

Stimulating R&D for a faster and better recovery

A knowledge and innovation-led economy remains the best strategy for future prosperity. Engineering has huge potential to contribute to a resilient UK economy that works for all, with innovation improving productivity, investment opportunities, public health, safety and security across the UK and beyond.

Here, the Royal Academy of Engineering sets out near-term interventions to ensure R&D in businesses of all sizes in the UK stays on track to deliver the government's ambitions and support a better and faster recovery from the COVID-19 crisis.

Following a rapid intelligence gathering exercise, these interventions are targeted towards supporting those parts of the business R&D process most at risk: business-university partnerships, pre-commercial development activities and technology diffusion. The interventions need to be delivered by a variety of organisations, including UKRI, Innovate UK, Local Enterprise Partnerships and devolved and local government to ensure that the benefits are felt across the UK.

Recommendations:

- Expand the Made Smarter pilot to support SMEs to adapt and thrive in the 'new normal'
- R&D as a way through the crisis: protect the innovation pipeline, future-proof and build resilience
 - Front-load public funding in multi-year programmes
 - Introduce agile and rapid Collaborative R&D programmes to promote industry-university collaborations and knowledge exchange
 - Boost support for late-stage R&D and demonstration
 - Maintain and improve the UK's competitive package of tax incentives for companies to innovate
 - Developing globally leading capabilities
- Use the Industrial Strategy Challenge Fund to stimulate pre-competitive collaboration to address future innovation needs and opportunities
- Make innovation a key component of the public procurement process to bring best value for money to the public purse
- Support regulators to adapt rapidly to innovation and new practices.

"Dramatic changes can help opportunists. And I mean "opportunists" in the nicest way. It's a time for taking some risks in a changing world."

Sir David Grant CBE FEng
non-executive Director of Renishaw Plc,
IQE Plc, and Chair NPL

Although not explored here, the sustainability, capabilities, capacity and success of UK universities, research and technology organisations and high-tech innovative start-ups is crucial to industry R&D and innovation activities.

Business R&D is at immediate risk

The pandemic has rapidly altered the business environment in which innovative start-ups and engineering R&D-intensive businesses operate. Reducing or outright halting R&D activities is one of the first cost-saving measures that businesses take during falling demand and cash flow difficulties. R&D will be the solution to the health crisis, but is also recognised by businesses as part of the solution for economic recovery. For some industries, recovery will not mean returning to pre-pandemic business as usual, instead they will require innovation to survive and adapt to the 'new normal' with different ways of working and dramatically changed supply and consumer demand. To build back better and sustainably, we will have to help businesses continue R&D, and ensure that businesses who have halted R&D activities in the initial crisis response have capacity and capability to progress R&D activities in the UK and reposition themselves in a reformed global market.

In the March 2020 Budget, the UK government presented ambitious plans to more than double public investment in R&D by 2025. The COVID-19 crisis has brought into sharper focus the important role R&D has to play in the UK's future, both in responding to upcoming challenges of the COVID-19 pandemic but also in driving the economic recovery, building back better and pursuing ambitions of becoming a global science and innovation superpower. The COVID-19 crisis has created a number of challenges, not least the impact on businesses' ability and appetite to undertake R&D and innovation, which need to be overcome for the UK to deliver on its plans to invest in R&D at or above the levels of its OECD peers.

During this crisis, the government has responded with speed and agility to support elements of the UK's R&D base. However, difficult decisions still lie ahead, and the Academy's message is that **investing in R&D is investing in the future**. Now is the time for government to set out a vision to demonstrate both its commitment to R&D and certainty to business.

The following near-term interventions aim to ensure R&D in businesses of all sizes in the UK stays on track to deliver the government's ambitions. Many of these interventions are centred around the middle of the R&D pipeline, which is identified as most at risk in an economic downturn and most relevant to the R&D activity of businesses and the translation, diffusion and adoption of innovation. These interventions need to be delivered by a variety of organisations, at the local, regional and national level, including UKRI, Innovate UK, Local Enterprise Partnerships and devolved and local government to ensure that the benefits are felt across the UK.

These interventions build on the Academy's ongoing body of work supporting investment in R&D^{1,2} and rapid evidence gathering exercises assessing the impact of COVID-19 on innovative start-ups³, R&D intensive businesses⁴ and investors.

The interventions presented here are proposed for immediate action to alleviate the near-term impacts of the COVID-19 pandemic. However, the impact of the crisis and ambitions of the government stretch beyond the near term and this will be an ongoing focus area for the Academy.

"If we are to survive in the medium term, we will have to find a way of getting as many as possible of our development projects back on track as soon as we can."

Eric Hawthorn FREng
Executive Chairman and Founder
Radio Designs Ltd

"Our focus in this challenging economic environment is to ensure the long-term sustainability of our business. Innovation is critical to our success. Digital initiatives can provide near term gains initially. Once sustainability and profitability are restored, our company's digital innovation offering can be enhanced and grow."

Jane Atkinson FREng
Executive Director of Engineering and
Automation, Bilfinger UK

1 [Increasing R&D investment: business perspectives](#), 2018.

2 [Radical innovation: a blueprint for a new UK research and technology funding agency](#), 2020.

3 [COVID-19 immediate impact on high-tech innovative start-ups](#), 9 April 2020.

4 [COVID-19 immediate impact on R&D-intensive businesses](#), June 2020.

R&D: lessons from 2008

Between 2000 and 2008, innovation accounted for 51% of productivity growth and 63% of economic growth in the UK.^{5,6} After the 2008 financial crisis, France, Germany, South Korea and Japan increased their investment in innovation and technology, giving them a chance to build competitive advantage.⁶ The UK was the only country with a lower R&D budget in 2010 than 2007.⁶ However, the analysis of the UK Innovation Survey 2011 found that innovative businesses performed better during the crisis.⁷

Expand the Made Smarter⁸ pilot to support SMEs to adapt and thrive in the 'new normal'

Grants that assist with technology diffusion, adoption and integration to support the return to work would provide an opportunity to be ready on the front foot. Businesses are considering how to safely return to work and operate with social distancing practices in place. Rapid uptake and upskilling with industrial digital technologies and automation can enable a faster and sustainable recovery.

Made Smarter provides advice from specialist technology experts to help identify and implement the right digital tools to deliver everyday improvements to SMEs. The pilot programme in the North West should be expanded across the country.

R&D as a way through the crisis: protect the innovation pipeline, future-proof and build resilience

Several sectors are experiencing severe impacts on cash flow due to the pandemic. For example, automotive and aerospace are seeing plummeting demand and potential sector transformation. With R&D often funded through revenue, many companies experiencing cash flow difficulties are at high risk of halting or significantly reducing R&D activity, including partnerships with universities and studentships.

Measures to mitigate the growing risk of severe disruption of the innovation pipeline and ecosystem will be crucial. The projects at highest risk are those in the middle of the pipeline, between the proof of concept through to the prototype and demonstration stages, which is costly and carries risk due to the technical difficulty and time needed to solve challenges. Cancelled projects or reduced uptake in R&D from early stage research in universities would result in the loss of the expected benefits from investment in R&D so far and a drop in innovative outputs and competitiveness in the coming years as planned projects do not reach maturity. This is an opportune time to reflect on existing projects and allow for flexibility to pivot where the context has changed.

→ **Front-load public funding in multi-year programmes.** Public funding contributions should be advanced and business contributions delayed to later stages of existing multi-year R&D programmes. This would create breathing space to enable companies to continue R&D activities while they stabilise cash flow.

“R&D is a vital element in delivering economic growth and gains in productivity. Maintaining, or ideally accelerating R&D activities and supporting associated engineering skills and infrastructures will be a key element in our recovery.”

Professor Neville Jackson FREng,
formerly Chief Technology & Innovation
Officer for Ricardo Plc.

5 [Investing in Innovation](#), 2015.

6 Nesta, [Plan I the case for innovation-led growth](#), 2012.

7 BIS, [Innovation, skills and performance in the downturn](#), 2014.

8 [Made Smarter](#) [Accessed 11 June 2020].

→ **Introduce agile and rapid Collaborative R&D programmes to promote industry-university collaborations and knowledge exchange**^{9,10}

The excellence of UK universities and the research base is a crucial asset and global draw to the UK R&D ecosystem. Many R&D intensive companies have spent years building close and strategic partnerships with universities and some have formed new partnerships during the emergency response to COVID-19. Now is the time to capitalise on these long-term and nascent relationships, strengthen the exchange and development of innovation across the public and private sector R&D pipeline and contribute to securing sustainable university research.

→ **Boost support for late-stage R&D and demonstration** for companies to develop products in real-world environments and attract further R&D and supply chains development.^{11,12,13}

→ **Maintain and improve the UK's competitive package of tax incentives for companies to innovate** such as R&D tax credits, Enterprise Investment Scheme and Seed Enterprise Investment Scheme.^{14,15}

→ **New programmes should consider developing globally leading capabilities**, both to put sectors on the front foot for recovery and to improve future resilience.

- **Building sectoral capability and capacity:** R&D projects in hard-hit sectors should be encouraged to prevent loss of technological and human capability, and in time to rebuild and grow internationally competitive capacity, skills and capabilities. Upskilling initiatives and sector and industry-led bodies such as the Advanced Propulsion Centre, Aerospace Technology Institute and the Catapults could be key partners.
- **Supporting strategic national capabilities:** this crisis has highlighted the vulnerabilities in supply chains for key national needs. With businesses struggling, some capabilities are at risk in the economic downturn, and will benefit from protection. Better long-term resilience can be developed by learning from examples of rapid adaptation and reconfiguration in the emergency response.

“Late-stage R&D is what businesses do: working with partners and customers, taking risks to bring innovative solutions to market.”

Dr Julia Sutcliffe
Chief Technologist and Head of
Engineering Strategy
BAE Systems

Use the Industrial Strategy Challenge Fund to stimulate pre-competitive collaboration to address future innovation needs and opportunities

COVID-19 has highlighted the importance of collaboration and innovation to tackling challenges. However, such collaborative innovation is at risk of being halted in many companies due to financial difficulties, despite presenting opportunities to adapt to new demands, collaborate and build up capability pre-competition, within and across sectors.

With flexibility on the timeline of private funding contributions, the Industrial Strategy Challenge Fund (ISCF) can engage with all sectors, universities, large companies and SMEs, to drive the recovery from this crisis by stimulating innovation and translation for a resilient, inclusive and net zero future.

9 [The Dowling Review of business-university research collaborations](#), 2015.

10 [Increasing R&D investment: business perspectives](#), 2018.

11 *Ibid.*

12 Increasing R&D investment: late-stage development, coming soon.

13 [Engineering priorities for our future economy and society](#), 2019.

14 *Ibid.*

15 [Increasing R&D investment: business perspectives](#), 2018.

Lessons and opportunities for the recovery from the pandemic

Companies who have continued R&D activity during economic downturns in the past have then been much better placed to recover.¹⁶ This may be even more relevant to this crisis, although there are differences from a financial downturn, with some sectors such as transport expecting their market and the world to look very different post-pandemic. There are also other broad and ambitious goals on the horizon such as net zero and levelling-up the country.

COVID-19 has highlighted that innovation can be adopted quickly, including in sectors such as healthcare where innovation diffusion is often viewed as challenging. There are lessons to be learned and an opportunity to grasp for broader modernisation and take up of innovative solutions.

Make innovation a key component of the public procurement process to bring best value for money to the public purse

Making the most out of procurement to deliver innovation and value for money to the public purse has been a widely acknowledged missed opportunity in the UK.^{17,18,19} In this time of emergency, procurement has brought together the country's capabilities and capacity for innovation to deliver the ventilator challenge for example. While there are examples of good procurement producing positive impacts, key elements of good procurement practice should be applied more widely to leverage maximum benefits, innovation and growth. Linked up to the ISCF and the Small Business Research Initiative (SBRI), public procurement can provide the pull needed to deliver the innovation most needed to solve everyday challenges.

The UK public sector spends £268 billion a year, equivalent to 14% of GDP, on procurement.²⁰ Extensive recommendations, advice and evidence already exists. Now is the time to take down the barriers preventing their uptake and capitalise on the barriers already broken down by the response to the pandemic.

Applying best practice in intelligent procurement to incentivise and support innovation by companies of all sizes should be a major focus of the government's work to increase business R&D investment. This must include strong leadership and vision, robust specification and planning, the involvement of intelligent clients, incentives to encourage the right behaviour and good management of risk. Cultural change in government with greater willingness to establish and accept appropriate levels of risk is crucial.

Support regulators to adapt rapidly to innovation and new practices²¹

Changing working practices and diffusion of new technologies should not happen at the expense of safety, ethics or privacy. However, unlocking new practices such as remote inspection and accelerating regulatory processes for innovative solutions to the crisis are crucial to restart the economy safely. It is vital to enable and equip regulators with frameworks and standards fit for the 'new normal' and capitalise on the opportunity to learn from practices set up to respond to the healthcare emergency.

“There is a unique and timely opportunity to reflect and learn from the emergency response to this global pandemic – collaborations, enabling funding and mechanisms to act fast to industrialise solutions.”

Dr Luisa Freitas dos Santos FEng
VP Global Clinical Supply Chain (R&D)
GSK

16 BIS, [Innovation, skills and performance in the downturn](#), 2014.

17 [Public projects and procurement in the UK](#), 2014.

18 [Increasing R&D investment: business perspectives](#), 2018.

19 [Engineering priorities for our future economy and society](#), 2019.

20 UK Government, [Building our Industrial Strategy](#), 2017.

21 [Increasing R&D investment: business perspectives](#), 2018.

The Royal Academy of Engineering is harnessing the power of engineering to build a sustainable society and an inclusive economy that works for everyone.

In collaboration with our Fellows and partners, we're growing talent and developing skills for the future, driving innovation and building global partnerships, and influencing policy and engaging the public.

Together we're working to tackle the greatest challenges of our age.

What we do

TALENT & DIVERSITY

We're growing talent by training, supporting, mentoring and funding the most talented and creative researchers, innovators and leaders from across the engineering profession.

We're developing skills for the future by identifying the challenges of an ever-changing world and developing the skills and approaches we need to build a resilient and diverse engineering profession.

INNOVATION

We're driving innovation by investing in some of the country's most creative and exciting engineering ideas and businesses.

We're building global partnerships that bring the world's best engineers from industry, entrepreneurship and academia together to collaborate on creative innovations that address the greatest global challenges of our age.

POLICY & ENGAGEMENT

We're influencing policy through the National Engineering Policy Centre - providing independent expert support to policymakers on issues of importance.

We're engaging the public by opening their eyes to the wonders of engineering and inspiring young people to become the next generation of engineers.

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