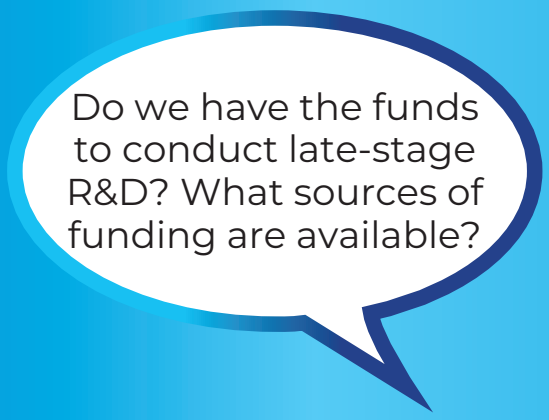
Investment

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



Public funding, including grants and loans for late-stage R&D

Public procurement and government as a customer to pull through and scale up late-stage R&D

Fiscal incentives including R&D tax reliefs

Private markets and investment incentives

To conduct late-stage R&D, businesses require funds to cover the various costs involved, such as materials, workforce and infrastructure. Given that outcomes and duration of late-stage R&D activities can be uncertain, conducting late-stage R&D carries a financial risk and the financial impact is often perceived by businesses as the **greatest risk to manage**.

"Companies reported cost as the biggest barrier to conducting R&D in the UK Innovation Survey 2019[29]"

Companies finance late-stage R&D in a range of ways.

Businesses generally finance R&D with a portion of their profits, and as such, their ability to invest in R&D is a function of the current business environment. However, businesses often seek external sources of finance to support late-stage R&D, with multiple sources potentially used throughout the duration of a late-stage R&D project. For example, CCm Technologies has funded its R&D activities with a combination of grants from BEIS and Innovate UK, EIS equity and have scaled to a position to win commercial contracts.

External sources of investment include:

- Grants for R&D and innovation from public bodies such as Innovate UK, EU Research and Innovation programmes, Scottish Enterprise, Invest Northern Ireland.
- Commercial loans from banks.
- Government loans, for example the loans Spirit Aerosystems Belfast (previously Bombardier) and

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SSTL agreed with government after identifying a commercial opportunity that they could otherwise not have pursued.

- Private markets such as private equity and venture capital.
- Capital markets such as the London Stock Exchange for publicly listed companies.
- Joint investment through partnerships or a consortium of companies.
- Contracts from customers, including from government.
- Innovation funds or allowances for regulated or government owned enterprises.

Company culture, ownership and structures have a huge influence on appetite for risk-taking with investment in R&D.

R&D investment decisions are complex and take into account a range of factors, including company finances, market trends, opportunities, threats and other priorities. The decision and scale of investment in R&D is often decided at the company board level. The risk appetite of the board, shareholder attitudes and expectations of returns, or whether a business is privately owned or public can both drive or act as a barrier to investment in R&D. For example:

- Businesses with small margins or startups with insecure sources of revenue are less able to pursue a strategic long-term approach due to the need to secure cash flow.

- To manage risk, many businesses pursue R&D activities only if they have secured a grant or contract to deliver and with a shorter turnaround between 18 months and three years.

- Larger businesses often operate a portfolio model with projects across different timescales, cost and challenge. However, even within larger corporates there can be competition between different business units to release funds for R&D.

How much does late-stage R&D cost?

The costs increase as the projects approach market, with the number of staff involved and scale of infrastructure likely increasing as the project progresses to include the broader skills and facilities needed. However, the costs vary significantly across sectors and the type of R&D and innovation, for example:

- New-to-market disruptive innovation can take a decade to develop and requires significant infrastructure investment such as a new manufacturing plant or innovative power plant design, and additional time for regulatory approval, for example in the pharmaceutical sector. In this case, the cost of late-stage R&D can reach tens or hundreds of millions.

- Shorter R&D projects, available for commercial use within 18 months to three years, can be significantly cheaper.

- Where the cost of R&D is limited to staff costs, the time to reach market can be very quick, for example with digital technology, late-stage R&D is much cheaper than in other engineering sectors.

PUBLIC FUNDING FOR LATE-STAGE R&D

The UK has historically under-invested in innovation and the 'D' of R&D[31,32]. UKRI had a £7.4 billion budget in 2019/2020, of which £2.68 billion was allocated through the Research Councils, generally on projects covering research and early development[33]. In contrast, Innovate UK, focused more towards development and demonstration, had a budget of £1.3 billion, including $491 million for the Industrial Strategy Challenge Fund.

"Corporate incentives in the FTSE 350 inhibit innovation[30]"

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Where can the UK government play a role?

It is appropriate that businesses assume significant financial risk for late-stage R&D, however due to significant 'spillover' 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 for financing and raising 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 – taking prototypes through to commercial application.

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 more of a focus on de-risking and enabling late-stage R&D (for example, beyond prototyping). This should include providing longer-term tailored support as companies grow, schemes to support 'first of kind' demonstration activities and growth of non-financial support such as partnership building.

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 TRL 5 to 9). A range of support mechanisms will be needed to cater to the breadth of activities in late-stage R&D and diversity of companies. Consideration should be given to loans, convertible loans, prizes, equity investment, patient capital investment and means to leverage private investment.

CASE STUDY

SPIRIT AEROSYSTEMS BELFAST (PREVIOUSLY BOMBARDIER): DEVELOPING AN AWARD-WINNING AIRCRAFT WING AND SUSTAINING HIGH-VALUE JOBS WITH LOAN AND GRANT SUPPORT FROM GOVERNMENT

Photo used with permission from Spirit Aerosystems

In 2006, Bombardier saw an opportunity to develop the only purpose-built aircraft for the 100 to 150 seat market. The aircraft, which entered service in 2016, became the Airbus A220 in 2018. Bombardier Belfast developed the aircraft wing using advanced composites to reduce weight by 10% compared to a metallic wing and improve corrosion resistance for greater efficiency and easier maintenance. Bombardier secured a £100 million loan from the UK government and £20 million in grants from Invest NI and, in total, invested more than £520 million in the development of the new product. This included a purpose-built 600,000 square foot facility in Belfast to house wing production, from receipt of raw material right through to despatch of assembled product.

Spirit AeroSystems recently acquired Bombardier's Belfast operation to diversify and strengthen its portfolio, including the addition of the composite wing programme for the Airbus A220 aircraft family. Looking towards the recovery of the aviation industry following the impacts of the global pandemic, Spirit has long-term plans to expand its Belfast wing manufacturing and assembly facility to accommodate future ramp-up activity on the programme, which will support jobs both within Spirit and its supply chain.

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CASE STUDY

CCm TECHNOLOGIES: GRANTS SUPPORTING THE DEVELOPMENT OF CARBON CAPTURE, UTILISATION AND RESOURCE OPTIMISATION TECHNOLOGY

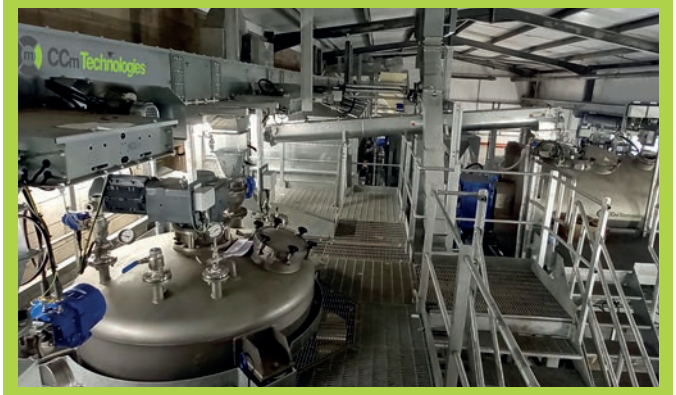

Photo used with permission from CCm Technology

CCm Technologies has developed a carbon utilisation technology – capturing carbon dioxide and waste streams to be converted into materials for use in fertilisers, plastics and energy storage. It started in 2012 and are now reaching scale-ready commercialisation. The development of the technology has been funded through Enterprise Investment Scheme equity and grants from the UK and Canada.

In 2020, CCm Technologies, in partnership with Severn Trent, won £1 million from BEIS and the Carbon Trust to develop a waste-water recycling process using captured CO2 to stabilise nitrogen, phosphate and organic chemicals held within waste streams at Severn Trent, turning them into sustainable plant nutrients.

Access to grant funding has enabled CCm Technologies to develop the technology, tailor a product for interested customers and infill various aspects of the technology as it prepares to move to commercial contracts. Non-financial support from Innovate UK was also hugely valuable, with support to create exhaustive financial models and a four-minute video building credibility with large organisations and good communication of complex engineering solutions. In July 2020, CCm announced a commercial contract with Yorkshire Water to recovery nutrients, primarily ammonia and phosphorus, from effluent discharge.

CASE STUDY

SURREY SATELLITE TECHNOLOGY LTD: BRINGING GOVERNMENT IN TO GRASP AN OPPORTUNITY WITH SMALL SATELLITES

Photo © ISRO/Antrix

Surrey Satellite Technology Ltd (SSTL) identified a market opportunity for small satellites in Earth observation. It proposed a constellation of affordable microsatellites to provide timely images and information supporting disaster relief, not readily available from large satellites. The UK government agreed to support the project with funding to catalyse an international consortium across six countries to collaborate on building a constellation of six optical Earth observation microsatellites. Working with users to help define image specification for disaster relief was crucial, enabling SSTL to clarify key basic needs to bring the cost and size of the satellites down to something achievable while still delivering useful information. From idea to delivery in orbit took five years.

Commercially, the project was a huge success and allowed SSTL to build six satellites and receive export orders for the next generation satellites from the partner countries. It helped expand its market and build long term relationships with international partners, raising the visibility of the UK space community internationally.