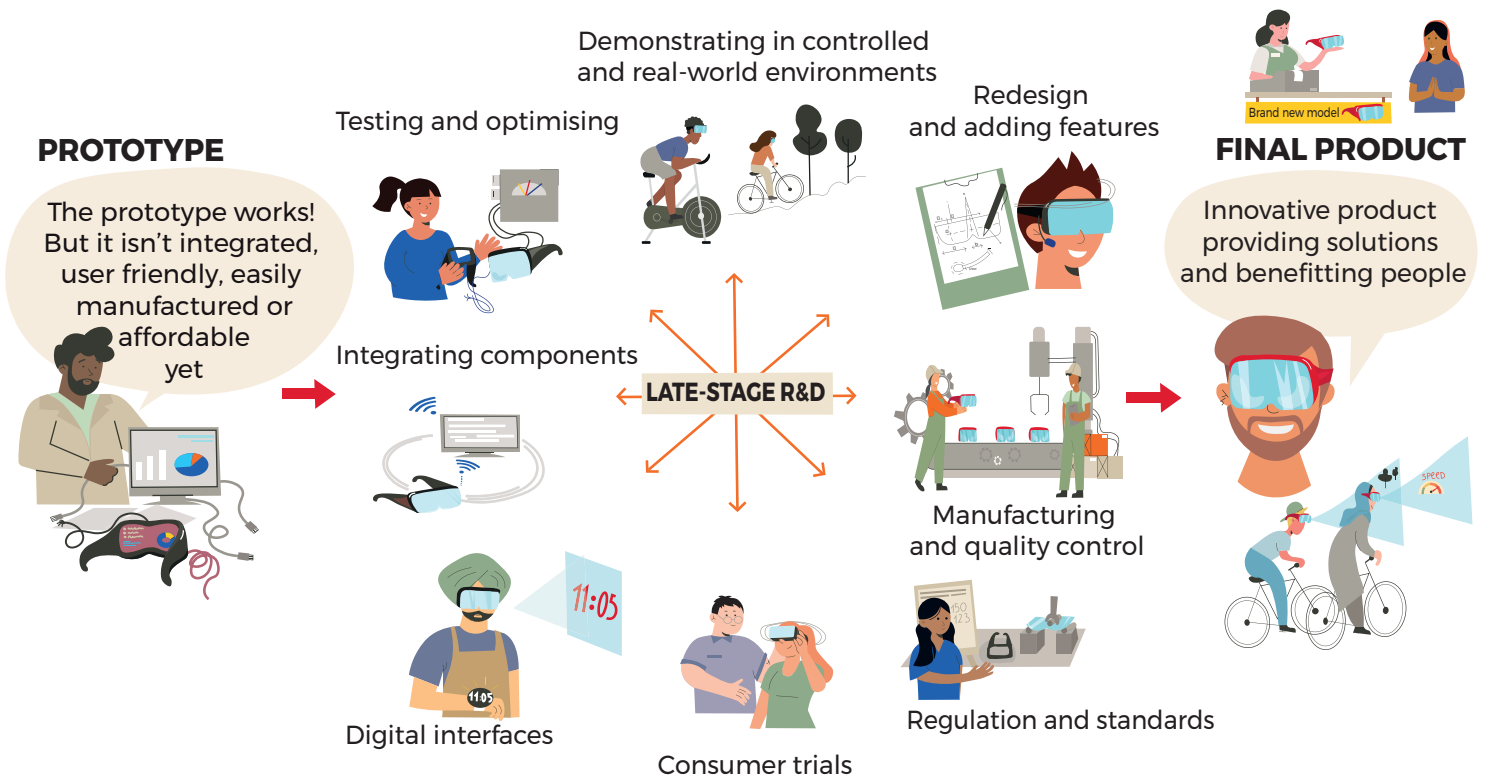


Late-stage R&D: business perspectives

Late-stage R&D: from prototype to commercialisation



To fulfil its science superpower, innovation, growth and green industrial revolution ambitions, the UK government must make the UK a more attractive environment for businesses to invest and conduct late-stage R&D in.

Executive summary

What is late-stage R&D?

Late-stage R&D is a key part of the innovation process and accounts for the majority of R&D that businesses do. It comprises the activities required to take a proof of concept or prototype through to commercial application, ultimately delivering new products, processes, technologies and services to market.

Late-stage R&D delivers tradeable solutions and improvements, creates new markets and jobs, increases efficiency and improves productivity – bringing returns and socio-economic benefits to people in all parts of the UK. Late-stage R&D generates ‘spill-over’ benefits beyond the individual business, contributing to innovation and growth in the local area. It can act as a focal point for a business to develop activities and infrastructure, attract partners and investment, develop new local markets and establish a broader skills base around a particular location. Late-stage R&D is predominantly financed by businesses, with the private sector contributing approximately two thirds of the UK’s investment in R&D.

Late-stage R&D, like all R&D and innovation carries risk. The risk is multifaceted, arising from the scale of the technical challenge, cost, timings, certainty of market opportunity, competitive environment and opportunities or barriers to commercialisation. There is a compelling case for the public sector to support businesses to manage the risks associated with late-stage R&D and incentivise business investment – the socio-economic benefits from the new products, processes, services and technologies are shared, so the risk must be too.

Late-stage R&D depends upon a thriving research base, involving universities, research institutes, R&D infrastructures, and businesses, to do the R&D required to provide a pipeline of projects ready to progress to late-stage R&D. Therefore, the health of the whole research and innovation system is crucial for successful late-stage R&D. However, this report focuses on support for late-stage R&D, an area identified as a UK weakness.¹

Where are we now?

Many businesses choose global locations for these high value late-stage R&D activities, from multinationals with multiple R&D sites to mobile innovative SMEs with growth ambitions. But existing UK support for late-stage

R&D is not meeting businesses’ needs and is considered poor compared to competitor countries².

There is a choice to be made - enable companies to take bold risks here, or they will go elsewhere.

With severe pressures on public finances, the impact of the COVID-19 pandemic on businesses putting R&D investment at risk^{3,4}, and growing global competition, supporting businesses to manage the risks associated with late-stage R&D is a way of securing our future growth, as well as reaping the returns from our investment in research and delivering the government’s ambitions for an innovation-led low-carbon economy. A focus on late-stage R&D will reap the returns from our investment in research, as long as the UK’s research base continues to thrive.

Innovation will happen irrespective of the UK’s policies; what is at risk is the UK’s ability to drive and benefit from it.

How is late-stage R&D conducted and where can government play a role?

Understanding the activities that underpin late-stage R&D and the motivations, incentives, resources and barriers, including policy levers at government’s disposal, will help identify what actions can be taken to ensure more late-stage R&D takes place in the UK. The report uses real-world examples to illustrate how different businesses conduct late-stage R&D, the range of activities and the resources they draw upon.

From interviews with engineering businesses, **five key common resources** essential for conducting and managing the risks associated with late-stage R&D were identified. Government can influence each of these resources to encourage business investment in late-stage R&D.

R&D infrastructures: the physical and digital infrastructures needed to test, certify and develop new products, processes, services and technologies safely and effectively.



Access to shared and world class public R&D infrastructures, as well as a cooperative and innovation-friendly regulatory and public sector environment, can support companies to demonstrate new products in use, helping generate investment and providing risk mitigation and certainty.

The UK should utilise infrastructure across the whole of the UK in a more creative way to test innovations, and also to support innovation more widely including through skills development, regulation and public engagement.

Investment: the availability of funds and fiscal measures that enable businesses to allocate funding for late-stage R&D activities.



It is appropriate that businesses assume significant financial risk for late-stage R&D, however due to significant 'spill-over' effects and global competition, there is a compelling case for government involvement. Furthermore, a substantial body of evidence has shown that public investment in R&D 'crowds-in' private investment.

Funding support for late-stage R&D is viewed as a gap, with fewer public funding opportunities than for the earlier stages of R&D. The UK is also a challenging environment to finance and raise private investment for late-stage R&D as investors often favour rapid returns and lower risk ventures. Government should develop new mechanisms targeted to help promising companies manage the financial risk associated with late-stage R&D and leverage business investment taking prototypes through to commercial application.

People: access and availability of diverse people with the experience and expertise to deliver technical and challenging projects to market.



Businesses will want to assemble the best team to deliver their R&D projects. Where large businesses may be able to invest and build their own pipeline of talent, sometimes in spite of government policy, that option is not open to all.

The UK talent pool and pipeline, from early age education through to vocational learning, higher education and lifelong adult learning, as well as visa conditions for international talent, must compete internationally to attract R&D from multinationals and SMEs into the UK. It must also meet the needs of UK SMEs to incentivise them to grow to scale in the UK.

Partnerships: the relationships, networks and collaborations that enable access to skills, infrastructure, investment and customers, reducing the burden placed on a single company through sharing resources and expertise with others.



Partnerships can provide game-changing opportunities for companies that lead to long-term growth in R&D investment in the UK.

Government has a key role in building partnerships, particularly through public R&D infrastructures. Government key role in building networks should be valued and incentivised by their KPIs. Government-initiated but industry-led activities and organisations, such as the Advanced Propulsion Centre and Aerospace Technology Institute, support strategic R&D partnerships reaching out across supply chains to innovate and respond to the challenges of the sector.

Market environment: the policies and frameworks influencing and producing opportunity or challenge for companies conducting late-stage R&D and commercialising innovation, including regulation, trade policy, intellectual property, and government strategies.



The ecosystem in which businesses conduct R&D is broad and complex. Government sets the tone and direction with strategies and policies that provide certainty and increased confidence for business and create greater opportunity for commercialisation.

To create a supportive environment for engineering business R&D and innovation, all government organisations must share a clearly defined vision of success and be well coordinated. This will provide a long-term stable backdrop for business decisions and investment.

A vision for 2027

In 2027, innovative and R&D intensive companies of all sizes are choosing to conduct R&D in the UK in preference to competitor countries. The UK is incentivising late-stage R&D and business investment with access to:

- a range of financial mechanisms and incentives targeted to late-stage R&D
- shared world-class R&D infrastructures for demonstration of new technologies
- a diverse and highly skilled workforce
- a multi-sector partnership ecosystem
- markets, both in the UK and globally through exports.

R&D and innovation underpin the UK's strategy for economic growth. There is a strategic approach across all government departments who work together to support business innovation and R&D, and to engage with businesses.

The policies and programmes to accelerate late-stage R&D have been co-designed by government and industry, with relevant government decision-makers having a deep understanding of the innovation system and businesses' experiences of interacting with it.

As a result, the UK's R&D drives the high-skill low-carbon economy, rather than simply delivering inventions for others to commercialise. This R&D gives the UK a strong competitive advantage, unleashing innovation, improving productivity, and delivering new products, processes, services and technologies that improve the lives of its citizens and solve society's challenges.

How to get there: recommendations to drive late-stage R&D in the UK

Late-stage R&D should lie at the heart of the UK government's Plan for Growth and upcoming Innovation Strategy.

Support should **target** late-stage R&D, with mechanisms that help businesses manage risk, filling gaps in current support.

- Government and industry should co-design new industry-led programmes, drawing on the successes of the Aerospace Technology Initiative (ATI) and Advanced Propulsion Centre (APC), to accelerate R&D in internationally competitive sectors and technologies that are vital to the delivery of national priorities such as net zero and infrastructure.
- The Department for Business, Energy and Industrial Strategy (BEIS), Innovate UK and the British Business Bank should work together to develop financial mechanisms designed to plug the gap in existing financial support for late-stage R&D (prototype to commercialisation, or Technology Readiness Levels 5 to 9).

Existing initiatives, institutions and infrastructures that support late-stage R&D should be **strengthened and scaled** to help businesses strengthen and scale their innovation activities and, in turn, their growth.

- Innovate UK should have an uplifted and multi-annual budget, with increased autonomy to design support mechanisms to rapidly meet the needs of innovative businesses, with longer-term tailored support as companies grow and more focus on de-risking and enabling late-stage R&D (for example, beyond prototyping).
- Government should promote and support strategic late-stage R&D and innovation infrastructures, such as the NPL and Catapult Centres, treating them as national innovation assets, with an uplift in public investment to enable them to step change their offer and engagement with innovative businesses and strengthen and scale their innovation ecosystems.

This improved and comprehensive package of support should be promoted globally to **signal** to the world that the UK is the place for businesses to come to undertake late-stage R&D and to unleash innovation.

- BEIS and UKRI should clearly signpost the UK's offer for late-stage R&D and innovation through an accessible online interface to facilitate navigation for the business user, and work with Department of International Trade to market it globally as part of a joined-up UK innovation pitch to international investors.