and accessing the required **funding and patient capital.**

Figure 2. Risk profile comparison: Deep tech vs regular tech scaleups. [Figure adapted from State of UK Deep Tech 2025 [4]]

2.3. UK government industrial strategy and growth mission

The UK government has adopted a mission-driven approach to one of its most critical objectives: accelerating economic growth.[13] This ambition is set out to be achieved through increased public and private investment, major infrastructure commitments, a pro-innovation business environment, strategic partnerships with industry, the development of a skilled future workforce and delivery of the UK's Industrial Strategy.[10]

Published in June 2025, the UK's Industrial Strategy outlines a ten-year plan to support high-potential sectors, aiming to boost productivity and reinforce economic stability.[10] Delivering the Industrial Strategy depends on fostering a dynamic, innovation-driven environment that enables the UK's most promising science and technology businesses to scale. Companies developing deep technologies or deep tech are among the most critical to this ambition, and importantly so is the innovation infrastructure that supports them.

Innovation infrastructure and UK growth

1. Growth and jobs

Locating shared innovation infrastructure across the UK supports national and regional economic growth by attracting investment and creating high-value jobs. These facilities support local supply chains, SMEs, jobs and inward investment. Public funding for R&D like the kind that supports the UK's innovation infrastructure has been shown to provide significant returns, with every £1 spent unlocking between £0.41 to £0.74 in private R&D investment in the same year and between £1.96 and £2.34 after 5 to 15 years.[14,15] UKRI has estimated that on average that same £1 generates at least £7 of net benefit and over half of the UK's future productivity growth will be driven by the application of innovations and technologies to create new processes, products and services.[1,16]

Wider economic impact analysis has been conducted at innovation infrastructure providers like the National Physical Laboratory (NPL), the UK's National Metrology Institute. NPL provides critical shared infrastructure to deep tech companies in testing and demonstration and shows evidence for being a structural contributor to UK-wide economic productivity and growth. A 2024 input-output analysis report published by the organisation showed NPL-supported activity:[17]

- **Has an export-intensity ~2.7 times higher than the UK average to both the EU and global markets.**
- **Has lead to a growth in gross value added (GVA) of 11.6% alongside an 11.4% decrease in carbon emissions from 2016-2021.**

2. Knowledge sharing and safeguarding

Shared infrastructure can act as repositories of key scientific skills, advanced equipment and technical know-how. By maintaining and sharing this knowledge, they increase innovation, reduce duplication and preserve national capabilities. The Government Office for Science's (GOS) 2019 review of Government Science Capability outlined the role these facilities have as stewards of skills, knowledge and infrastructure as well as their value in supporting wider research and innovation systems.[18]

3. Innovation adoption and diffusion

Provided sufficient access, shared facilities can lower barriers to the adoption of new technologies and processes for its users. This in turn accelerates innovation of products from lab to market. Innovation infrastructure plays an important role for its users in identifying appropriate technologies for adoption, providing evidence of technology effectiveness and supporting its user's employees with their skills and capabilities. Each of these factors have been identified as top enablers of technology adoption in findings from DSIT's 2025 Innovation Diffusion & Adoption Survey.[19]

4. Clusters

Shared innovation infrastructure often co-located alongside academia and industry attracts new businesses and helps to generate dynamic regional clusters. These clusters encourage collaborations between businesses, academia, and supply chains, driving partnerships, inward investment, talent inflow, and local economic growth. The Semiconductor Catapult plays a critical role in Wales's thriving semiconductor cluster.
See Case Study 2.

5. Global investment and company anchoring

A robust network of shared innovation infrastructure that supports later-stage companies to scale signals a strong end-to-end innovation ecosystem, attracting foreign direct investment and positioning the UK as a leading destination for deep tech development. Unique and more niche capabilities can also anchor companies into long term scaling and R&D activities within the UK and even attract previously relocated companies, as has been observed in the case of PsiQuantum described below.

Example: Unique infrastructure helping to anchor deep tech scaling back in the UK

PsiQuantum provides a useful example of how access to distinctive shared innovation infrastructure can help attract strategically important deep tech activity back to the UK.[20] Founded by researchers who concluded that building a commercially useful quantum computer would require leaving academia and scaling in a more industrial environment, the company moved its centre of gravity to Silicon Valley in 2016 after securing substantially greater early-stage finance, stronger access to hardware-focused talent, and a business culture better aligned with rapid engineering-led scaleup. In the years that followed, PsiQuantum built its core capabilities within the US semiconductor and systems ecosystem, focusing on the manufacture and packaging of photonic quantum chips and the wider architecture required for fault-tolerant quantum computing.[21]

The company's return to the UK for a significant part of its R&D activity was driven not by finance alone, but by access to a highly specific infrastructure capability that was difficult to replicate elsewhere. In 2023, PsiQuantum opened its first R&D facility outside the United States at STFC's Daresbury Laboratory, supported by £9 million of UK government funding.[22] The Daresbury site gave the company access to one of Europe's largest liquid-helium cryogenic plants and to specialist expertise in large-scale cryogenic engineering, capabilities that PsiQuantum identified as critical to the next phase of its technology roadmap. PsiQuantum's photonic approach to quantum computing depends on highly sensitive single-photon detectors operating at cryogenic temperatures. Working with Daresbury was expected to increase PsiQuantum's cryogenic capability 100-fold, with single cryogenic modules capable of delivering 100W of cooling power at liquid-helium temperatures, enabling the development of larger and more operationally relevant quantum subsystems.

The choice of Daresbury also reflects the value of a wider science and innovation campus model. Sci-Tech Daresbury combines national laboratory capability with a broader public-private innovation environment, including a large on-site company base, flexible science and engineering space, and access to related assets such as the Hartree Centre. The STFC run campus is home to more than 150 companies and around 2,000 people, creating an ecosystem in which advanced scaleups can work alongside public research capability while remaining commercially focused.[23] STFC and their cluster model is explored in more detail in Case Study 1.

Access to Daresbury's cryogenic infrastructure, local expertise and UK supply chains enabled PsiQuantum to move at pace in developing its next-generation cryogenic module capability.

Even where companies move overseas to access larger pools of capital or faster-scaling ecosystems, they may still choose to anchor substantial R&D activity in the UK where there is a clear concentration of specialist infrastructure, expert talent and supportive operating conditions. In that sense, shared innovation infrastructure can do more than support domestic companies. Under the right conditions, it can also help re-attract strategically valuable deep tech activity, strengthen local supply chains, and increase the share of high-value scaling and R&D retained within the UK.

2.4. The challenge requiring action

The UK's shared innovation infrastructure is an invaluable national asset: it reduces the cost and risk of commercialisation, safeguards critical capabilities, and underpins regional clusters and growth. Yet to deliver maximum economic and strategic benefit, the network must work reliably for both users and providers. Deep tech scaleups report barriers in identifying the right facilities and securing timely access on workable terms, particularly at later TRLs. Pace matters because deep tech scaleups often operate within narrow funding, customer and regulatory windows. Delays in accessing facilities can extend development timelines, weaken investor confidence, slow procurement or certification processes, and risk losing market position to overseas competitors. At the same time, infrastructure operators face structural pressures in areas of funding models, uneven demand, limited specialist staff, and complex IP and contracting expectations. That can make open access difficult to deliver at pace. Addressing these system frictions is therefore not simply a matter of improving the 'customer journey'; it is essential to strengthening national capability, accelerating scaleup, and improving returns on public and private investment. Understanding these tensions is a prerequisite to designing practical recommendations that improve access while maintaining provider sustainability and national capability.

The scaleup infrastructure access journey

Using shared innovation infrastructure is rarely a single transaction, but rather an end-to-end process that deep tech companies must navigate as they move from prototype towards demonstration and early scaleup. Figure 3 sets out a simplified 'scaleup infrastructure access journey', organised into three stages: discovery (identifying relevant facilities and capabilities), access (securing entry on workable terms), and utilisation (delivering work through the facility reliably and at pace). Here, 'infrastructure' refers to shared or open-access facilities, equipment and expertise used for translation, demonstration, commercialisation and scaleup.

At each stage, Figure 3 highlights the most common thematic barrier areas reported by both demand-side users (deep tech companies) and supply-side providers (including universities, Catapults, PSREs, RTOs and commercial providers). For each of the three stages, the upper set of bubbles reflects provider-side constraints (supply side) and the lower set reflects user-side barriers (demand side). Many of the barriers reflect genuine trade-offs, for example, between speed and assurance, openness and sustainability, or flexibility and compliance. Where barriers sit on the supply side, they often arise from legitimate requirements (safety, IP, quality, stewardship) and the constraints of funding and capacity.

The journey depicted in Figure 3 is not strictly linear as companies may re-enter discovery following unsuccessful trials, capability gaps, or changes in technical requirements. In practice, scaleups often cycle through these stages multiple times as requirements evolve, results are iterated, and additional facilities are needed at higher TRLs.

The figure also links several barriers across both sides to illustrate where challenges interact, creating points of friction and tension (for example, between openness and sustainability, or speed and assurance). These intersections represent opportunities to develop solutions and interventions by addressing the interrelated challenges faced by both providers and users alike. improving outcomes for companies and strengthening provider sustainability and capability stewardship.

The figure is intended as visual representation and an organising framework rather than a comprehensive map. It does not attempt to catalogue all UK facilities, quantify the relative importance of each barrier, or capture all sector specific variations. Instead, it provides a clear structure for the analysis that follows. The next section examines each stage of the journey in turn, drawing on interview evidence, desk research, case studies and international examples to set out how barriers manifest in practice, make explicit the trade offs faced by providers and users, and develop practical recommendations for deep tech companies, infrastructure operators, government and other stakeholders. The recommendations aim to provide options for improving performance across the three stages, reducing time-to-market, increasing the utilisation of publicly supported assets, and strengthening the UK's ability to anchor deep tech scaleup activity.

The scaleup infrastructure access journey

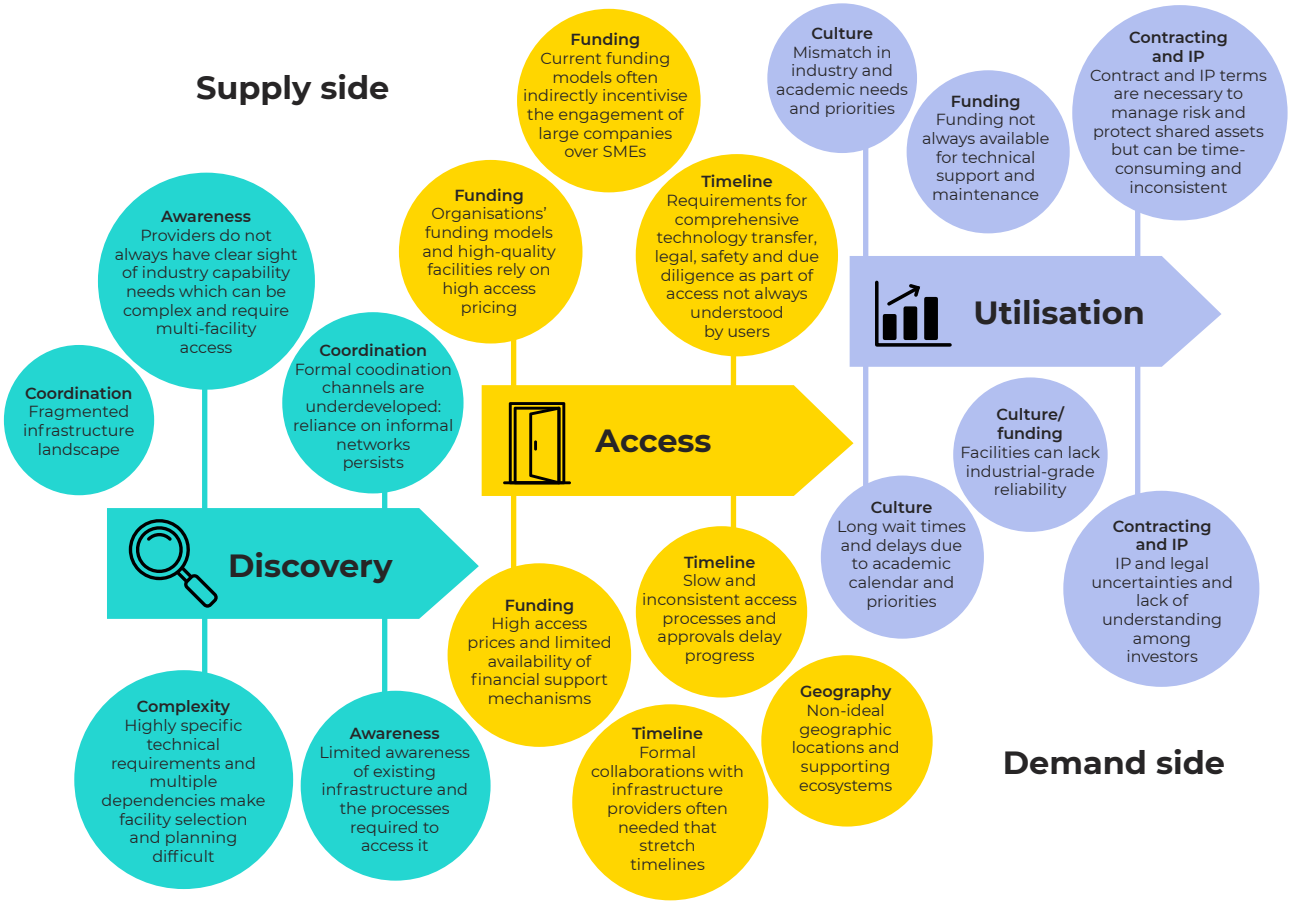
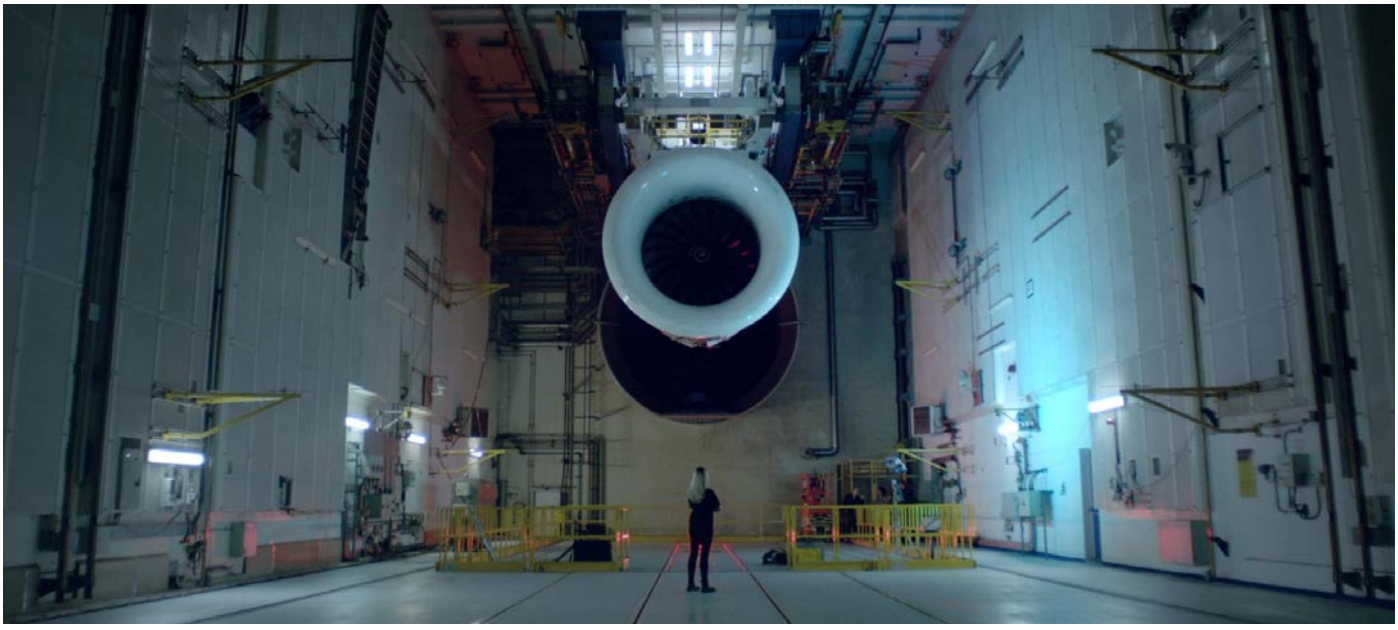


Figure 3. The Scaleup Infrastructure Access Journey: Describing key challenges and barriers at each stage of scaleup facility access journey, faced by both the demand-side use and the supply-side provision of infrastructure.



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Box 1. Project scope and definitions

This box sets out the scope boundaries and working definitions used throughout the report, to support consistent interpretation of evidence and recommendations.

Objectives

This policy paper examines the role of the UK's shared innovation infrastructure in enabling deep tech companies to commercialise and scale. It aims to:

1. Provide an overview of the UK's shared innovation infrastructure network, highlighting its key benefits and essential role in supporting deep tech scale□ups.
2. Describe the end-to-end journey deep tech companies take to locate, access and use shared infrastructure, presenting clear evidence on the challenges, barriers and tensions experienced by both companies and infrastructure providers.
3. Set out clear, practical and robust recommendations for deep tech companies, infrastructure operators, government and other stakeholders.
4. Offer well-evidenced examples and case studies illustrating best practice, specific challenges, and international models of support.

Evidence base

The analysis draws on desk research and semi-structured interviews with shared innovation infrastructure providers and deep tech companies. Further methodological details are provided in Section 6.

Deep Tech (definition)

This project focuses on deep tech companies and the infrastructure supporting them. While qualitative rather than exhaustive, the evidence provides cross-cutting insights into common challenges across the UK deep tech landscape.

The report uses the Royal Academy of Engineering's definition of deep tech used in the State of UK Deep Tech series:[4] Deep tech companies build on the fundamental principles of engineering and science to create novel solutions and are capital, time and R&D-intensive. Being grounded in cutting-edge advances in engineering and science, deep tech offers solutions to the world's most complex environmental, economic and societal challenges.

Indicative sectors include: advanced materials, advanced manufacturing, CleanTech, engineering biology, MedTech, robotics, semiconductors, space and quantum technologies. Importantly however, many shared infrastructure facilities examined also support the broader UK science and technology base.

Scaleup (definition)

For the purposes of this report, "scaleup" refers to the stage at which a company requires access to specialist facilities, equipment and expertise to progress technical validation, demonstration, piloting and/or early scaled manufacture. Headcount and investment stage are not primary indicators; early-stage start-ups are largely excluded.

The report focuses on company needs and infrastructure interaction from TRL 3 onwards, with particular attention to constraints encountered from TRL 6+ (demonstration, piloting, early production readiness). Early-stage support primarily oriented around incubation, acceleration and general grow-on space is not a primary focus (see 'Out of scope' below). This is where the project's definition differs from UKRI's broader combined definition of research and innovation infrastructure: 'facilities and assets that enable the development, demonstration and delivery of innovative (new to market) products, services or processes in business, public services, or non-profit sectors'.[1]

Shared innovation infrastructure (definitions)

Shared innovation infrastructure refers to the national network of facilities, equipment, specialist skills and technical expertise that businesses can access to accelerate commercialisation and scaleup while reducing cost, risk and capital barriers. In this report, shared innovation infrastructure is taken to include open-access and shared-access facilities operated by:

- Universities and institutes.
- Catapult Centres.
- Public Sector Research Establishments (PSREs).
- Specialist Research and Technology Organisations (RTOs).
- Private/commercial providers offering shared access.

What 'shared' means in practice:

Shared access can be provided through a range of mechanisms, including commercial contracts, collaborative R&D projects, framework agreements, and subsidised or grant-supported access. Inclusion in scope is based on accessibility to multiple external users, not ownership model. Examples of shared innovation infrastructure that support the scaleup of deep tech companies appear throughout the report and in summary in Figure 1.

Open access and 'fair access':

Where used in this report, open access denotes facilities that are available to multiple users without requiring them to build equivalent in-house capability. Open access does not imply free access.

Fair access refers to facilities operating under transparent, proportionate and non-discriminatory terms and processes (for example: published eligibility criteria, clear pricing structures, and clear IP/contracting routes). Fair access does not necessarily imply uniform pricing, as pricing may legitimately vary by service level, project type, or user category.

Scaling in-house and adjacent challenges

This project does not examine in detail the difficulties faced by companies scaling internally using their own infrastructure and in-house facilities. The need to scale in-house, without external support, varies depending on the technology, sector, business model, and company size. The project did however identify a distinct set of challenges for companies requiring significant capital investment to scale, including limited access to funding, investment risk, access to skills, access to markets, regulatory barriers, lack of commercial space, geographical constraints, and specialised technical requirements.

These pressures often drive companies to seek external capabilities offered by shared innovation infrastructure where they may then encounter additional barriers related to visibility, access, availability and suitability. This can lead to a cycle where growth is constrained by limited options both internally and externally. These adjacent barriers, often representing some of the more well-documented scaleup challenges are explored throughout the report, but not to the same extent.

Separately to shared innovation infrastructure needs, other cross-cutting areas of infrastructure challenges facing UK deep tech companies include access to suitable wet lab space [24–28] (particularly in the Golden Triangle region), access to digital, [29–35] energy [36–39] and other enabling infrastructure, and issues with the UK's complex planning and regulatory environment. [40–43]

In scope / out of scope summary

In scope:

- Infrastructure enabling validation, testing, demonstration, pilot and both early and later stage scaleup activities (beyond proof of concept).
- Provider and user experiences of locating, accessing and utilising shared infrastructure (including contracting, pricing, scheduling, and technical support).

- Commercial shared access facilities where access is available on fair, pay-to-play, contract or collaborative terms.

Out of scope:

- Incubators, accelerators and general grow-on space whose primary purpose is early-stage support rather than scaleup infrastructure provision.
- A full assessment of company-level decisions to scale entirely in-house (although relevant constraints are noted where they interact with shared infrastructure demand).
- Comprehensive treatment of broader scaleup policy issues (finance, procurement, talent, regulation) except where these directly affect infrastructure access and use.



Image: © This is Engineering

Box 2. Innovation infrastructure mapping

A range of UK reviews and analytical tools have sought to describe the innovation ecosystem and provide partial 'maps' of the organisations, assets and places that underpin research, development and innovation. These resources vary in purpose and level of granularity: some focus on improving how businesses navigate collaboration support, others describe the organisational landscape of publicly funded research and innovation, and others provide data-driven mapping of infrastructure assets or innovation clusters. This box summarises a small set of widely used references that inform the overview in this report, while noting that none provides a comprehensive, end-to-end representation of the shared innovation infrastructure 'user-provider journey' that is the focus of the analysis.

The Dowling Review (2015) – Business-University Research Collaborations

The Dowling Review was set out with the aim of strengthening UK business-university research collaborations by reducing complexity in public support, improving brokering, and improving contracts/IP practices, with particular emphasis on making collaboration easier for SMEs.[44]

In doing so it attempted to map the UK's national research and innovation landscape, including PSREs, national laboratories, RTOs and Catapults in relation university and businesses. This was not a systematic map of shared innovation infrastructure facilities. Instead, it diagnoses the complexity of the innovation support system and how this affects businesses ability to engage with universities and intermediaries. It situated intermediaries (eg. Catapults) as part of the broader innovation landscape and makes recommendations on sustained support and brokerage.

The Nurse Review (2023) – Independent Review of the UK's Research, Development and Innovation Organisational Landscape

The Nurse Review reviewed the UK's research, development and innovation organisational landscape (universities, PSREs, institutes/units, and other components) and recommend reforms to make it more effective, sustainable, resilient and responsive, aligned to the UK's science ambitions.[110]

It provided a high-level system map of organisational types and how they interact (and where the system is hard to navigate), rather than a granular catalogue of facilities. The review included a specific emphasis on the importance of RDI infrastructures as national assets within the wider organisational landscape and highlighted navigability and permeability challenges across organisational boundaries, reinforcing that the landscape can be difficult to navigate.

UKRI infrastructure landscape analysis (2023)

UKRI's analysis report provides robust evidence base on the UK's research and innovation infrastructure landscape (2018–2019), to support the UKRI infrastructure roadmap and future planning by establishing a 'current state' baseline. The report emphasises the UK's extensive, diverse infrastructure base and provides system-level evidence on barriers such as skill constraints, funding certainty, and capacity management.[1]

This is the most direct 'mapping' resource in the UK to date, having used a large questionnaire exercise to identify and characterise hundreds of infrastructures and their characteristics (such as location, staffing, funding, operations, capacity, links to the economy). It reports a snapshot identifying 750+ infrastructures (including national/international significance), with infrastructure located across all UK regions and some overseas. It also clarifies how it treats 'innovation infrastructure' alongside research infrastructure, and notes limits (eg. not fully

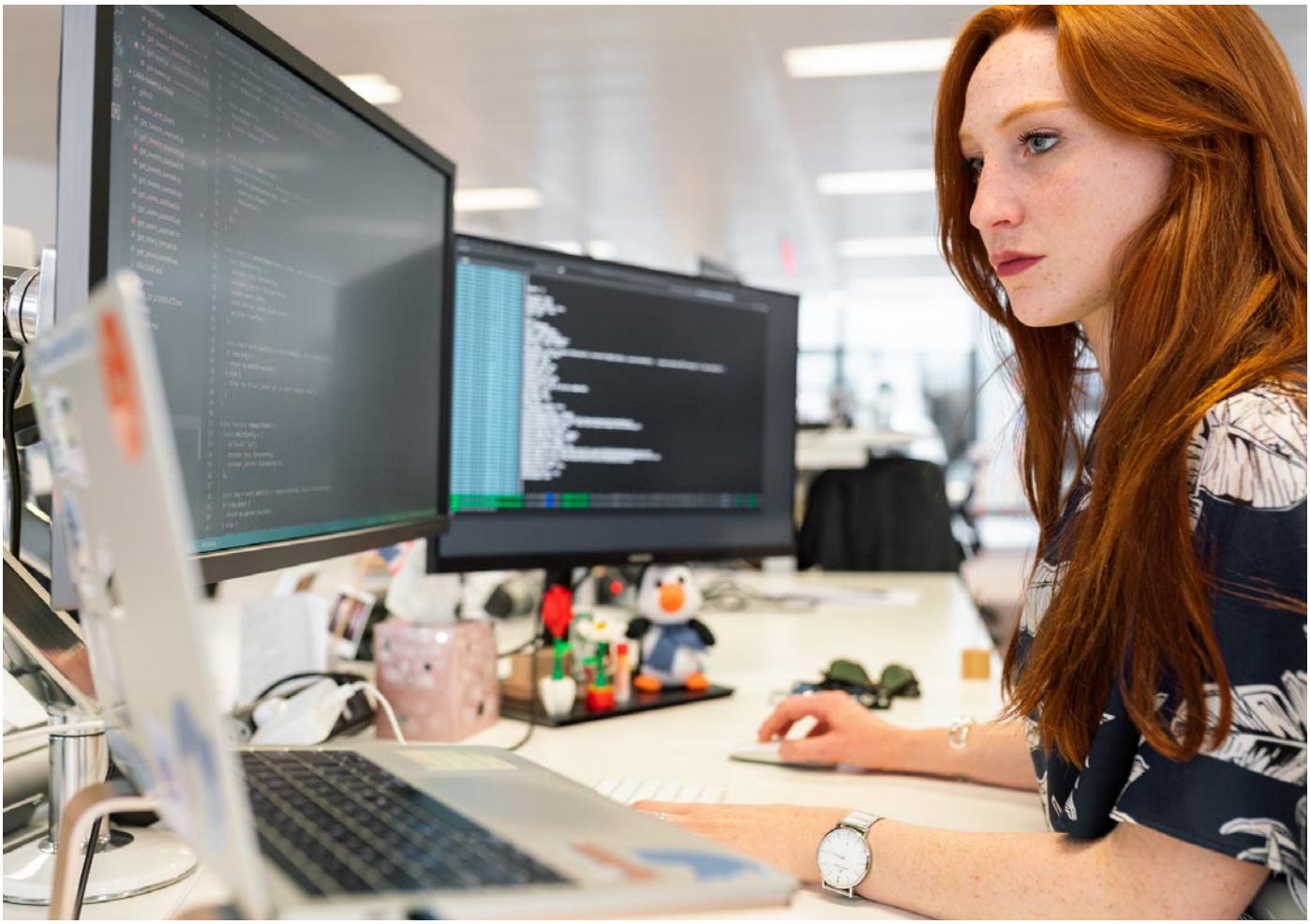
capturing privately/charitably funded infrastructure in the core mapping exercise). However, UKRI's forthcoming update (2026) to the landscape analysis report will include private commercial facilities in its analysis.

The landscape analysis is also published alongside UKRI's accompanying discovery tool (InfraPortal) to support finding and understanding infrastructures.[45]

DSIT Innovation Clusters Map (2025)

The DSIT Innovation Clusters Map provides an interactive, data-driven tool to identify and visualise UK innovation clusters and related RDI activity, supporting place-based policy, investment decision-making, and stakeholder engagement.[2]

The tool maps clusters of RD&I-active companies and related ecosystem features (including research institutions/infrastructure in the cluster framing), rather than cataloguing shared infrastructure facilities as assets in the way UKRI's landscape analysis does. It uses a transparent methodology: clusters are generated using business location and sector data (eg. IDBR), and the tool is intended to show where innovation activity is concentrated "organically" rather than by administrative boundaries. The public map interface enables exploring innovation across the UK, with sector filters and additional layers for some innovation infrastructures or research facilities.



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Case Study 1:

Space Solar and the Satellite Applications Catapult (SAC) at STFC Harwell Campus – accelerating commercialisation through networks and cluster support

Deep tech SME Space Solar has accelerated its technological development and commercial trajectory through strategic partnership with the Satellite Applications Catapult (SAC) and the broader innovation ecosystem at the Science and Technology Facilities Council (STFC)managed Harwell Campus. The collaboration highlights how shared national facilities, expert networks, and the Harwell Space Cluster's critical mass of capabilities have supported Space Solar's journey towards scaleup.

Satellite Applications Catapult (SAC):

The Satellite Applications Catapult (SAC) is one of the UK's network of Innovate UK Catapults, established to accelerate the adoption of satellite technologies and support commercial innovation across the space sector. It provides worldclass technical facilities, multidisciplinary expertise, and targeted support to help companies design, build, test and commercialise new satelliteenabled solutions. SAC offers access to advanced capabilities including antenna and RF testing, inorbit servicing and manufacturing facilities and secure assembly and integration spaces, helping companies overcome growth barriers and bring products to market faster.[46,47]

Since launching in 2013 at Harwell, SAC has grown into a central component of the UK's space innovation ecosystem. It plays a major role in connecting companies with research organisations, facilitating collaboration, and supporting commercial readiness through its strategic networks and regional Centres of Excellence across the UK.[48] SAC's combination of technical depth, openinnovation model, and highquality infrastructure has enabled hundreds of companies to accelerate development cycles and scale solutions aligned to the UK's national space objectives.[47]

STFC Harwell:

The Harwell Campus is one of the UK's largest and most significant science and innovation campuses, hosting over £1b of research infrastructure and a diverse community of more than 5,500 scientists, engineers and innovators across 200+ organisations.[49] The campus brings together worldleading national laboratories, government agencies, large multinational companies, and a vibrant ecosystem of SMEs working across deep tech sectors such as space, energy, health tech and quantum technologies. Its strategic location, crossdisciplinary environment and its regional embeddedness make it a premier destination for R&D intensive deep tech companies seeking collaborative opportunities and accelerated scaleup.

At the heart of the campus is the Harwell Space Cluster, now comprising over 100 space technology organisations employing more than 1,600 people, which includes major national assets such as RAL Space, the UK Space Agency, the European Space Agency, and the SAC.[50] STFC's campus management model provides companies with access to flexible facilities, expertise, coordinated networking services and events. This enables organisations to expand rapidly, benefit from colocation with complementary capabilities, and leverage extensive innovation infrastructure.

Space Solar's experience:

Space Solar is a UK-based, deep tech SME commercialising space-based solar power to deliver continuous, clean and renewable energy from space to Earth. Their high-orbit CASSIOPeiA solar power satellite features lightweight solar panels and a system of mirrors to concentrate sunlight onto the panels. The electricity generated is converted into high

frequency radio waves, and the power is beamed to a receiving antenna at a fixed point on the ground below. The company is planning an in-space demonstrator within three years and the first-ever space-based solar power plant set to be operational by 2030 with an initial capacity on 30MW scaling to a GW system by 2035.[51,52]

Space Solar's engagement with the Satellite Applications Catapult and its location within the Harwell Campus and Space Cluster have been central to the company's rapid development and growth trajectory. According to Space Solar, the company has made extensive use of SAC's purposebuilt facilities for both building and testing activities, enabling them to progress from earlystage concepts towards commercially credible systems. Space Solar have a deep partnership with SAC, who are a shareholder in the business, yet Space Solar emphasised that operationally they are treated like any other company in a 'pay-to-play' environment, with fair access and the SAC's market-driven innovation model. SAC's detailed understanding of sector needs and its handson technical expertise were highlighted as critical enablers in accelerating Space Solar's development pathway.

Being colocated with SAC at Harwell was a major benefit. Space Solar noted the "huge advantage" of being embedded within a dense cluster of space-related facilities, expertise, and collaborators. Harwell's cross-disciplinary and international environment, supported by the presence of major agencies and advanced test facilities, aligns closely with the company's ambitions in space-based solar power and in-orbit systems development. The proximity to complementary capabilities accelerates problemsolving, reduces development costs, and provides rapid access to technical partners, research institutions and potential customers.

Space Solar also relayed the practical support provided by the STFC Harwell campus team, particularly in securing additional office and operational space as the company's headcount has grown. The ability to expand within the same ecosystem has enabled continuity of R&D, recruitment, and industry engagement. These attributes mirror STFC's broader mission of fostering business growth through accessible national facilities and coordinated site network management.

Space Solar's experience demonstrates how CatapultSME partnerships, embedded within a well-functioning innovation cluster, can accelerate commercialisation and early-stage scaling for deep tech SMEs in the UK.

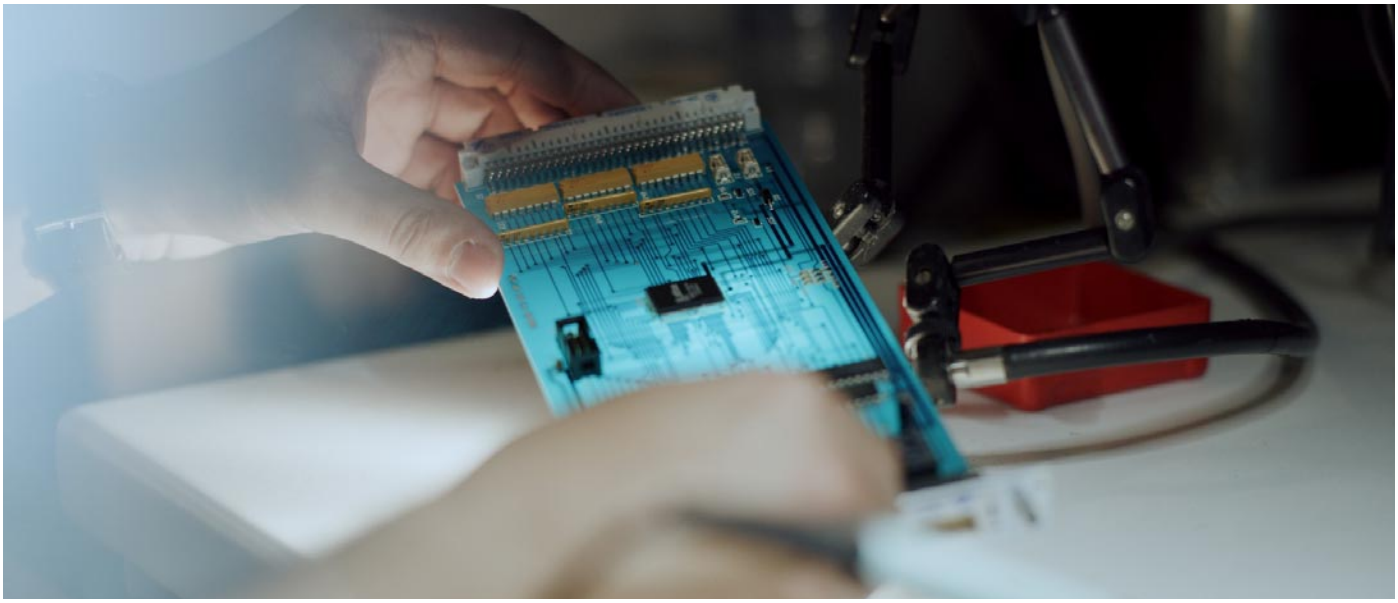

Image: © This is Engineering

Case Study 2:
The Wales Compound Semiconductor Cluster – co-located shared innovation infrastructure for deep tech scaleups

South Wales hosts the UK's largest regional deep tech cluster centred on compound semiconductors. The cluster brings together shared national and regional innovation infrastructure, industry, and academia to support companies from early-stage R&D through to pilot manufacturing and global scaleup. Key organisations include CSconnected, the Semiconductor Catapult, Cardiff University, Swansea University, University of South Wales the Compound Semiconductor Centre (CSC), globally active large companies such as IQE, KLA and Vishay, as well as growing scaleups like MicroLink Devices and Kubos Semiconductors.[53,54]

Since its inception, the South Wales compound semiconductor cluster has delivered: [55,56]

- £850m invested in facilities.
- Over £150m in collaborative research and development.
- Supported approximately 3,000 jobs.
- A global reputation as the go-to location for compound semiconductors.

Cluster coordination:

CSconnected provides the strategic backbone of the cluster, acting as an industry-led coordinating body that aligns infrastructure, skills, supply chains and inward investment. It connects large manufacturers, SMEs, universities and government, ensuring that shared facilities respond to real industrial demand. This coordination reduces fragmentation, creates clear scaleup pathways for SMEs, and strengthens the UK's domestic compound semiconductor supply chain.[57]

Shared innovation infrastructure:

The Semiconductor Catapult plays a central role in bridging the gap between research and manufacturing. Its open-access pilot-line facilities enable companies to develop, integrate and test compound semiconductor devices and systems at pre-commercial scale. For SMEs, this significantly reduces technical and financial risk by avoiding early capital investment in fabrication and packaging infrastructure, while providing credibility with customers and investors.[58]

The Compound Semiconductor Centre (CSC), a joint venture between IQE and Cardiff University complements this offer by providing industrial cleanroom facilities and specialist equipment for device development and small-scale manufacturing. The CSC supports companies transitioning from laboratory prototypes towards repeatable manufacturing processes, enabling faster iteration and smoother progression into volume production.[59]

Co-location for commercialisation and scaleup:

Compound semiconductors are critical technologies foundational for supporting key domestic industries in power electronics, photonics, telecoms and sensing, but are highly capital-intensive and complex to manufacture. Individual SMEs rarely have the resources to access full-scale fabrication, epitaxy, packaging and testing capabilities. In Wales, shared facilities address this market failure.

Co-location of these assets alongside universities and industry enables rapid iteration between research, materials, devices and applications, significantly shortening development cycles. The cluster's integrated infrastructure supports companies at the critical transition from prototype to volume manufacture. Companies can validate manufacturability, demonstrate performance to customers, and meet the technical due diligence requirements of investors. This helps attract domestic and international private capital into the region and supports UK scaleup as an alternative to early exit or overseas relocation.

Scaleup company spotlight – MicroLink Devices Ltd:

MicroLink Devices Ltd is a leader in the design and manufacture of lightweight flexible solar cells having pioneered the scaleup and commercialisation of epitaxial lift-off (ELO) process from GaAs wafers. These solar cells are world-leading in performance and low mass and are supplied to key sectors such as aerospace including for Airbus and BAE Systems. The company also produces bespoke battery packs and complete solar-electric power systems.[60]

MicroLink Devices based out of Port Talbot Wales, is well embedded in the CSconnected ecosystem. MicroLink Devices have successfully progressed the innovation and commercialisation of their technology using shared infrastructure. Its flexible solar cells being the first cells to be fabricated in the UK under CSconnected and UKRI's Strength in Places Fund using Swansea University facilities and the Semiconductor Catapult reporting a 2021 R&D collaboration resulting in a TRL shift from 3 to 5.[61,62]

Place-based economic impact:

Co-location has enabled the development of a skilled workforce, with strong links to regional universities and technical training providers. High-value jobs in design, engineering and advanced manufacturing are retained locally, supporting inclusive regional growth.

Semiconductor Catapult alone has:[54]

- **Engaged in over 156 projects between 2019-2024.**
- **Supported the creation of 1325 FTE jobs and safeguarded a further 3393.**
- **R&D revenue of nearly £4.5m in 2023-2024.**

The presence of nationally significant facilities in Wales has also created a strong international proposition, positioning the UK as a competitive location for compound semiconductor R&D and manufacturing. Shared infrastructure embeds capability in place, reducing the risk that strategic technologies migrate offshore. It also sends influential signals to investors.

Crowding in private investment:

Public funding for the CSconnected cluster and its shared innovation infrastructure has been followed by significantly larger private investment, demonstrating the effective crowding in of private capital. The cluster has seen £850m of combined public and private investment in facilities since inception with an original £25m funded through UKRI's Strength in Places Fund in 2020. CSconnected and the Welsh Government cite the combined figure as being predominantly industry-led capital investment. Recent private investment commitments include £250m from Vishay following acquisition of the Newport Wafer Fab and $138m from KLA in a new Newport-based R&D and manufacturing facility.[55,63,64]

Summary – careful replication is needed:

The South Wales compound semiconductor cluster provides a replicable model of how shared innovation infrastructure can support deep tech scaleups:

- **Its co-located shared innovation infrastructure reduces scaleup risk.**
- **Cluster coordination bodies like CSconneccted are critical to system effectiveness.**
- **Shared infrastructure like Semiconductor Catapult and CSC must be industry-led and demand-driven.**
- **Place-based investment delivers durable regional economic impact.**
- **Public funding is effective at crowding in private capital**

However, its success reflects long-term alignment between industry, academia and government, and cannot be replicated through isolated asset investment alone. Effective replication requires sustained coordination, sector focus and patient capital, tailored to regional strengths.

3. Scaling deep tech with the UK's innovation infrastructure

3.1. Discovery: Coordination and awareness in a complex landscape

For deep tech companies, the innovation infrastructure journey begins with the largely overlooked task of identifying which facilities, equipment and capabilities are needed to solve a specific technical challenge, and where those capabilities can be accessed at the right time and on workable terms. As shown previously in Figure 3, this discovery stage is often the first major point at which deep tech SMEs and scaleups encounter friction, despite the UK's rich and diverse network of shared innovation infrastructure.

The UK landscape is extensive, but it is also complex and structurally fragmented. Provision is distributed across universities, Catapults, PSREs, RTOs and commercial providers, with significant variation in governance, mission, access routes, funding models and sector focus. The system is often organised around institutional boundaries and programme structures rather than user journeys. Many providers lack the resources or incentives to systematically promote and translate their capabilities for industry users, relying instead on personal networks, prior partnerships and project-based relationships. The result is that companies frequently expend substantial time and effort navigating informal introductions, variable information sources and inconsistent terminology before they can form a clear view of the options available.

These dynamics create consistent barriers at the discovery stage, affecting both deep tech companies seeking access and infrastructure providers attempting to connect capability with demand.

3.1.1. Coordination in a distributed and uneven landscape

While the UK has a large number of high-quality facilities, the overall system does not consistently operate as a coherent national offer for deep tech scaleup. The landscape is divided by institution type, funding source, governance, geography and sector, and coordination between organisations is often inconsistent or difficult to navigate.

Deep tech scaleup rarely depends on a single facility, with companies typically requiring access to multiple capabilities at different stages of maturity, often across several organisations. Where clear pathways and coordinated handovers do not exist, the burden of joining these capabilities falls to the company, often at a point when internal resources and capacity are already constrained.

Stitching together capabilities across multiple facilities

Many deep tech companies rely on combining services from multiple providers to move from early testing to pilot-scale validation. In areas such as advanced semiconductor packaging, this model is frequently required and increases search, coordination and logistical costs.65 Uneven geographic distribution of specialist facilities adds further complexity, particularly where repeated travel is required or where work must be conducted within tight timelines.

> **"We use five different facilities to manufacture our devices and the whole process requires a lot of supply chain providers. This complex process, the time and travel involved puts us at a disadvantage and can lead to wastage and increased costs."**
> ***Semiconductor SME***

Example: How "stitch together" challenges work:

A hydrogen fuel cell company is scaling their breakthrough technology. The company must use:

- a university materials lab for characterisation
- a Catapult Centre for system-level testing
- and a private engineering site for pressure cycling.

Each facility has separate enquiry processes, contracting arrangements, compliance requirements and timelines. The cumulative burden of managing these interactions can slow progress and increase the risk of delays, particularly for SMEs.

Geographic unevenness and national gaps

Discovery becomes more complex where capabilities are not available domestically. Identifying and securing access to international facilities introduces additional logistical, financial and operational challenges. Infrastructure gaps are common across several deep tech sectors, particularly at the translation and scaleup stages, and can drive companies towards overseas provision or incremental in-house development, both of which introduce additional cost and risk. Infrastructure gaps, while not the main focus of this paper, are examined in a broader context in the Appendix section 5.

Duplication and the absence of joined-up governance

The absence of coordinated national oversight contributes to duplication of infrastructure and support offers. Without system-wide visibility of utilisation, capability planning and demand trends, investment decisions are often made in isolation. This can lead to overlapping provision in some areas, alongside persistent gaps in others.

This lack of alignment reduces the clarity of the overall system and makes it more difficult for companies to identify the most appropriate starting point. It also limits the efficiency of public and private investment in infrastructure by failing to optimise the distribution and use of existing assets.

3.1.2. SMEs falling through institutional cracks

Fragmentation is reinforced by limited formal communication and coordination between infrastructure providers. Organisations often operate within silos, and while informal referrals between providers do occur, there is typically no consistent incentive structure, formal mechanism or recognised role for directing companies to more appropriate facilities.

As a result, deep tech SMEs often rely on existing relationships or local networks when identifying infrastructure. This can lead to suboptimal decisions, where companies engage with facilities that are convenient or familiar rather than best suited to their technical needs.

> **"SMEs often don't know where to go or they go to things that they are familiar with or where they already have a relationship. This might not be the best place to get the capabilities they need."**
> ***National infrastructure provider***

Where discovery relies heavily on informal pathways, companies may miss critical capabilities or only realise late in the process that a facility does not meet their requirements in terms of scale, throughput, accreditation or safety classification. This results in avoidable delays and increases the cost of progression through the scaleup journey.

3.1.3. Awareness, mapping and the limits of current discovery tools

A core barrier at the discovery stage is the limited visibility of available infrastructure and its practical applications. Deep tech SMEs often lack access to clear, comparable and accessible information on facilities and their capabilities. Discovery is frequently shaped by existing relationships rather than a transparent view of the system.

There is no single authoritative registry of UK scaleup infrastructure. While multiple mapping exercises have been undertaken, these vary in scope, quality and completeness. Gaps in coverage and inconsistencies in categorisation limit their usefulness for industry users. Capability descriptions are often highly technical and framed in institutional terminology rather than application-led use cases. As a result, companies may struggle to determine whether a facility is suitable for their specific needs. In some cases, facilities are miscategorised or described inconsistently, further reducing confidence in available information.

> **"There have been discussions about having a catalogue of different facilities that companies or individuals can access to understand what is available – there should be a public listing of what they offer. This would be a meaningful change."**
> ***National funding body***

Discovery therefore often depends on informal networks, introductions and ad hoc exchanges, which can take considerable time to navigate. This is particularly challenging in a scaleup context, where timing is closely linked to funding, technical milestones and commercial opportunities.

International approaches demonstrate how more coordinated and centralised discovery mechanisms can reduce search costs and improve clarity of access.

Case Study 3:
International: Singapore's A*STAR centralised innovation infrastructure network

Singapore provides a leading international example of how centralised discovery and access to shared innovation infrastructure can support deep tech companies to commercialise and scale.

Coordinated, centralised system approach to access (A*STAR, A*SEF, RSC)

The Agency for Science, Technology and Research (A*STAR) is Singapore's national public research organisation, coordinating a network of research institutes, national centres and technology platforms across advanced manufacturing, biomedical sciences, energy and digital technologies.[66,67] Its primary mission is to bridge the gap between academia and industry, translating research and innovation capability into economic impact.

A key enabling mechanism is the A*STAR Scientific Equipment & Services Finder (A*SEF), a national digital platform that provides a single, industry-facing entry point to discover scientific equipment and technical services across all A*STAR institutes.[68] A*SEF allows companies to search by capability, equipment type and service offering. This single interface reduces search costs and complexity for deep tech companies seeking specialist facilities critical for prototyping, testing and scale-up.

Discovery through A*SEF is supported by A*STAR's Research Support Centre (RSC), which provides the operational backing for shared infrastructure access. RSC manages equipment lifecycle oversight, booking processes, consumables supply and access to trained technical specialists, ensuring that industry access is supported and reliable.[69]

Key learnings:

For the UK, the A*STAR model illustrates the value of treating shared innovation infrastructure as a discoverable, user-centred national system, rather than a fragmented set of local assets. A*SEF demonstrates how digital platforms can act as critical enabling infrastructure, translating physical assets into visibly accessible scale-up support for industry.

While the UK's innovation landscape is structurally more decentralised, there are clear principles around centralised discoverability, clear access pathways and integration with technical support that can be taken away.

3.1.4. Infrastructure beyond universities: widening the discovery pathway

Many deep tech SMEs, particularly university spinouts, initially engage with infrastructure through university environments. This reflects the strong link between academic research and company formation. However, as companies transition towards commercialisation and scaleup, relevant capabilities increasingly sit outside university settings, including within Catapult Centres, PSREs, RTOs and commercial shared-access facilities.

Engagement with these organisations is less embedded within UK innovation pathways than in some comparator countries (eg. Germany, France, Singapore). As a result, companies may not fully consider or understand the range of available options beyond universities. In the UK, publicly funded innovation grants and collaborative research programmes remain a predominant and important route through which companies access broader infrastructure networks. However, long application cycles, administrative burden and delays to project start dates can reduce their attractiveness, particularly where rapid iteration is required.

> **"UK SMEs don't work with RTOs as much as other countries in the UK its quite uncommon. It's not always as well understood that it's an option, compared to Germany where it's woven into the fabric of commercial R&D and innovation."**
> ***National infrastructure provider***

Where university and Catapult capabilities are co-located or embedded, discovery pathways tend to be clearer. Models such as WMG and AMRC demonstrate the benefits of integrating academic research with industrial-scale facilities, providing companies with more direct routes into applied development and scaleup support, and increasing awareness of non-university infrastructure.

Warwick Manufacturing Group (WMG) – University of Warwick:

WMG is an academic department embedded within the University of Warwick and a core HVMC centre that provides industrial-scale research, development and test facilities spanning electrification, automation, digital manufacturing and materials innovation. Close integration with industry-facing programmes enables SMEs to access applied engineering expertise, de-risk product development, improve productivity and bring new technologies to market.

- **WMG employs around 800 people across 25 research areas and engages with over 700 manufacturing industry partners. It is estimated that since 2018 the WMG's dedicated SME Group has resulted in additional employment of 464 and additional GVA of £31.4m.**[70]

Advanced Manufacturing Research Centre (AMRC) – University of Sheffield

AMRC, part of the HVMC and embedded within the University of Sheffield, offers SMEs and deep tech companies access to industrial-level capabilities across additive manufacturing, robotics, composites, prototyping and digital manufacturing. AMRC and its dedicated SME support de-risks innovation by providing commercialisation pathways using production-scale facilities to validate new processes before deployment.

AMRC employs around 500 people, and in 2021 it partnered with 704 SMEs and 507 large manufacturers. It is estimated that the economic output of the centre's FTE employees is in the order of £55m GVA per annum.[71,72]

Key learnings:

- **Better access to scaleup support.** Embedding and co-location of Catapult Centres within universities can provide deep tech SMEs with access to industrial-grade facilities, multidisciplinary expertise and tailored scaleup guidance.
- **Strong partnerships created between academia, catapults and industry.** The links that are created in these relationships result in commercially informed research, valuable industry partnerships and access to specific innovation infrastructure, accelerating commercialisation and de-risking scaleup.
- **Awareness of pathways to infrastructure beyond universities.** Critically these embedded centres raise the profile, awareness and access links to commercialisation capabilities and support that exceeds what standalone university labs can typically offer.

3.1.5. An issue of supply and demand: signalling capability needs and navigating gaps

Discovery challenges arise from both demand-side and supply-side dynamics. Infrastructure providers often face difficulties in identifying, aggregating and prioritising emerging industry needs, particularly where requirements are highly specialised or evolving rapidly.

Infrastructure gaps and oversubscription

Scarcity of certain capabilities, particularly in capital-intensive and fast-evolving sectors, increases the difficulty of discovery and access. In areas such as engineering biology and semiconductors, demand can exceed available capacity, creating bottlenecks and delays. Where gaps exist, companies may shift activity overseas or attempt to build their own capabilities incrementally.

Example gaps:

- High-volume compound semiconductor nanofabrication capacity.[73]
- Quantum and semiconductor subsystem/module development facilities.[74]
- Bioprocessing pilot lines and larger-scale bioreactors for engineering biology.[75]

Infrastructure gaps, while not the main focus of this paper, are examined in a broader context in the Appendix section 5.

Weak feedback loops for investment and maintenance decisions

Communication of capability needs between users, providers, government and funders is often inconsistent. This weakens the ability to translate emerging demand into timely investment decisions. Without visibility of utilisation levels and cross-sector demand trends, providers may struggle to justify upgrades, expansions or new service lines.

> **"Infrastructures aren't always that good at articulating what they do. Capabilities need to be made clearer and in a more joined-up way. Have people self-report in a standardised way would help with this."**
> ***Infrastructure provider***

> **"There is a lack of coordination and awareness of available infrastructure at Catapults. Our view is that while a list of available infrastructure is useful, a central map would not be. A map of technology needs and gaps would be more beneficial."**
> ***Infrastructure provider***

In this context, mapping technology needs and infrastructure gaps can be as important as mapping existing facilities. One emerging approach to strengthening two-way communication between infrastructure providers and users is the use of forward-looking technology and capability roadmaps, offering a structured approach to anticipating demand and guiding future investment. Case Study 4 below highlights how the High Value Manufacturing Catapult (HVMC) has developed and consulted on its Technology Capability Roadmaps, and the role this plays in aligning future infrastructure provision with the needs of deep tech scaleup companies.

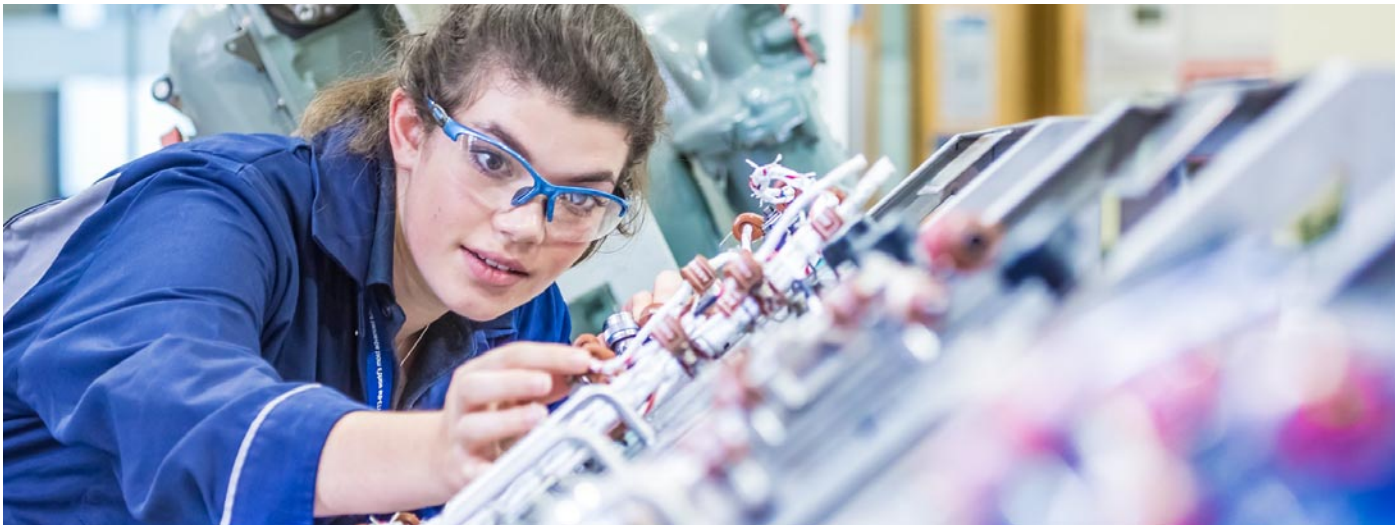

Image: © Rolls-Royce PLC

Case Study 4:
High Value Manufacturing Catapult technology capability roadmaps

The High Value Manufacturing Catapult (HVMC) has developed a series of Technology Capability Roadmaps as part of its emerging Technology Strategy, published in draft form for consultation in January 2026. The roadmaps are intended to provide a clear, shared view of future manufacturing capability needs, helping industry, infrastructure providers and government align decisions on technology development, infrastructure investment and skills.[76] Roadmapping is a common approach taken by companies in devising their internal strategy and is becoming increasingly pivotal in national/trans-national strategies for innovation infrastructure provision like those being outlined for specific quantum technologies in the Quantum Europe Strategy.[77,78]

Cross-stakeholder communication and consultation:

- The technology capability roadmaps have been developed through a structured, evidence-led process, drawing on industry and stakeholder workshops, cross-centre technical expertise from across the HVMC's network, as well as analysis of industrial demand drivers and long-term national priorities.
- Publication in draft form is designed to enable open consultation and iterative refinement, with structured feedback sessions taking place across multiple Catapult centres during early 2026.[79]

Addressing supply–demand signalling challenges:

The roadmaps respond to a core challenge in shared innovation infrastructure systems: the absence of clear, forward-looking signals about industry demand for capabilities, and the resulting difficulty for providers in planning capital investment. HVMC's approach makes industry needs visible by mapping:

- Key demand drivers facing UK manufacturing sectors (e.g. sustainability, resilience, prioritising of the industrial strategy's growth sectors)
- Industry capability needs (what company's need to be able to do)
- Innovation requirements (technologies, tools and processes needed to support the UK's frontier industries),
- Pathways for priority industry capability needs (potential connected system architecture for industry scaleup)
- Technology transformation maps, indicating when capabilities are expected to become industry-ready.[79]

This structured articulation of demand gives infrastructure providers a clearer evidence-base to justify capital upgrades, expansions and new service lines, addressing the investment planning challenges often caused by fragmented or anecdotal intelligence.

Key learnings:

- The HVMC's technology roadmaps show the value of using cross-cutting sector-wide consultation and engagement to translate emerging industry needs into clear signals for infrastructure development.
- The roadmaps support better alignment between emerging industrial needs and infrastructure investment decisions, increasing confidence for industry that the right technology capabilities will be available at the right time to support commercialisation and scaleup.
- Other infrastructure providers could adopt similar, time-based road-mapping and open consultation approaches to align investment decisions with future deep tech demand, improve coordination across facilities, and give companies greater confidence that the right capabilities will be accessible as their technologies mature and scale.



Discovery Recommendations:
improving coordination, visibility and capability signalling

Addressing discovery-stage challenges requires coordinated action across government, funders, infrastructure providers and users. The focus should be on improving system integration, strengthening visibility of capabilities, and enabling more effective matching between demand and supply.

1. **Establish an Innovation Infrastructure Coordination Function or system integrator aligned to Industrial Strategy growth sectors (IS-8) and critical deep technologies.**
   Create a clear responsibility within government or a jointly mandated body to coordinate the shared innovation infrastructure ecosystem for scaleup: connecting pathways, enabling referrals, and supporting smoother transitions between providers. This function should convene providers across institutional types and maintain a system-wide view of capability, demand trends and gaps.

2. **Conduct regular, sector-specific technology and capability roadmaps.**
   For priority deep tech sectors, the government should develop roadmaps jointly with industry, infrastructure operators and academia. These should translate emerging technical requirements into actionable infrastructure capability plans (what exists, what is needed, what is at risk, and what is planned) and should be updated on a predictable cycle.

3. **Strengthen infrastructure gap analysis and prioritisation.**
   The UK government in collaboration with infrastructure providers, industry and academia s hould undertake deeper, technically grounded analysis of critical infrastructure gaps across the deep tech landscape. Opportunities for tech convergence (where multi-sector facilities could erve multiple technology areas) should be explored, but this should be accompanied by comprehensive futures analysis, cost-benefit appraisal and delivery options, and should link explicitly to investment decisions.

4. **Improve transparency of infrastructure utilisation and capacity constraints.**
   Require publicly funded infrastructure organisations to consistently publish utilisation and capacity metrics (appropriately aggregated where needed). The data should be published and assessed by the newly established infrastructure coordinating function within the government/funding bodies. It should be used to inform investment decisions, reduce unnecessary duplication, and identify where underutilisation could be addressed through improved discovery pathways and access routes.

5. **Develop targeted international access arrangements where UK gaps are most acute.**
   Where critical gaps cannot be filled quickly, the government should pursue pragmatic international agreements to secure improved terms for UK company access to overseas infrastructure that is essential to scale strategically important deep tech sectors.

6. **Incentivise referral and joined-up provision across providers, creating a new Innovation Infrastructure Capability Forum.**
   Infrastructure providers should create a cross-infrastructure Forum dedicated to joining-up communications, capabilities, provision and referral mechanisms, working with funders and

government to introduce formal expectations that providers participate. Where providers compete, ensure incentives still reward appropriate signposting and collaboration, particularly for SMEs. Inspiration for the Forum should be drawn from cross-regulatory forums like the Digital Regulation Cooperation Forum.[80]

7. **Adopt standardised, industry-readable capability descriptions and self-reporting formats.** Infrastructure providers should present capability offers in a consistent template that combines technical parameters with practical 'what you can do here' use-cases (including constraints such as scale, throughput, accreditation / quality systems, safety classifications and typical timelines). This should reduce misfit discovery and late-stage surprises.

8. **Create or strengthen 'front door' engagement routes for deep tech companies.** Infrastructure providers should provide a visible, staffed entry point for external companies that can triage needs, direct companies to the right internal capability, and where appropriate, refer them to alternative providers. This should be supported by agreed referral protocols so that they become recognised and operationalised, not left to personal networks. Within these engagements, deep tech companies should communicate requirements clearly (technical specifications, TRL stage, throughput needs, constraints, timelines, quality / regulatory requirements). Better 'demand articulation' reduces matching time and improves the quality of provider responses. Inspiration for operating these engagement routes should be drawn from the Regulatory Innovation Office's 'front door' scheme.[81]

9. **Develop a central registry and improve use of existing directory resources.** The newly established Innovation Infrastructure Coordination Function should build and maintain an authoritative registry of scaleup-relevant shared infrastructure (with clear scope and inclusion criteria), integrated with existing tools and updated routinely. The registry should be searchable by use-case, sector and TRL relevance, not only by institution type, and should signpost alternatives and collaborative routes.



3.2. Access: Stretched finances, timelines and attention

Once a suitable facility has been identified, gaining access can prove to be a complex and time-consuming process. Deep tech companies frequently encounter unclear engagement routes, variable pricing, long lead times, and access conditions shaped more by institutional constraints than by the needs of commercialisation and scaleup.

In its 2025 annual review, the Scaleup Institute identified navigating infrastructure and access to R&D facilities as a critical concern for UK scaleups. 33% of companies surveyed in their work named 'access to flexible infrastructure, equipment and facilities' as the support they most wanted in order to innovate and collaborate, and 24% wanted 'introductions to University research facilities'.[142]

At the same time, infrastructure providers must balance industrial demand with finite capacity, safety requirements and existing research commitments. This creates inherent tensions in delivering access routes that are both efficient for users and sustainable for providers.

The result is a set of structural challenges that affect the speed, cost and reliability with which companies can engage with shared innovation infrastructure at a critical stage of growth.

3.2.1. Operating models, pricing and access conditions

Providers of high-quality innovation infrastructure operate within funding models that require cost recovery and the maintenance/upgrade of technically advanced assets. Rising operational costs, combined with the need to retain capability and expertise, mean that access pricing is often set at levels necessary to ensure sustainability. For deep tech SMEs and scaleups with constrained capital, these costs can be difficult to absorb, particularly where multiple facilities are required.

Cost, contractual rigidity and financial risk

Access to infrastructure is not only shaped by price levels but also by the structure of contractual arrangements. Pricing can vary significantly between universities, Catapults and commercial providers, reflecting differences in funding models, cost structures and service offers. For many deep tech companies, particularly those in early or capital-constrained stages, access costs can be prohibitive. This is compounded by contractual terms that may involve large upfront commitments, limited flexibility, or obligations that persist even when services are delayed or unavailable. While these arrangements often reflect legitimate needs for financial certainty and risk management by providers, they can shift disproportionate risk onto SMEs and discourage engagement, particularly where uncertainty around timelines or outcomes is high.

> **"The contracts were poorly designed; companies had to pay even if no services were provided or if equipment was unavailable... attempts to nullify the contract were difficult and frustrating."**
> ***Robotics and automation SME***

The financial constraints and growing costs for innovation infrastructure providers is explored in more detail in the context of operations, maintenance and reliability in Section 3.3.3.

Stretched timelines and misaligned funding pathways

In addition to financial cost, access is often shaped by formal requirements such as technology transfer arrangements, legal agreements and safety due diligence. These are necessary for managing risk and ensuring compliance, but they can significantly extend timelines. Access is frequently structured around formal collaborations or grant-funded programmes, which provide stability and long-term engagement but are not always aligned with the immediate needs of companies seeking rapid iteration and timely validation.

Longer-term collaborations and grant-funded partnerships are often encouraged because they support deeper engagement, knowledge transfer and sustained capability development. However, the processes required to secure these arrangements can introduce significant delay. Common challenges include lengthy grant cycles, slow decision-making, complex application requirements and delays between award decisions and project initiation.

Highly competitive funding environments further increase the time and effort required to secure access, with a high risk of unsuccessful applications.

Innovate UK plays a central role in this system. Alongside providing core funding for Catapult Centres, it delivers grants, loans and co-investment programmes for innovative UK companies, working within a wider public finance landscape that includes the British Business Bank, National Wealth Fund and Advanced Research and Invention Agency.[82] Its contribution extends beyond finance to include business growth advice, procurement and market-shaping interventions, market validation, investor engagement, internationalisation, partnerships, networks, and connections to specialist expertise and facilities. These interventions help companies address practical barriers to commercialisation that funding alone cannot resolve.

Innovate UK Business Connect, a separately constituted strategic delivery and network partner funded by Innovate UK, complements this role by convening businesses, researchers, investors and government. It uses sector expertise and intelligence gathered through these networks to connect innovators with relevant partners and opportunities, identify emerging system needs and inform the design of interventions across Innovate UK and wider government. Its investor networks illustrate how commercial expertise and market insight can be embedded throughout the venture-building process, rather than introduced only when a company begins actively raising finance. Investors can contribute experience, market connections and commercial challenge alongside capital, helping companies develop more investable and scalable propositions at an earlier stage.

Nevertheless, the growing number of targeted programmes, each with distinct objectives, eligibility requirements and delivery timetables, can make the support landscape difficult for companies to navigate and incur significant delays.[83]

> **"Grant processes are long, involve a lot of work, and are very uncertain... long wait times to hear back and receive first payment do not align with business timescales."**
> ***Engineering biology scaleup***

For companies operating under commercial pressures, these delays can be difficult to accommodate. The need to align technical progress with investor expectations, market timing and internal development cycles means that extended access timelines can hinder momentum and increase risk.

> **"Innovate UK grants are too small, and success rates are too low to bother with."**
> ***Space SME***

3.2.2. Inconsistency and administrative complexity in access procedures

Access processes are often slow and inconsistent, particularly where companies interact with multiple providers. Infrastructure organisations must manage complex internal systems alongside external requirements for compliance, contracting and reporting. This can result in administrative processes that are difficult to navigate and vary significantly between organisations.

Even within individual institutions, such as research-intensive universities or larger umbrella Catapult Centres, different facilities or departments may operate separate platforms, approval routes and procedures. This lack of consistency creates additional friction for companies seeking to access multiple capabilities as part of a broader development pathway. These challenges are often amplified in academic environments where commercial timelines and processes differ from research-led approaches. Where there is limited convening support or brokerage, SMEs are required to manage these complexities themselves, drawing on limited internal resources. The cumulative effect is slower access to capability, increased administrative burden, and reduced responsiveness at a stage where speed is often critical.

> **"The bureaucracy, governance and decision-making processes do not align with SME timelines... there is a backlog of applications that results in companies not being able to access funding or expertise at the right time."**
> ***Innovation accelerator***

Alternative access models and international comparisons

More flexible access models and procedures exist in parts of the UK innovation infrastructure landscape, but they are not yet consistently available across all sectors, technologies or stages of scaleup. Commercial providers offering 'pay-to-play' or access-only models can enable faster engagement, clearer pricing and reduced administrative burden.

One example in the engineering biology and life sciences sectors is Biocatalysts Ltd, which provides flexible open-access fermentation, contract R&D and scaleup services for developing enzyme and protein fermentation processes. Its 'Plug and Produce' model emphasises upfront clarity on costs, intellectual property arrangements and timelines, without reliance on grant funding or formal collaboration structures. These models offer advantages in speed and simplicity, particularly for companies that require rapid iteration. However, they do not suit all business models or sectors, and comparable provision is not evenly distributed across the UK infrastructure landscape.

In engineering biology, elements of more flexible access models are present within UK's publicly funded innovation infrastructure, including Catapult Centres. The Centre for Process Innovation's (CPI) National Industrial Biotechnology Facilities (NIBF) for example provide technical development support across a broad range of experimental scales, from early-stage laboratory work through to pilot and demonstration activity. CPI reports that its engineering biology capability spans fermentation volumes from 1ml to 10,000L and supports projects across TRLs 3 to 8. This broader TRL range reflects the nature of engineering biology, where decisions made at early stages, such as host strain selection or process design, can materially affect later scaleup. CPI uses flexible engagement routes, including small-scale scoping and feasibility projects, and has drawn on mechanisms such as Innovate UK EDGE grants to help SMEs engage with its capabilities in a lower-burden way.

However, providers face structural challenges in meeting the highly diverse needs of engineering biology companies. SMEs may require very different combinations of strain engineering, fermentation, downstream processing, analytical capability, regulatory support, economic assessment and manufacturing readiness advice. No single facility can cover all technology pathways, feedstocks, end products or production models. As a result, infrastructure providers often need to operate as part of a wider network, helping companies identify the right combination of facilities and expertise. This networked role is valuable, but it can also create complexity for companies seeking rapid, end-to-end support.

While there are numerous UK bio foundries supporting earlier TRLs such as the London Biofoundry and the Earlham Institute Biofoundry, Biocatalysts Ltd. was recently identified by the Innovation and Research Caucus as the only open-access organisation in the UK offering businesses commercial scale biomanufacturing services beyond the pilot scale, with 20,000L fermentation capacity, as well as onward capabilities of 63,000L and full downstream processing capabilities.[75]

The challenge for the UK is not necessarily the absence of engineering biology infrastructure overall, but the availability, visibility and flexibility of facilities at specific scales, technology pathways and commercial readiness points.In some cases, the absence of suitable domestic provision, or the difficulty of accessing it quickly on workable terms, has contributed to companies accessing infrastructure abroad. Evidence suggests that businesses in engineering biology, for example, are engaging with facilities in countries such as the Netherlands, Sweden and Portugal, where access models may offer greater flexibility or capacity. A 2025 report by the UK Bio-Based materials Regulatory Network (BB-REG-NET) identified at least seven bio-based or engineering biology companies that have moved operations abroad specifically to address challenges related to the availability and cost of scaleup and manufacturing facilities in the UK.[84] One such example of European facilities cited as a frequently used alternative is explored in Case Study 5, Bio Base Europe Pilot Plant, Ghent, Belgium.

While difficult to draw direct comparisons, in the semiconductors and quantum technologies sector there is no equivalent commercial company to Biocatalysts offering this type of flexible access model for scaleup and manufacture of integrated circuits. However, similar style models do exist internationally, often described as 'pure-play' foundries such as TSMC in Taiwan, GlobalFoundries in the United States and SMART Photonics in the Netherlands.

The international examples explored in these case studies do not predicate the need for direct simple replication of overseas commercial models. Rather, they evidence the value in further exploration of how the most effective features of flexible access models, including clear pricing, rapid scoping, bilateral fee-for-service routes, predictable IP terms, confidentiality, and continuity from development to demonstration, could be expanded within UK shared innovation infrastructure. For Catapult Centres and other publicly supported providers, the policy challenge is to preserve their collaborative, mission-led and public-good functions while improving the speed, simplicity and commercial usability of access for deep tech SMEs.

Case Study 5:
International pay-to-play scaleup facilities: Bio Base Europe pilot plant, Ghent, Belgium – a flexible open-access model for process development, scaleup and early industrial demonstration

Bio Base Europe Pilot Plant (BBEPP), located in Ghent, Belgium, is an independent, open-access pilot and demonstration facility for the bioeconomy that supports companies with process development, scaleup and custom manufacturing from laboratory level through to multi-ton scale.[85] It provides companies with access to a broad suite of modular unit operations and engineering expertise across biomass pretreatment, biocatalysis, precision fermentation, biomass fermentation, gas fermentation, green chemistry, and downstream product recovery and purification. Recent investments have expanded its fermentation offer up to 75,000 litres, allowing businesses to validate processes under more industrially relevant conditions before committing to a dedicated production line or large-scale contract manufacturer.[86]

The facility's value lies not only in the scale of its equipment but in its flexible operating model, independent governance and ability to provide continuity across process development, scaleup and early demonstration.

Flexible access options

BBEPP works through a combination of private bilateral projects, consortium-based public projects, and its own technology development activity, allowing companies to engage through the route most suited to their needs. In bilateral projects, it operates under strict confidentiality, with customers retaining produced batches and receiving a technology transfer package to support transfer into contract manufacturing or in-house production. Its service offer is explicitly designed to cover the TRL 4 to TRL 8 journey, with projects adapted flexibly to customer requirements in timing, scope and scale, rather than only through fixed grant cycles or formal academic collaboration structures.[87]

This produces a model that is flexible, clear and customer-led, including more direct fee-for-service access where appropriate. BBEPP can act as a one-stop-shop, performing the production chain in a single plant from biomass feedstock to final refined product, reducing the need for organisations to stitch together multiple providers across different stages of process development and scaleup.[88] It combines open access with industrial process discipline, enabling companies to test and optimise processes at progressively larger scales while maintaining continuity in equipment, staff and downstream capability.

Independent governance and hybrid funding

BBEPP is an independent facility with no industrial shareholders, offering confidential, application-focused support without the same degree of institutional complexity and uncertainty in areas of intellectual property often associated with public or academic environments. BBEPP is neither a purely academic facility nor a conventional contract manufacturer. It sits in the space between public innovation infrastructure and commercial service provider.

Unlike the UK Catapults' 'thirds' model, which seeks to balance core public grant, collaborative R&D income and commercial revenue, BBEPP operates through a more flexible mix of bilateral fee-for-service work, consortium projects and periodic public capital investment, without an equivalent target funding ratio. It has expanded through a mix of commercial project income and targeted public investment, including support from the European Regional Development Fund, Flemish regional funding and local public partners. Between 2017 and 2024, this investment model supported a further

€45 million expansion in pilot and demonstration infrastructure, including new downstream processing halls, additional mid-scale fermenters and the 75 m^3 demonstration line.[89,90] This has enabled BBEPP to scale its offer in response to industry need while retaining an open-access role in the wider European bioeconomy ecosystem.

Key learnings:

BBEPP should not be viewed as a direct substitute for UK Catapult Centres or other publicly supported infrastructure, which often have broader missions around collaboration, capability building, skills, public-good research and ecosystem development. UK infrastructure providers already adopt flexible approaches in some areas, including scoping projects, SME engagement routes and support across different TRLs. However, the BBEPP model illustrates the potential value of expanding access routes that are faster, clearer and more commercially straightforward, particularly for companies that need rapid iteration and do not have the time or resources to engage through complex grant-funded consortia.

- BBEPP's flexible access model allows alongside more collaborative R&D projects the offer of faster, more direct routes into scaleup infrastructure. Facilities like BBEPP that offer bilateral, fee-for-service access alongside clear pricing, confidentiality and tailored project scope can reduce administrative burden and help companies move more quickly from process development to industrial validation. This is especially valuable where deep tech SMEs need speed, iteration and clarity rather than lengthy grant-funded routes.
- BBEPP offers connected process development, scaleup and downstream processing in one facility, reducing the burden on companies to coordinate multiple providers. This is particularly relevant for engineering biology, where process continuity and early technical decisions can strongly affect later manufacturing viability.
- BBEPP shows the value of an independent facility with no industrial shareholders, able to operate under strict confidentiality while remaining accessible to a wide range of companies. This can give users greater confidence on intellectual property, reduce institutional complexity, and provide a more industry-facing operating culture than is often possible in more traditional academic environments.
- BBEPP demonstrates that long-term public support for infrastructure expansion can work well when combined with a flexible service model that responds to company needs. Its growth has been enabled by targeted public investment in new fermentation and downstream processing assets, while bilateral and consortium project activity sustains usage and market relevance.

3.2.3. Uneven access for SMEs and scaleups

Access conditions are not experienced evenly across industry stakeholders and company size. SMEs and scaleups often face additional constraints compared to larger businesses, even where there is a strong stated commitment to supporting them. Infrastructure providers operate within financial and operational frameworks that can favour engagements which are larger in scale, longer in duration, and lower in transaction cost. Larger companies are typically better positioned to meet these conditions, with greater financial resources, established procurement processes and the ability to enter into long-term agreements.

As a result, SME engagement is sometimes dependent on dedicated programmes, targeted funding schemes or specific initiatives, rather than being consistently embedded in standard operating models.[91] This can limit flexibility and create reliance on external funding or structured interventions to enable access.

Institutional incentives and funding models

The incentives shaping access for SMEs and scaleups are closely linked to organisational structures and funding models across different provider types.

Within universities, institutes and certain national laboratories and RTOs, early-stage companies benefit significantly from proximity to academic expertise, specialist facilities and research environments. In research-intensive settings, it is expected that infrastructure use is shaped by academic priorities, including teaching, publication and research outputs, which play a central role in institutional missions and funding models. However, where university-based innovation facilities explicitly seek to engage industry and support SMEs as customers, these priorities can create tensions with commercial timelines, responsiveness and modes of working.

In practice, there are often fewer direct incentives to prioritise external SME access compared to large-scale, multi-year collaborations with established industrial partners, which offer greater financial stability and alignment with existing operating models.[27] While this reflects legitimate organisational constraints, it can result in misalignment between the needs of deep tech scaleups and the way access is structured and delivered. Addressing this requires mechanisms that better reconcile academic and commercial objectives, particularly in facilities with a stated industry-facing mission. The nature of these cultural and operational tensions, and their implications for effective utilisation of infrastructure, are explored in more detail in Section 3.3.

Better commercial access for SMEs to use innovation facilities typically occurs at academic environments where they have separately governed entities, institutes or RTOs with a stronger industry focus that are based at, co-located with, or institutionally embedded within them. Although depending on the relationship, academic priorities can often prevail. Some examples are explored below.

At Catapult Centres, the 'thirds' funding model is intended to balance core public funding, competitively won collaborative R&D funding, and industry income. In principle, this blended model helps Catapults remain industry-relevant, avoid over-reliance on public funds, and operate close to market needs while still supporting earlier-stage innovation and government-academia-business collaboration. The model is not applied as a strict rule across all Catapults; rather, it operates as a guiding framework, with the appropriate balance depending on the maturity, sector, market context and business model of each centre. Some Catapults achieve a funding mix close to the thirds model, while others, particularly those supporting emerging technologies or less mature markets, may rely more heavily on public funding or collaborative R&D. In its Catapult focused 2022 report, the House of Lords Science and Technology Committee similarly noted that the model is appropriate in theory, but not necessarily achievable in all cases, and that it should not be applied too dogmatically across different Catapult contexts.[92]

The model also contains important positive incentives. Because around two-thirds of the intended funding mix is derived from public sources, through core grant and collaborative R&D programmes, it can in principle support activity that would not be viable on purely commercial terms. This should enable Catapults to work with SMEs and scaleups that have strong innovation potential but limited ability to pay directly, rather than focusing only on larger corporate partners. Catapults are also required to report regularly against key performance indicators, including engagement with SMEs and wider industry impact, helping to maintain accountability for their role in supporting smaller businesses and the innovation ecosystem. However, these metrics can vary across centres and may not always capture the quality, depth or commercial significance of SME engagement with sufficient precision.

In practice, tensions remain. Smaller companies are often more dependent than larger companies on winning public funding to access Catapult capabilities, as larger companies can more readily engage through direct commercial contracts.[93] Competition for grant funding is high, and SMEs may lack the time, resource or bid-writing experience to participate effectively in complex consortia. Where Catapults rely heavily on industry income, access may become easier for companies able to pay commercially, while SMEs and deep tech scaleups face greater uncertainty unless grant or subsidy routes are available. This does not mean the thirds model is inherently unsuitable; rather, it suggests that its effects differ significantly by sector, technology maturity and company type.

Evidence indicates that small and micro businesses can benefit substantially from Catapult engagement, with Innovate UK analysis showing stronger turnover growth among businesses that work with Catapults (50% faster on average).[94] Access is therefore pivotal. However, the benefits of the model depend on whether SMEs can reach Catapult capabilities at the right time, on workable terms, and without disproportionate transaction costs. A more balanced policy approach should therefore preserve the strengths of the thirds model, including industry relevance and financial discipline, while ensuring that public funding, KPI design and SME access routes are sufficiently targeted to support deep tech SMEs through the most capital-intensive stages of scaleup.

What works - RTOs and institutes embedded in universities with independent operating models and industry focus.

CORNERSTONE – University of Southampton:
CORNERSTONE is an open-source, licence-free silicon photonics rapid prototyping foundry led from the University of Southampton and involving expertise from the Universities of Southampton and Glasgow.[74] It offers industry and researchers access to multiple photonics platforms, including services such as multi-project wafer runs, bespoke fabrication batches, design consultancy and training. Its model lowers barriers to entry by combining a standard component library, clear service routes and comparatively fast turnaround times, allowing companies to focus on application development rather than building in-house fabrication capability.[95,96] Although rooted in a university research environment, CORNERSTONE operates with a distinctly industry-facing service model that supports proof-of-concept work and early commercial prototyping in areas such as telecoms, sensing, quantum and LiDAR.

Fraunhofer CAP – University of Strathclyde:
Fraunhofer CAP is based at the University of Strathclyde's Technology and Innovation Centre but operates as a not-for-profit applied R&D organisation. It develops advanced laser and optical systems for sectors including quantum, space, energy, sensing, healthcare, security and communications, and works with clients ranging from SMEs to global corporations. Its strategic partnership with Strathclyde gives it access to academic expertise, joint studentships and collaborative projects, while its independent governance and applied research mission allow it to operate with a more commercial, industry-responsive culture than a conventional university department. This combination helps bridge the gap between university capability and industrial deployment, with a strong emphasis on contract and collaborative R&D that is driven by user need.

Henry Royce Institute – Multi-university-embedded national institute model:
The Henry Royce Institute is a national institute for advanced materials with facilities and equipment distributed across several university partners, but with dedicated industry-facing mechanisms designed to make facilities easier for companies to use. One of the strongest examples is its Application Scientists model, through which businesses can access hands-on technical support, project scoping and coordination across facilities, with flexible involvement ranging from short commercial projects to longer translational work. Royce also operates SME access schemes that subsidise use of its equipment and lower the cost and risk of experimental R&D.[97] Because it combines university-based facilities with dedicated application support, funding routes and a clear point of coordination, Royce shows how university-embedded infrastructure can be organised in a more integrated and industry-accessible way than conventional academic provision alone. Both the Henry Royce Institute and Fraunhofer CAP are explored in more detail in Case Study 6.



Image: © Axial Medical



Access recommendations:
improving flexibility, speed and fairness of access

Addressing access-stage challenges requires action to reduce administrative burden, improve affordability, and create more flexible engagement pathways between deep tech companies and infrastructure providers. The focus should be on enabling faster, clearer and more predictable routes into infrastructure while maintaining provider sustainability.

10. **Review funding and incentive models to better support SME access.**
The UK government and funding bodies should review how existing funding frameworks, including the Catapult "thirds" model, influence access for SMEs and scaleups. Greater flexibility in applying these models may be required for emerging deep tech sectors, where businesses have limited resources and shorter commercial timelines. Expansion of SME-focused funding mechanisms that enable direct access to infrastructure without requiring complex consortia participation would reduce barriers. Additional financial instruments, such as subsidies or tax incentives, could also be explored to lower the cost burden of infrastructure access for scaleup activities.

11. **Strengthen SME access models within industry facing universities and RTOs.**
Where infrastructure providers target industry engagement as a priority, capacity should be explicitly allocated for external SME use. Universities and RTOs should develop dedicated, SME-friendly access models that offer simplified onboarding, shorter engagement formats, and clearer pricing structures. Internal frameworks should recognise the wider value of SME engagement, including pathways to future collaboration, industry-led research opportunities and talent development. The development of separately governed or commercially oriented entities within universities can further support more responsive and industry-aligned engagement.

12. **Expand flexible and rapid-access models.**
Where appropriate, infrastructure providers should develop alternative access routes that allow companies to engage quickly without committing to long-term collaborations or grant-funded programmes. This includes pay-to-play models, short-term technical engagements, feasibility studies, and challenge-led access programmes. These approaches should be supported where appropriate by public funding to ensure affordability for SMEs. Greater availability of these models would enable companies to iterate more rapidly and reduce reliance on slower, more rigid pathways.

13. **Increase standardisation, transparency and predictability of access processes.**
Led by a newly established Innovation Infrastructure Coordination Function, a coordinated effort across government, funders and providers is needed to simplify and align access procedures. This should include the adoption of common templates, project agreements and costing frameworks. Greater consistency in processes across institutions would reduce duplication and streamline access. Infrastructure providers should also publish clear and consistent information on access processes, including indicative timelines for contracting, onboarding, compliance approvals and project initiation. Pricing structures should be transparent, with clear breakdowns of costs and optional services. Improved visibility over expected timelines and costs will enable deep tech companies to plan more effectively and reduce uncertainty at critical stages of development.

14. **Improve pricing flexibility and affordability of access.**
    Infrastructure providers should explore tiered pricing structures that reflect the differing needs and financial capacity of SMEs, scaleups and larger companies. Greater flexibility in payment structures, including staged payments or reduced upfront commitments, would lower barriers to entry. Funding bodies should support this through targeted subsidies or co-funding mechanisms to ensure that cost does not prevent companies from accessing critical capabilities.

15. **Enable clearer navigation between different access pathways.**
    Companies require guidance on when to use different types of engagement models, including grant-funded collaboration, direct commercial access, or hybrid approaches. Infrastructure providers and funders should provide clearer signposting of these pathways and their suitability depending on company needs, stage of development and urgency. Avoiding default reliance on full collaborative models will allow businesses to select more appropriate and efficient routes to access where speed is critical.



3.3. Utilisation: Structural and cultural tensions, amid a challenging funding environment

Once accessed, the ability to use infrastructure effectively, reliably and at pace is critical to translating technical progress into commercial outcomes. Deep tech companies require not only physical assets, but also consistent access to technical expertise, iterative testing environments, and support to troubleshoot complex processes. These requirements place significant demands on infrastructure providers, particularly where operating models, staffing and funding are not designed for sustained industrial engagement. At this stage, a range of structural, cultural and financial factors converge. These include differences in operating models between academia and industry, inconsistencies in technical support, constraints on facility reliability, and funding systems that do not always support maintenance, upgrade and long-term operational capability. The result is that even where access has been secured, effective utilisation can remain uneven.

3.3.1. Academic operating models, availability and industry alignment

A significant proportion of the UK's innovation infrastructure supporting deep tech is located within research-intensive universities. These environments are essential to early-stage discovery and play a central role in the wider innovation system. In many cases, it is appropriate that facilities are designed primarily to support academic research, teaching and publication outputs. However, challenges arise where facilities are also expected to support industry use, particularly for commercialisation and scaleup. Differences in priorities, timelines and operating models between academia and industry can become pronounced. Academic environments often operate on longer research cycles, with shared access to equipment and activities structured around teaching and research commitments. In contrast, deep tech companies require predictable timelines, higher levels of control, and responsiveness aligned to commercial pressures.

These differences are reflected in how infrastructure is scheduled, accessed and prioritised. Availability can be constrained by teaching timetables, academic calendars and institutional commitments, making it difficult to accommodate short-notice or time-sensitive industrial work. Where collaboration is formally structured and objectives are aligned, these constraints can often be managed effectively. However, in more flexible or transactional access models, competing priorities can result in delays and reduced reliability.

> **"Universities may provide access to infrastructure, but availability is limited... challenges disappear when partnerships are aligned in their aims."**
> ***Quantum technologies scaleup company***

There are also structural factors that influence how access is allocated. Larger, longer-term industrial collaborations can offer greater financial stability and alignment with institutional incentives, while smaller, short-term SME engagements may be more difficult to accommodate within existing operating models.

These dynamics do not represent a failure of university infrastructure but reflect its original purpose and design. However, where facilities are explicitly positioned to support industry and scaleup, there is a need for clearer mechanisms to align academic and commercial priorities. This includes defining the role of facilities, setting expectations around availability, and ensuring that operating models are appropriate for industry-facing activity.

Alternative and emerging models for research and innovation infrastructure

Alongside established infrastructure providers, there exists in the UK, a growing number of new and emerging organisational models designed to address research, innovation and commercialisation challenges that do not fit easily within traditional academic or commercial settings. These include mission-driven research organisations, independent research institutes, Focused Research Organisations (FROs) and Frontier Research Contractors (FRCs). FROs and FRCs are typically agile, engineering-intensive organisations established around defined technical challenges, capabilities or public-good objectives. FROs are generally designed to deliver

ambitious, multi-year programmes of work, while FRCs tend to operate through smaller, more flexible projects with shorter delivery timelines.[98,99] Both models are being explored in the UK through ARIA's Activation Partners programme.[100] Examples include Amodo Design, which provides specialist engineering expertise and technical capability to research teams across a wide range of domains including robotics, high-throughput data pipelines, advanced sensors, manufacturing systems and clinical testing equipment, helping researchers access capabilities that would be difficult for individual laboratories to sustain independently.[101] Another example is the Scaling Inference Lab, supported by ARIA, which is being set up and delivered by CommonAI CIC, and aims to act as an open testbed where startups and research groups can validate novel AI hardware and systems within deployable, real-world computing environments, helping reduce barriers between technical development and commercial adoption.[102,103]

These models provide an alternative approach to building and supporting innovation capability. By combining long-term scientific ambition with engineering, operational and commercial expertise, they may be particularly well suited to supporting deep tech commercialisation and scaleup activities that require dedicated technical capability, flexible governance and industry-aligned operating models. While many remain focused on earlier-stage research and technology development, they can also support venture creation, technology validation and commercialisation by providing specialist facilities, engineering expertise and translational capabilities. As such, they have the potential to complement existing university, Catapult and PSRE infrastructure by providing additional routes through the research-to-commercialisation pathway, particularly in emerging technology areas where new capabilities need to be developed rapidly.

Recent initiatives, including ARIA's support for FROs and FRCs and the government's Research Ventures Catalyst programme, reflect growing recognition that valuable research and innovation capability exists beyond traditional institutional models.104 A recent open letter written by Science Works to the Chief Executive of UKRI, co-signed by the Royal Academy of Engineering and other organisations, argues that current eligibility criteria can create barriers for new research-performing organisations seeking access to funding, infrastructure and facilities.[105] The letter recommends more flexible and forward-looking eligibility arrangements to enable a wider range of high-quality organisations to contribute to the UK's research and innovation ecosystem, strengthen institutional diversity and support future economic growth.

3.3.2. Technical support, reliability and operational performance

Effective utilisation of infrastructure depends on more than simple access to physical assets and capabilities. Deep tech scaleups require consistent access to high-quality technical support, reliable equipment, and operating environments that can support iterative and often complex development processes.

Across many facilities, there is a gap between the level of technical support required and the resources available. In research-led environments, infrastructure may be supported by academic staff or rotating student cohorts, leading to variability in operation, maintenance and reliability as well as underutilisation of equipment, delays in adapting facilities for industrial processes, and challenges in achieving consistent performance. Dedicated technical staff with industry-relevant expertise, including application specialists and experienced technicians, are not always available, especially with expertise in later TRL stage processes. Shortages of skilled technical personnel in key deep tech sectors, such as semiconductors and quantum technologies, further constrain the system's ability to support commercial scaleup.

> **"It's easier to find specialists in R&D at the early stages when you are developing new materials, but for the next wave of recruitment they will need people familiar with later stage processes with five to six years of experience and it's hard to see where they will come from. The recruitment and training process is time consuming, costly and if it goes wrong and you get the wrong person these costs are amplified."**
> ***Semiconductor SME***

Reliability of infrastructure is another key factor. Equipment used by multiple users with differing requirements may require frequent calibration and

adjustment. Achieving stable operating conditions for a specific application can take significant time and effort. Where access is intermittent or disrupted, this work may need to be repeated, increasing costs and extending timelines. Companies also require sufficient continuity of access to make effective use of infrastructure. Short or fragmented usage periods can limit the ability to optimise processes or validate results at scale, reducing the overall value of access.

"Universities have invested in world class infrastructure, but they often do not put in place the operational budgets to keep those capabilities up to date, operating, maintained and reliable."
Innovation infrastructure coordinator

"Available equipment often requires upgrades, restocking consumables and calibrating instruments. Maintenance quality often depends on academic supervision, which can lead to inconsistent standards."
Electronic devices company.

The onboarding of new users for infrastructure providers is a critical, complex and time-consuming process that cannot easily be shortcut or streamlined. Aligning technical requirements, safety protocols and operational processes takes time, particularly where infrastructure has been designed primarily for research rather than industrial throughput. Without sufficient technical support and operational flexibility, these onboarding processes can create additional delays at a critical stage of scaleup.

Case study 6 explores two 'what works' examples of where The Henry Royce Institute and Fraunhofer CAP provide dedicated technical and business development support to SMEs and scaleups.



Image: © This is Engineering

Case Study 6:
The Henry Royce Institute and Fraunhofer CAP – application specialists, business development support and problem-solving offer

Deep tech companies face long development timelines, high technical risk and often have limited internal capacity to translate research into commercialised technologies. Traditional academic support and access models can struggle to meet industry needs for rapid iteration, system integration and commercially relevant outcomes. Similarly, access to the use of high-quality university infrastructure alone is insufficient without the right technical support.

As such, scale-up success depends on access to skilled and reliable technical staff as well as industry aligned, problem-led applied research capability. The following two examples showcase how university equipment and facilities can be used more efficiently and effectively to support deep tech scaleups.

The Henry Royce Institute – Application Scientist model:

The Henry Royce Institute has established a dedicated, nationally distributed Application Scientist workforce embedded within its shared advanced materials facilities. Application Scientists are permanently or long-term funded technical specialists who provide hands-on, outcome-focused support to industrial users, including SMEs and scale-ups. Their remit includes project scoping, experimental design, equipment operation, data interpretation and process optimisation across multiple TRLs.[106]

Unlike short-term project staff, Application Scientists operate as a continuous interface between facilities, academic expertise and industry. They coordinate access across multiple sites, maintain deep knowledge of equipment capabilities and limitations, and tailor experimental approaches to commercial constraints such as time, cost and manufacturability.

Case evidence from Royce shows that continuity of technical support across successive projects enables faster progress and avoids repeated knowledge transfer, a critical factor for SMEs with limited internal R&D capacity.[107]

Fraunhofer Centre for Applied Photonics (CAP) – Problem-solving specialism and business development support:

Fraunhofer CAP, based at the University of Strathclyde, applies the proven Fraunhofer applied research model to UK industry. Fraunhofer CAP operates as a not-for-profit RTO, combining long-term core funding with competitively won contract and collaborative R&D. This funding model enables CAP to maintain specialist technical staff, invest ahead of demand in capability, and respond flexibly to industrial challenges.[108]

Fraunhofer CAP positions itself as an external R&D and 'problem-solving' partner for industry, rather than just a facility-access provider.[74] It embeds long-term funded multidisciplinary technical teams around industrial problems rather than projects or equipment. These teams work directly with companies to define technical problems, develop laser and optical systems, build and test pre-production prototypes, and integrate components into deployable solutions across sectors including quantum, energy, defence, healthcare and communications.

Fraunhofer CAP's business-facing model is reinforced by an explicit business development and delivery function, enabling rapid project scoping, clear commercial outcomes and flexible engagement models suited to SMEs. Since its establishment in 2012, Fraunhofer CAP has delivered hundreds of applied R&D projects for over 200 industrial partners, leveraging core public funding more than ten-fold in industry-funded activity.[109]

Key learnings:

Both the Henry Royce Institute and Fraunhofer CAP demonstrate that industry aligned staffing services at shared innovation infrastructure is critical to the effective support for deep tech scaleups. The access and utilisation of shared university-based infrastructure become a much more likely prospect where applied problem-solving approaches are used, funding of long-term application and technical specialists is secured, and critical business model development support is provided.

Longterm funding for technical roles is as important as capital investment in facilities. Embedding Application Scientist-type roles across the UK's shared innovation infrastructure network would improve SME access, accelerate deep tech scale-up, maximise returns on public infrastructure investment, and directly support the UK's ambitions for innovation-led growth and strategic industrial capability.

The main benefits of these models:

- **De-risk scaleup and remove access barriers.** Lowers the technical, operational and commercial risks associated with using complex infrastructure, enabling deep tech SMEs to engage earlier and more confidently in scale-up activity.
- **Research to market translation.** Helps to move technologies beyond proof-of-concept towards more repeatable industry-relevant solutions, shortening development timelines and improving commercial readiness.
- **Demand-led solution-focused infrastructure.** Increases equipment uptime, quality of support and alignment with industry needs, transforming facilities into problem-solving environments and ensuring capital-intensive facilities deliver continuous economic and innovation impact.
- **Reliability and maintenance of shared assets.** Improves utilisation and performance of shared infrastructure, increasing equipment uptime, reliability and asset lifetime.
- **Institutional knowledge and system capability.** Helps to retain knowledge with the infrastructure provider, enables learning across projects and users, and allows facilities to evolve strategically rather than responding only to short-term funding cycles.
- **Commercial scaleup support alongside research outputs.** Maximises returns on public capital investment by ensuring facilities deliver sustained commercial and translational impact for deep tech SMEs, not just academic research outputs.
- **Flexible SME engagement and public ROI.** Increases repeat and flexible SME use, leverages private R&D investment, and maximises the productivity and value-for-money of public infrastructure funding.

3.3.3. Long-term funding, maintenance and strategic continuity

A recurring constraint on utilisation is the availability and structure of funding for infrastructure. While capital investment in facilities is often secured through targeted programmes, funding for ongoing maintenance, upgrades and technical support is less consistent. Short-term funding cycles, fragmented funding streams and inflexible programme structures can limit the ability of providers to plan and invest over the long term. This affects not only the condition and reliability of infrastructure but also the ability to retain skilled staff and develop industry-facing services. In this work and others [1,110], issues with the funding of infrastructure are the most frequently highlighted barriers from infrastructure providers.

The uncertainty from short term funding rounds and the absence of "batteries included" funding for maintenance, consumables and operational costs creates risks to service continuity. It also constrains the ability of infrastructure providers to respond to evolving industry needs. These impacts are especially felt by PSRE's, who receive fewer predictable long-term funding arrangements from government than other organisation's in the UK innovation infrastructure landscape.

These funding related barriers coupled with related bureaucratic issues such as inflexible financial frameworks, rigid government procurement and tendering processes, can have significant long-term impacts on infrastructure provision. They impact organisation's agility, their long-term strategic planning and their engagement with and facilitation of increased access to scaleups and SMEs.[110]

> **"There needs to be signalling that the UK is committed to innovation infrastructure in certain areas, with security in funding... that certainty helps attract wider investment."**
> ***National infrastructure provider***

In contrast, international examples of successful scaleup support infrastructure such as IMECH in Belgium and Germany's Fraunhofer Gesellschaft demonstrate the benefits of long-term, predictable funding models in supporting sustained capability development and industrial engagement.

> **"Good examples of strategic long-term investing by the government includes the Grenoble region; IMECH started in the 80s as a long-term initiative. The UK lacks similar long-term thinking, expecting quick results without providing the necessary funding. Funding needs to be independent of the election cycle, like Fraunhofer, which receives consistent funding."**
> ***National innovation infrastructure provider***

Growing costs and precarious finances for university infrastructure

Financial pressure on shared research and innovation infrastructure is increasing across the system, but the challenge is especially acute for infrastructure provided by universities. A March 2026 report by the National Audit Office (NAO) found that English universities are spending around £1.8 billion each year on research infrastructure, including £758 million spent entirely on maintenance, while an estimated £5.6 billion would be required to restore university-owned research infrastructure to full operational condition.[111] The same report notes that the condition of university research infrastructure is deteriorating and that some facilities can no longer be used as intended. More broadly, the NAO emphasises that research infrastructure is integral to the UK's role as a hub for international collaboration, underlining the wider strategic significance of maintaining capability to a high standard.

The digital infrastructure that underpins research and innovation delivery are also becoming a growing source of cost and constraint. A Jisc report has warned that accumulated old software and digital systems across UK higher education are becoming outdated, fragmented and poorly integrated, and is now a material drag on institutional resilience, research productivity and innovation. Jisc estimates that this 'technical legacy' could be costing universities between £2 billion and £4.7 billion a year, through duplicated systems, legacy maintenance requirements and lost staff productivity.[112] Jisc argues that fragmented funding arrangements and weak cost recovery have contributed to siloed digital infrastructure, creating burdens for researchers and support teams and making it harder for institutions to adopt new technologies, including AI.[113]

Recent policy announcements in England reflect an attempt to respond to this growing strain by concentrating funding more explicitly on the upkeep of existing capability. In March 2026, Research England confirmed that, from 2026–27 onwards, formula-based Research Capital Investment Fund (RCIF) allocations should be used only to sustain current facilities and should not be used for new buildings or major new infrastructure. Over the spending review period, RCIF will also be tapered as its purpose narrows, falling from £174 million in 2026–27 to £124 million in 2029–30.[114] Research England has framed this shift as part of a broader move towards a more coordinated and transparent infrastructure portfolio, alongside increased investment in digital research infrastructure and future competitive capital opportunities. However, in an already financially strained environment, the narrowing of RCIF is likely to be challenging for universities that have previously relied on the flexibility of formula funding to balance maintenance, upgrades and longer-term infrastructure renewal.[113,115]

3.3.4. Intellectual property, legal frameworks and risk management

Intellectual property and legal arrangements are an essential component of shared infrastructure use. They provide the framework for managing ownership, confidentiality and risk in collaborative or

multi-user environments. In many cases, companies accept certain trade-offs in IP ownership as part of accessing high-quality facilities. However, challenges arise from inconsistency, complexity and lack of standardisation in how these arrangements are implemented.[116] IP terms can vary significantly between providers, and negotiating agreements can introduce additional time, cost and uncertainty.

Key areas of concern include ownership of data generated on shared equipment, rights to foreground IP arising from joint work, and protection of background IP when working with facility staff. Inconsistent approaches across providers make it more difficult for companies to plan and can influence decisions to favour commercial or international infrastructure options, over open access or domestic publicly funded options. Additional uncertainty about the confidentiality and security of shared environments, services and systems only helps to exacerbate this situation.

> **"Stronger multi-year IP strategic agreements help mitigate practical problems compared to simply using infrastructure."**
> ***Quantum scaleup company***

> **"There is a constant worry about IP leakage. It is our greatest asset and must be protected."**
> ***Engineering biology SME***

Even where there is acceptance of IP trade-offs from businesses, their financial backers might have different views. The potential risks of IP leakage can be of greater concern to investors and the significant value of access to scaleup infrastructure not as well understood.

Alternative IP-light infrastructure access models are not common in the UK. Certain commercially operated facilities and Contract Research Organisations provide support without IP capture, but open-access style infrastructures of this kind are more commonplace across Europe at the US. BBEPP, in Ghent, Belgium is one such example explored in Case Study 5, and another is SMART Photonics, Eindhoven exampled below.

International Example – SMART Photonics, Eindhoven: Pure-play foundry model as an alternative commercial access route

SMART Photonics, based in Eindhoven, is an independent pure-play indium phosphide (InP) foundry that manufactures photonic components and photonic integrated circuits for customers based on their designs, from proof of concept through to full production. As a pure-play foundry, it does not design or market competing end products of its own; instead, it focuses on manufacturing for external users using shared industrial infrastructure and proven design flows.[117] SMART Photonics' foundry model combines shared expensive infrastructure with a generic integration process, process design kits and multi-project wafer runs, allowing multiple users' designs to be fabricated on a single wafer. This lowers prototyping costs, reduces the number of design iterations required and shortens the route from concept to manufacturable product.[118]

Importantly with respect to intellectual property, SMART Photonics ensures that product IP remains with the customer, which simplifies one of the most sensitive areas of infrastructure use for deep tech SMEs with valuable IP. Rather than negotiating complex arrangements around foreground IP, background IP and shared ownership in collaborative environments, companies can engage through a more straightforward commercial manufacturing relationship.[119] This can reduce legal complexity, lower transaction costs, and gives both companies and investors greater confidence that core IP will remain protected as a business asset.

As such, the pure-play model provides key technical, commercial and legal benefits. The model supports faster and more direct access for businesses that need clarity on pricing, confidentiality and timelines, without necessarily entering into broader collaborative structures, and provides a clearer division of roles between infrastructure provider and customer, simplifies IP protection, and offers a more commercial friendly route from design to scaleup.



Utilisation Recommendations:
improving reliability, capability and long-term sustainability

Addressing utilisation-stage challenges requires a focus on strengthening technical capability, aligning operating models with industry needs, and ensuring long-term sustainability of infrastructure provision. The aim should be to enable consistent, high-quality use of facilities that supports deep tech scaleup while maintaining the integrity of research environments.

16. **Provide long-term, predictable funding for infrastructure by extending 10-year R&D budgets to innovation infrastructure relevant to critical deep technologies amongst the Industrial Strategy Growth Sectors (IS-8).**
The government should provide stable, long-term funding frameworks for infrastructure that supports deep tech scaleup, including funding for maintenance, refurbishment and operational costs. Funding structures should move beyond short-term cycles and enable long-term planning, particularly in strategically important sectors. Clear signals of long-term commitment can also help attract private investment and support ecosystem development.

17. **Strengthen technical capability, staffing and maintenance functions.**
Infrastructure providers should invest in dedicated technical staff, including technicians and application specialists, responsible for operating, maintaining and adapting facilities for industrial use. Clear career pathways should be developed for technical and scaleup supporting roles, including progression routes outside of traditional academic structures. Government and funders should support fully costed plans for maintenance, upgrades and staffing as part of infrastructure investment, ensuring that facilities remain operational, reliable and aligned with industry needs.

18. **Define and align the mission of industry-facing facilities.**
Universities, RTOs and national laboratories should clearly categorise infrastructure based on its primary purpose, distinguishing between research-focused facilities and those intended to support industry engagement and scaleup. For facilities that target industry users, a clear mission should be established with leadership accountability, aligned operating models, and performance metrics linked to industrial outcomes. Infrastructure upgrade programmes in these cases should be contingent on demonstrable improvements in industry access and utilisation. Where facilities are increasingly used by industry, alternative governance models should be considered. This may include separately governed entities, joint ventures or subsidiary structures that allow for greater operational flexibility, commercial responsiveness and alignment with industry needs while retaining connections to academic expertise.

19. **Improve reliability and operational fit for industrial use.**
Infrastructure providers where industry is a primary target customer should prioritise measures that improve reliability, including structured maintenance regimes, consistent calibration standards and protected usage periods for industrial users. These facilities should adapt operating models to better accommodate industrial processes, including reduced setup times and more predictable access conditions.

20. **Strengthen capability through collaboration across providers.**
    Infrastructure providers should actively develop partnerships to share expertise, capacity and risk. This includes collaboration on technical support, joint use of facilities and coordinated service provision across the scaleup journey. Stronger collaboration can help address capacity constraints, reduce duplication and improve the overall performance of the system.

21. **Support the development of alternative commercial operating models.**
    Government and investors should support the growth of commercially oriented, open-access infrastructure that provides flexible, IP-light access models where appropriate. Sectoral strategies tasked with identifying capabilities gaps should set out where these gaps exist and how they might be filled by commercial facilities that complement existing public infrastructure.

22. **Improve clarity, consistency and standardisation of IP arrangements.**
    Infrastructure providers, funders and government should work towards more standardised IP frameworks, including template agreements that reduce complexity and negotiation time. Multi-year access agreements and strategic partnerships should be encouraged where appropriate to provide greater certainty for both companies and providers. Clear communication of IP terms, risks and mitigation strategies should be embedded in early-stage engagement.

23. **Ensure secure and trusted environments for industrial engagement.**
    Infrastructure providers should ensure that robust systems are in place to protect sensitive data and intellectual property, including secure digital systems, physical access controls and clear governance procedures. Clear articulation of these protections will help build confidence among companies and investors when using shared infrastructure.

4. Conclusion

This report builds on the findings of the Royal Academy of Engineering's Quantum Infrastructure Review,[74] which identified infrastructure as a critical enabler of quantum technology commercialisation and sector growth. It examines whether similar challenges are experienced across the wider deep tech landscape and whether broader policy approaches could strengthen the infrastructure supporting UK companies to commercialise and scale.

The UK has strong foundations. Its world-leading research base, research-intensive universities and thriving early-stage innovation ecosystem generate promising deep tech companies across engineering biology, semiconductors, quantum technologies, space, robotics, advanced materials and other strategically important sectors. The UK has also developed a significant national network of specialist facilities, equipment and expertise across universities, Catapult Centres, PSREs, RTOs and commercial providers. However, success in research and company creation does not guarantee that these businesses will scale, manufacture and remain in the UK. Deep tech companies require specialist infrastructure as they move from proof of concept towards validation, demonstration, piloting and scaled manufacture. These stages are capital intensive, technically demanding and difficult to finance before reliable revenues are established. Shared innovation infrastructure can help companies overcome these barriers by reducing the need for major upfront investment, providing specialist technical support and enabling technologies to be tested under commercially relevant conditions.

Infrastructure can also act as an anchor around which companies, skills, supply chains and investment cluster and grow. Where a critical mass develops, these ecosystems can become self-reinforcing, supporting further business formation and creating high-quality jobs, productivity growth and regional economic opportunity. They can also help the UK retain strategically important capabilities, strengthen supply chain resilience and build comparative advantage in emerging technologies. This catalytic potential is realised most fully when infrastructure is aligned with industry need and operated in ways that support the transition from research into commercial application.

The evidence gathered for this report indicates that the UK does not yet achieve this consistently. Its infrastructure landscape contains many valuable assets but does not operate as a sufficiently connected, navigable or scaleup-ready system. Companies can struggle to identify the right facilities, secure access within commercial timescales and use them with the continuity and technical support required for later-stage development. Providers face their own constraints, including uncertain long-term funding, shortages of specialist staff, uneven demand and insufficient support for maintenance, upgrades and operational costs. Differences in institutional purpose, contracting, intellectual property and operating culture create further friction.

The challenge is to make more strategic choices about which capabilities the UK needs, how existing assets should connect and where genuine gaps require investment. It is also to ensure that facilities intended to support industry have clear missions, sustainable operating models and the technical capacity to deliver reliably. Not every research facility should become an industrial service, nor will a single access model suit every sector or company. A stronger system will require a complementary mix of research-led, collaborative and commercially oriented provision.

The report sets out practical measures to move towards this goal. These include stronger national coordination, sector-specific infrastructure roadmaps, better evidence on capability and demand, clearer routes for companies to navigate the network, more flexible access models and greater consistency in intellectual property and contracting. They also include long-term funding that recognises the full cost of maintaining capability, not only the initial purchase of equipment.

The Government's Industrial Strategy provides an important opportunity to bring these changes together.[10] Its sectoral priorities should be translated into a coherent approach that identifies where the UK intends to build and retain strategic capability, how facilities will contribute collectively, and how public and private investment can align around that ambition.

Shared innovation infrastructure cannot resolve the scaleup challenge alone. Companies also need finance, skills, market demand, proportionate regulation, procurement opportunities, enabling infrastructure and suitable commercial space. Nevertheless, access to specialist facilities and expertise is an essential part of that environment.

The UK already possesses many of the assets needed to support world-leading deep tech sectors. The task now is to connect, sustain and operate them with greater clarity, ambition and urgency. Failure to act risks allowing critical capabilities to erode and promising companies to scale elsewhere, taking investment, supply chains and high-value jobs with them. The greatest risk is not only underusing the infrastructure already built, but losing the wider economic and strategic opportunities that it could unlock.



Image: © Rolls-Royce PLC

5. Appendix: Analysis of the deep tech scaleup landscape and sector specific challenges

This appendix section summarises the infrastructure-related challenges facing a number of key UK deep tech sectors and brings together the main themes emerging from a rapid evidence assessment of recent government strategies, independent reviews, sector studies and policy papers. It focuses primarily on sectors where there is now a sufficiently visible evidence base on infrastructure conditions for innovation, commercialisation and scaleup, notably quantum and semiconductors, engineering biology, AI, and robotics / advanced materials / advanced manufacturing.

Here we identify evidence of critical gaps in UK innovation infrastructure provision, including both physical infrastructure (for example pilot and scaleup facilities, cleanrooms, compute, testbeds and specialist manufacturing environments) and 'soft' infrastructure barriers such as skills, standards, regulation, coordination, finance, adoption capability and access to markets. A concise sector-by-sector synthesis is provided in Table 2, alongside the principal resources used, including government reports, grey literature and sector policy papers. The table should therefore be read as an evidence-informed summary, produced through a rapid assessment of available material, rather than as a comprehensive gap analysis of all UK deep tech infrastructure. The sectors included in Table 2 are those for which there is currently the clearest and most readily available evidence on infrastructure gaps and scaleup constraints. Across these sectors, the evidence base is increasingly consistent in pointing to a common strategic challenge in which the UK performs strongly in research, discovery and early-stage innovation, but is weaker in translating that strength into late-stage development, pilot manufacture, scaleup and broad commercial adoption. This pattern is explicit across several sector reports and government strategies, identifying a need for stronger translational and deployment infrastructure if UK scientific strengths are to generate sustained economic advantage.

There is significant cross-over in both infrastructure needs and barriers not only between the sectors included in Table 2, but also with other deep tech domains not examined in detail in this appendix. These include, but are not limited to, life sciences and biotech deep tech sectors, space and satellites, future telecommunications, CleanTech and AgriTech.

A broad reading of the deep tech scaleup landscape suggests that infrastructure problems are rarely confined to a single missing asset. Rather, they typically arise where multiple complementary conditions are absent at the same time: businesses may need affordable space, specialist equipment, access to technical expertise, regulatory clarity, reliable power or data access, and sufficiently sophisticated customers or investors. Evidence from engineering biology, semiconductors, AI and advanced manufacturing all points to the importance of these wider enabling conditions, and to the fact that 'soft' infrastructure can be as constraining as physical capacity itself.

Broad cross-sector infrastructure gap trends

In addition to the sector-specific issues summarised in Table 2, the evidence points to several recurring cross-sector trends across the UK deep tech landscape:

- **Scaleup bottlenecks between prototype and pilot.** In multiple sectors, large downstream manufacturers and customers require proof that a technology can be produced reliably at pilot scale before committing to procurement or integration. However, the UK often lacks sufficient facilities able to demonstrate this transition at the required scale, particularly where companies need not only physical space but also access to specialist equipment, operational expertise, standards support and affordable commercial terms. This challenge is especially visible in engineering biology, semiconductors and advanced manufacturing, where the evidence emphasises the need for stronger scaleup, translational and demonstration environments.
- **Existing infrastructure not universally effective.** Reports across sectors suggest that infrastructure value depends not simply on the availability of buildings or equipment, but on whether facilities also provide the right technical workforce, embedded know-how, supply-chain connections, validation capacity, standards support and business accessibility. The result is that nominal infrastructure provision may overstate effective capacity if facilities are too costly, too specialised, poorly connected to users, or unable to support companies through later-stage development.

- **High cost of provision.** Many of the facilities most needed by deep tech companies, such as cleanrooms, biomanufacturing facilities, compute infrastructure, robotics and advanced manufacturing demonstrators, and specialist pilot lines, are capital intensive to establish and expensive to operate. There is a structural challenge for UK infrastructure providers in maintaining large-footprint, equipment-heavy assets with high running costs while also keeping them accessible to innovative SMEs and scaleups.
- **Domestic capabilities comparatively limited.** Multiple sector studies indicate that businesses can be pulled overseas by ecosystems offering more mature pilot, scaleup and manufacturing infrastructure, or by stronger connections between research, demonstration and final production. This is particularly evident in engineering biology and semiconductors.
- **Competition for access is greater at later stages of scaleup.** Where the overall pool of pilot and late-stage manufacturing capacity is limited, scaleups face stronger competition for access, longer lead times and a greater risk of delaying or relocating commercialisation. This pressure is likely to be most acute in sectors that require highly specialised environments, significant utilities, or high levels of validation before full production.

Table 2: Selected deep tech sector infrastructure related challenges, gaps and key resources

Semiconductors and quantum technologies		
Challenges overview	**Infrastructure gaps and requirements**	**Sector reports and strategies**
The UK has strong positions in quantum research, semiconductor R&D, design/IP and compound semiconductors, but both sectors face a persistent challenge in translating research strength into commercial scaleup and manufacturing capability. Key overarching barriers cited include skills, finance, and the cost of accessing critical equipment and infrastructure, especially for design-intensive businesses and in research commercialisation. Semiconductor growth is constrained by complex, globally concentrated supply chains and by the UK's limited leverage in advanced silicon manufacturing; the UK's growth strategy is therefore focused on niche high-value segments, but that still requires stronger domestic translation and resilience capacity.	Limited access to design tools/IP, silicon prototyping, compound semiconductor manufacturing / open foundry capacity, and advanced packaging are identified as key barriers to commercial innovation and investor readiness. There is a gap in R&D translation and scaleup infrastructure for semiconductors, particularly for SMEs and university spinouts that need proof-of-concept manufacturing and prototyping before they can attract investment. Evidence points to insufficiently coordinated end-to-end support infrastructure across the semiconductor supply chain, alongside fragmented sector coordination. For quantum, there is a persisting gap between research and deployable national capability. Dedicated national facilities and testbeds (including the National Quantum Computing Centre) are needed to support business development, demonstration and adoption.	*Digital and Technologies Sector Plan.* Department for Business and Trade; 2025.[120] *Building a sovereign AI chip design industry in the UK.* Council for Science and Technology, 2025.[121] *Semiconductor sector study.* Department of Science, Innovation and Technology; 2024.[122] *Quantum Infrastructure Review.* Royal Academy of Engineering; 2024.[74] *UK Semiconductor Infrastructure Initiative Feasibility Study.* Institute for Manufacturing, University of Cambridge; 2023.[123] *The Semiconductor Industry in the UK.* House of Commons Business, Energy and Industrial Strategy Committee; 2022.[73] *National semiconductor strategy.* Department of Science, Innovation and Technology; 2023 (legacy strategy).[124]
Engineering biology		
Challenges overview	**Infrastructure gaps and requirements**	**Sector reports and strategies**
The UK has a strong science base in engineering biology, but is reaching a commercialisation tipping point where the UK risks losing ground without faster progress in scaleup, commercial process development and downstream industrial adoption.	A major gap is the absence of enough biomanufacturing and scaleup facilities that are accessible to smaller businesses, especially outside health applications; with specifical calls for multidisciplinary Biomanufacturing Innovation Centres linked to industrial bases and universities.	*Engineering Biology Aspirations.* Government Office for Science; 2025.[127] *From Research to Revenue: The Case for Scaling UK Bio-Based.* BB-REG-NET; 2025.[84]

Evidence identifies a pressing need for a continuum of innovation facilities, beyond early-stage biofoundry support, so that promising businesses can move into pilot-scale and commercial process development rather than going abroad or stalling at higher TRLs. There are adjacent systemic challenges around infrastructure, including in talent and skills, regulation, measurement, standards and metrology, and lack of sufficient pull-through into wider sectors such as food, chemicals, materials and fuels.	The UK lacks sufficient commercial process development infrastructure sitting between research facilities and full-scale production. The evidence repeatedly points to the need for integrated test / scaleup / commercialisation hubs. There are also gaps in foundational infrastructure for programming biology, including DNA synthesis/build capability, and in standards/metrology infrastructure to support scalable and reliable deployment. Regulatory infrastructure remains underdeveloped for such a fast-moving technology with cross-sector applications.	*Mapping the Innovation and Commercialisation Infrastructure for Non-Health Applications of Engineering Biology in the UK.* Innovation and Research Caucus; 2024.[75] *National Vision for Engineering Biology.* Department for Science, Innovation and Technology; 2023. (legacy strategy).[128] *Engineering Biology for the UK a Resource to Help Build Back Better.* UK Engineering Biology Leadership Council; 2021. (legacy strategy). [129]
AI (data, digital infrastructure and compute)		
Challenges overview	**Infrastructure gaps and requirements**	**Sector reports and strategies**
The UK's AI evidence base broadly identifies compute, data and skills / support capability as the binding constraints on growth. Strategies point to UK competitiveness depending on building sufficient, secure and sustainable AI infrastructure at speed. The UK must not only increase compute capacity, but ensure it is accessible, configurable, adjustable and collaborative, and that hardware investment must be matched with training and support. A second core challenge identified is access to high-quality data where AI researchers and businesses citing the need for better access to sufficiently regulated public, restricted and commercially licensed datasets, alongside stronger standards and interoperability. Energy infrastructure, planning, and onshore data-centre buildouts are highlighted as critical constraints, with AI infrastructure being linked to land, power and grid capacity.	Insufficient sovereign and public compute capacity is highlighted frequently as a gap. There are gaps in data infrastructure and data access with calls for more high-quality regulated public/open datasets, better access to restricted and licensed data, and improved data management standards. A shortage of suitable AI data-centre infrastructure is identified, together with planning and energy barriers, leading to the proposal for AI Growth Zones. There is also an adjacent skills gap in the form of insufficient research technology professionals and embedded support functions needed to help researchers and companies use advanced compute and data infrastructure effectively.	*UK Compute Roadmap.* Department for Science, Innovation and Technology and UK Research and Innovation; 2025.[130] *AI for Science Strategy.* Department for Science, Innovation and Technology; 2025.[131] *AI Opportunities Action Plan.* Department for Science, Innovation and Technology; 2025.[30] *Engineering Responsible AI: Foundations for environmentally sustainable AI.* Royal Academy of Engineering; 2025. [132] *Greening AI: A Policy Agenda for the Artificial Intelligence and Energy Revolutions.* Tony Blair Institute for Global Change; 2024.[133] *Review of Digital Research Infrastructure Requirements for AI.* The Alan Turing Institute, Technopolis; 2023.[29] *The Open Data Institute 5 Year Strategy 2023-2028.* Open Data Institute; 2023.[134]

Advanced materials, manufacturing and robotics		
Challenges overview	**Infrastructure gaps and requirements**	**Sector reports and strategies**
The UK has strong research capabilities in robotics and advanced manufacturing, but the evidence consistently points to a challenge in commercialisation, scaling and diffusion. Evidence broadly suggests a significant gap between ambition and actual deployment, with the UK having historically lagged on automation and robotics adoption, especially in manufacturing, and remains the only G7 country with robot density below the world average. Recurring barriers identified include skills and workforce transition, finance, awareness, technology adoption, and the need for stronger national coordination to support uptake across businesses, especially SMEs. Advanced manufacturing also faces structural pressures in decarbonisation and digitisation, with success increasingly dependent on adoption of automation, AI, digital twins, advanced materials and modern production systems.	The robotics evidence points to gaps in the environments needed to test, integrate, validate and adopt systems at scale, as well as in wider commercialisation pathways from research to market. For advanced manufacturing, there are capability gaps across the production system in areas of robotics and automation, digital manufacturing, assurance / inspection / test, composites / advanced materials, joining, and other manufacturing technologies that are needed to pull innovations through into industrial deployment. Challenges are often framed as one of moving from invention to industrial impact. Broader infrastructure gaps in demonstration, pilot-scale capability, process integration and supply-chain readiness exist with resulting challenges in moving from invention to industrial impact.	*Technology strategy*. High Value Manufacturing Catapult; 2026.[135] *Advanced Manufacturing Sector Plan*. Department for Business and Trade; 2025.[136] *Smart Machines Strategy 2035*. Robotics Growth Partnership; 2025.[137] *Technology Adoption Review*. Department for Business and Trade, Department for Science, Innovation and Technology, HM Treasury; 2025.[138] *2050 Vision for Automation and Robotics in UK Manufacturing*. High Value Manufacturing Catapult; 2024.[139] *A New National Purpose: The UK's Opportunity to Lead in Next-Wave Robotics*. Tony Blair Institute for Global Change; 2024.[140] *A Study to Assess UK Strategic Advantage in Advanced Materials*. BEIS; 2022.[141]

6. Methodology

The evidence, insights, analysis and recommendations presented in this paper constitutes the outcome of a project undertaken at the Royal Academy of Engineering on the open-access infrastructure to support deep tech scaleups. The primary sources of evidence used to inform these findings included those derived from desk research, expert stakeholder engagement and a series of semistructured interviews.

A Rapid Evidence Assessment (REA) has evidenced the current landscape of scaleup infrastructure for deep tech sectors in the UK, key deep tech sectors specific infrastructure requirements and has informed on the challenges experienced by various deep tech sectors at the scaleup stage. This structured approach builds on prior research, avoiding duplication of existing work, and ensures an unbiased identification of insights by making no assumptions. A search strategy was devised with inclusion and exclusion criteria and an extraction template was created to systematise the insights obtained from the evidence collected, with the appropriate quality assurance standards. Key trends identified across deep tech sectors from the desk research directed efforts to explore specific areas of opportunity and the demand-supply side dynamics in scaleup infrastructure use.

29 semi-structured interviews with deep tech companies and infrastructure providers have provided more detailed and nuanced evidence on deep tech scaleup infrastructure, other adjacent challenges experienced and on potential solutions. The semi-structured interviews followed a semi-structured framework with predefined questions while also allowing flexibility to explore emerging themes and adapt follow-up questions based on interviewee's responses. The starting interview questions were tailored to each interviewee, while following a general framework that explores the prioritised opportunity areas. Potential follow-up questions are identified both before and during the interviews. Interviews were recorded for note taking purposed and ranged from 30-60 minutes in length.

Semistructured interviews and other contributors:

Deep tech company	Sector
Space Solar	Space
Oxford Instruments Plasma Technology	Quantum
LanzaTech	Cleantech / Eng bio
Kao Data	Data centres
IQE plc	Semiconductors
Omass Therapeutics	Life Sciences
Kelpi	Biomaterials
MediSieve	Medical devices
Unicorn Bio	Life Sciences / Robotics
RFC Power	Energy storage
M Squared Lasers	Quantum / Photonics
Kubos Semiconductors Ltd	Semiconductors
EnsiliTech	Eng Bio / Life Sciences
Wootzano	Robotics
Microchip Technologies UK	Semiconductors
Quantum Dice	Quantum

Infrastructure providers and other stakeholders

Savills
Fraunhofer Centre for Applied Photonics
High Value Manufacturing Catapult (HVMC)
The Faraday Institution
Science and Technology Facilities Council (STFC)
ScaleUp Institute
Henry Royce Institute
Enterprise Scotland
CSC Ltd
Innovate UK
Semiconductor Catapult
Materials Processing Institute
Sheffield Innovation Spine
Centre for Process Innovation (CPI)
AIRTO

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8. Acknowledgements

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