Innovate UK | UK Research and Innovation

Delivery Plan 2019

Contents

1. Foreword

Dr Ian Campbell, Interim Executive Chair, Innovate UK

Over the last 12 years Innovate UK has invested over £2.2 billion in innovation. This has spanned more than 11,000 projects that have generated up to £16 billion in Gross Value Added for the UK economy and 70,000 jobs. We have delivered these results by supporting businesses to develop and commercialise ideas drawing on their own know-how or research, from the UK's world-leading research base, and through collaboration with partners.

This is a proven track record we can be very proud of. Now, as part of UK Research and Innovation (UKRI), we have the opportunity to build on our success and tackle the significant challenges ahead.

The world is changing rapidly, in terms of technology, politics and societal trends. Lasting global trends such as demographic change, climate change and a technological revolution need innovative solutions. More than ever, the UK's ability to thrive in the face of change depends on ideas, with innovative companies driving a productive, growing economy and solving the challenges we face as a society.

The government's Industrial Strategy recognises the importance of innovation in delivering the best outcomes. We will be central to the delivery of that strategy through finding and enabling solutions by investing in UK companies with the potential to take them to global markets. This will require UK industries to build new collaborations, develop new approaches and take advantage of the latest research, through either the transformation of existing sectors or the creation of completely new value chains.

Innovate UK's unique role within UKRI will make this a reality. Helping businesses of all sizes in all sectors across the UK to access the knowledge, partners, investors and markets they need to innovate and grow. We are the Government's innovation agency and delivery partner, providing support for innovation across a range of policy areas.

To achieve the government's Industrial Strategy commitment to increase R&D spending to 2.4% of GDP by 2027, Innovate UK is changing. Our role in delivering these goals through the Industrial Strategy Challenge Fund will be an important contribution to the goal. But government cannot do this alone. It needs business, researchers and government to work together.

So our new strategy takes more of an investment-driven approach to innovation. It focuses much more closely on creating the conditions for private investment in R&D, on creating an enabling environment by championing and assisting industry to innovate, on nurturing the sectors and technologies that will transform the UK, and on encouraging innovation in all businesses with the potential to grow and scale, right across the country.

We will take a thought-leadership role around business-led innovation, providing leadership through our expertise, being recognized as a trusted voice, and setting the direction for innovation in the UK and beyond. We have already introduced new ways of working with innovative businesses through world-class programmes and processes. These include building up the UK's innovation infrastructure with the Catapult network and introducing new forms of innovation finance such as Innovation Loans and our Investment Accelerator. But we now need to move further and faster to make the most of public funding, ensuring maximum impact as an investor in business innovation, and not just as a funder.

Successful organisations innovate, responding quickly to new challenges and opportunities, with a clear focus on positive impact. These principles underpin our new strategy. By investing in innovation we can maximise the impact of our work. Exploring new ways to finance innovation, and strengthening our non-financial support, underpin this investment. In this way we will achieve our vision for the UK to be the best place in the world for businesses to innovate and grow, in order to maximise the economic and societal benefits of innovation over the long term.

Dr. Ian Campbell, Interim Executive Chair
Innovate UK

2. Vision and objectives

The world we live in is undergoing major changes. New technologies, policies and economic circumstances are emerging. More urgency is needed to address lasting global trends such as demographic change, climate change and globalisation. All of these developments represent significant societal challenges, but also tremendous business opportunities.

To seize these opportunities, innovation is vital. Accelerating the development of new products, processes, services and business models based on new ideas and technologies drives productivity, increases exports, grows businesses and generates prosperity.

Our vision is therefore for the UK to be among the very best places in the world for businesses to innovate and grow in order to maximise the economic and societal benefits of innovation over the long term. To this end, our mission is to drive sustainable economic growth through business-led innovation, by investing in innovation and giving innovative businesses of all sizes in all sectors access to the knowledge, partners, investment and markets they need.

We are the UK's innovation agency. We work across UKRI and with partners to drive sustainable growth by investing in high-potential entrepreneurs and businesses across the UK that have the ambition and potential to contribute to economic growth and society through innovation. This includes working with spin-outs and start-ups through to large businesses at the top of complex supply chains that can provide routes to market for the companies supporting them. Our work is also key to delivering the government's Industrial Strategy, including the commitment of UK R&D expenditure reaching 2.4% of GDP by 2027.

To ensure the UK is best placed to achieve all this, we are implementing a new strategy. Our focus will be on backing business-led innovation that has a positive, measurable impact on the economy and society. We will work with partners to create a system of financial and non-financial support that stimulates successful innovation, boosts competitiveness and delivers economic growth. At the heart of this strategy are 5 new strategic goals:

1. Deliver measurable economic and societal impact across the UK.
2. Support and invest in innovative businesses and entrepreneurs with the potential and ambition to grow.
3. Maximise the commercial impact of world-class knowledge developed in UK industries and its research base.
4. Identify, support and grow transforming and emerging industries through innovation.
5. Build a coherent, supportive environment incentivising R&D investment and enabling people and businesses to innovate.

To realise the ambitious 2.4% R&D commitment and the Industrial Strategy's wider goals, we will focus on increasing innovation investment across the economy, by universities, the public sector and especially from businesses, which conduct two-thirds of all UK R&D. This will involve a new approach to driving business-led innovation that implements a system of financial support for all businesses seeking to grow through innovation in the UK and which anchors significant value of that support within this country. Building on Innovation Loans and the Investment Accelerator, we will explore new innovation finance options, including repayable grants, equity and other investment mechanisms that can maximise the value and impact of government innovation funding.

We will take an investment-driven approach, increasing our focus on businesses with the ambition and potential to commercialise their ideas and grow through innovation, helping them develop the capacity and embed the capability to innovate and maximise its impact. This marks a strategic transition from a traditional grant-awarding body to a modern innovation agency, identifying companies which, with our support, can innovate and scale, maximising the return on our investment to the UK economy and society. It also means taking risks bigger than the private sector can take alone, but encouraging the private sector to invest alongside us by helping to de-risk innovation.

In promoting our thought-leadership role as the UK's innovation agency, our work will go beyond providing finance for innovation. We will help create the right environment for entrepreneurs and businesses to innovate successfully, including an effective innovation infrastructure, introduction of a new strategy for innovation talent and skills, and support for increased, seamless collaboration with universities and the wider research base.

We will provide strong regional engagement, forging closer links to Local Enterprise Partnerships and Growth Hubs, and partnering with devolved government administrations and their agencies. But we will also become more global in our thinking and help UK businesses do the same. We will therefore enable access to international collaborators, investors and markets so British innovations can address global problems, attract international investment and grow the UK economy.

Crucially, our new strategy will be built on evidence and we will continuously monitor, evaluate and refine our programmes to maximise economic and societal impact. Annual performance reports will set out progress towards our vision. When we are successful, we will be able to measure that success. So we will be able to demonstrate that:

- businesses across the UK economy are producing novel, effective solutions to Industrial Strategy Grand Challenges; we will evaluate the Industrial Strategy Challenge Fund and report on the impact generated from Innovate UK and UKRI more broadly
- business R&D investment is growing sustainably as a proportion of GDP, from its current 1.12%; every year, we will report leveraged and national R&D investment figures
- businesses we work with are attracting more private investment and scaling-up; over 1,000 companies that have received a grant from us have also received equity investment – totalling over £4bn – and we will grow this number, monitoring and reporting on new investments each year
- collaboration between industry and the research base is increasing, leading to successful commercialisation of innovative ideas; we will monitor and report on business-academic collaborations and those projects' outcomes
- international businesses are conducting more innovation activities in the UK and more UK businesses are connecting to international partners to enhance growth prospects
- more businesses of all sizes are aware of, understand and are benefitting from Innovate UK and UKRI support
- appetite for innovation is increasing in the business community.

3. Research and Innovation priorities

3.1 Deliver measurable economic and societal impact across the UK

We will take a bold approach, including challenge-orientated programmes, to put the UK at the forefront of innovative solutions that address industrial and societal challenges, creating and serving entirely new global markets and servicing existing ones more effectively.

Context

Outlining key challenges facing our economy and society, the Industrial Strategy sets out Grand Challenges that offer huge opportunities for ambitious businesses. We are at the heart of delivering that strategy, working with partners across research and industry to develop solutions which will boost the economy, create high-value jobs and enhance society. We will work across UKRI and with government and private sector partners to ensure the UK takes a lead in developing the technologies and industries of the future.

Against this background, the Industrial Strategy Challenge Fund is a new approach to driving innovation in areas where economic and societal impacts can be greatest. The challenges it addresses frame the opportunities that beckon, with each drawing on numerous technology and industry sectors.

But our work is not limited to these areas, because we acknowledge a wider range of businesses and ideas are needed to maximise economic growth and societal impact across the country. So our programmes combine to support both the specific innovations that will help tackle the Grand Challenges, and other sectors and technologies with significant innovation potential and impact.

The Grand Challenges represent major global trends for societies worldwide. The UK needs to work with international partners to rise to these challenges and take advantage of the global opportunities. With innovation an increasingly global endeavour and with over 95% of R&D conducted outside the UK, the UK must collaborate globally to remain at innovation's cutting edge.

Innovate UK is ideally placed to help innovative UK companies to go global and make internationalisation a key step in their growth journey. We will seek to expand our international activities to help companies identify and access global knowledge, investment and markets.

Long-term ambitions

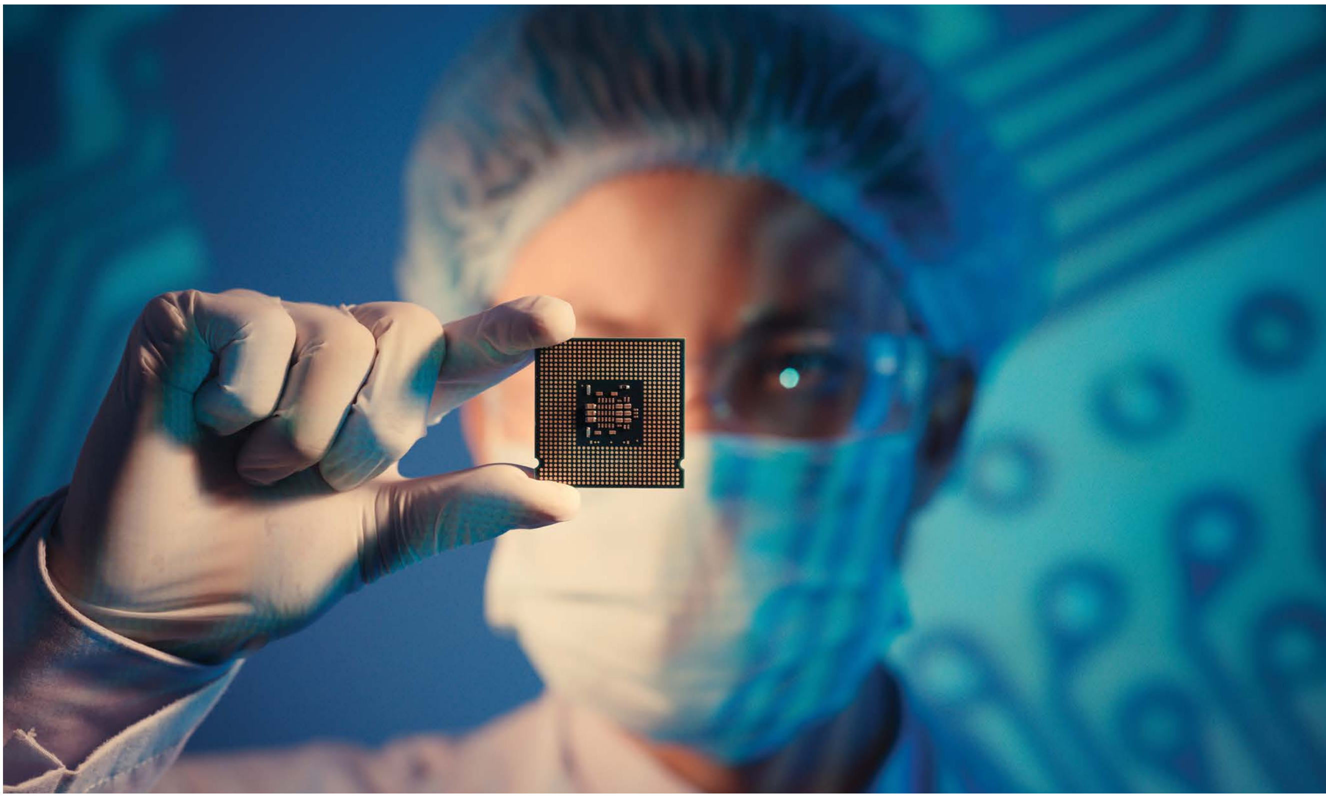
- deliver a continuously evolving programme of challenge-orientated innovation support, identifying new industrial and societal challenges as they emerge and putting UK companies at the forefront of developing and commercialising solutions to these
- help businesses to produce solutions that drive UK economic growth and measurable benefits for society, including environmental and health and wellbeing outcomes. We will develop and publish a framework for assessing and evaluating the full economic and societal impacts of our activities
- work with partners such as the Department for International Trade (DIT) to develop and implement a programme of support for innovative UK companies to go global, including to access markets, to collaborate with international research and business, and to secure inward investment. This will include and complement UKRI cross-cutting funds for international collaboration in research and innovation.

[1] UK Research and Innovation. 'Industrial Strategy Challenge Fund', https://www.ukri.org/innovation/industrial-strategy-challenge-fund/
[2] United Nations. 'About the Sustainable Development Goals', https://www.un.org/sustainabledevelopment/sustainable-development-goals/

Near-term actions

In 2019/20 we will:

- deliver the Industrial Strategy Challenge Fund challenges that the government has already announced[1]
- deliver a programme of support for innovation in the technologies and sectors which make up the Grand Challenges
- assist the Catapult network in its work across the Grand Challenges and beyond, to ensure businesses have access to the expertise, facilities and collaborations to commercialise innovation
- deliver a programme of activity for UK businesses seeking to go global:
  - connect businesses to European and international funding opportunities and help them understand and develop innovation opportunities in new markets through our Global Expert Missions and Global Business Innovation Programme
  - deliver international programmes, including our elements of UKRI's Fund for International Collaboration (FIC) and facilitating access to the EU's Horizon 2020 programme through our dedicated National Contact Points and the Knowledge Transfer Network (KTN). Provide direct support under the EUREKA framework, building on the UK's 2018-19 chairmanship, to continue its development into a global platform for innovation collaboration. Invest in new collaboration opportunities under the framework, including bilateral programmes with member countries such as Canada, Israel and South Korea, alongside partnerships with non-member countries such as Singapore and Japan
  - participate in the Global Challenges Research Fund (GCRF), widening our engagement across emerging economies, particularly in sub-Saharan Africa. By partnering with the Official Development Assistance (ODA) programmes, including the Newton Fund and those funded by the Department for International Development (DFID) and the Department of Health and Social Care (DHSC), we will also enable UK businesses to participate in finding solutions to the global challenges highlighted through the UN's Sustainable Development Goals[2].



Priority areas for investment

Artificial intelligence (AI) and the data economy

AI is an industry in its own right. It also has potential to transform many other parts of our economy and society, and harnessing its potential has been set out as one of the Industrial Strategy Grand Challenges. Full use of data and AI throughout value chains will increase productivity and create thousands of high-value jobs. Our focus is on AI and data innovation for sectors of strategic importance to the UK, including creative industries, space and high-value services.

We are working on the growing need for tools that can interpret and exploit data for improved decision-making and competitiveness. These include:

- secure and reliable data capture and transmission, including the Internet of Things, 5G and satellite communications
- advanced data analysis
- tools for people to interact with and interpret data and content
- business models that underpin a sustainable data economy.

The UK is already a world leader in AI and data, with clusters in London, Edinburgh, Manchester, Oxford, Bristol, Belfast and Cambridge, and considerable strength in related technologies such as cyber-security, robotics and Earth observation. In 2019-20, we will:

- support the UK's vibrant AI and data eco-system across sectors to develop and adopt cutting-edge innovations to increase productivity and competitiveness
- work with the Office for AI to develop the technology's commercial potential in the UK through the AI Sector Deal, for example through KTPs to transfer research skills into businesses
- work with the new Centre for Data Ethics and Innovation and regulators to foster trusted AI and data technologies, and support the Open Data Institute to ensure the UK stays at the vanguard of data and innovation.

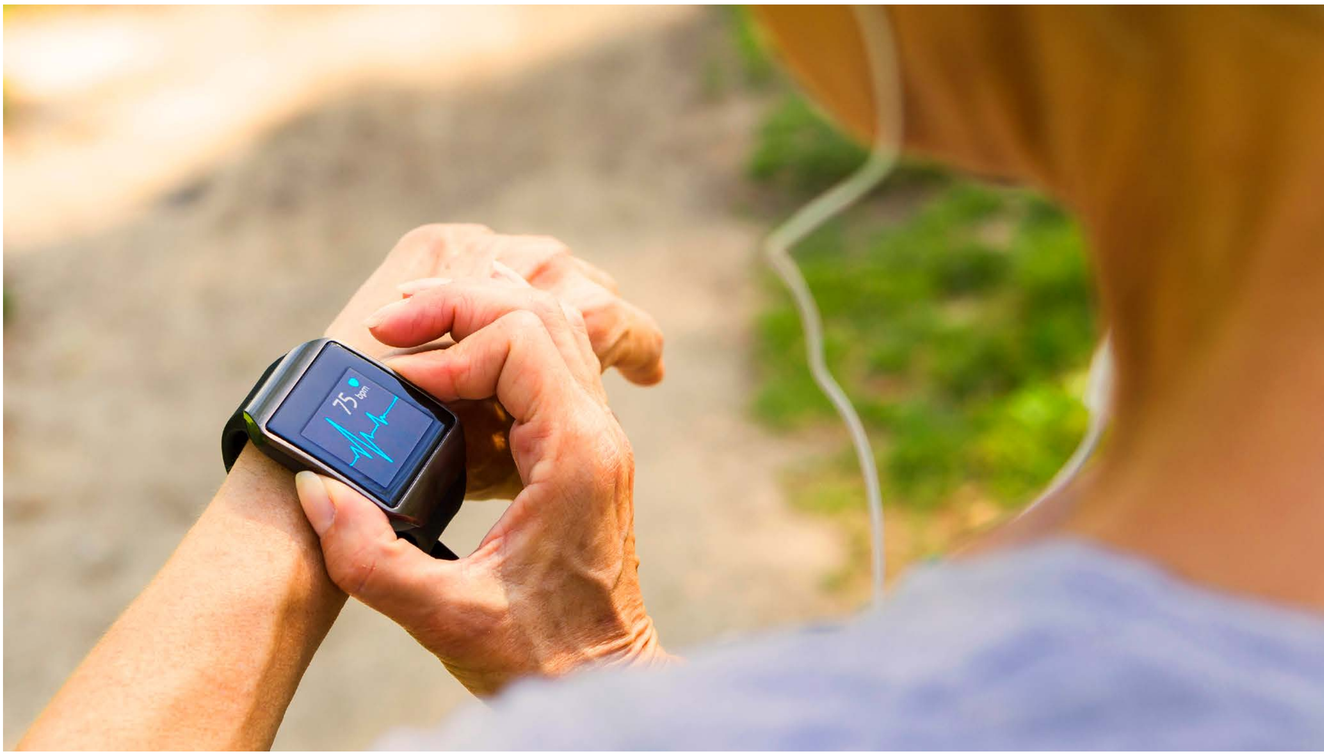
Ageing society, health and nutrition

The global population is not only growing. It is ageing, with the proportion of the population aged over 80 set to double over the next 25 years and 2.1bn people forecast to be 60 or over by 2050. The associated challenges present a significant opportunity for UK businesses. Opportunities exist for innovation to:

- scale productivity of food production through modern methods such as vertical farming
- develop, test and manufacture at scale next-generation medicines, such as cell and gene therapies, that treat patients individually and potentially offer cures
- diagnose diseases faster and before symptoms emerge
- enable people to lead more independent lives as they age.

The UK is building world-leading expertise in these areas and has strong business sectors working across healthcare, medicines, agriculture, food and biosciences – supported by service sectors such as the UK's world-leading design industry – which contribute significantly to the economy and provide thousands of high-value jobs. As a result, they are well-placed to meet the challenges and lead in global markets. In 2019-20 Innovate UK will:

- support the UK's strong SME sector to develop and generate real-world evidence for innovative medical devices, diagnostics and regulated digital health products, to advance commercial evaluation and adoption
- ensure the UK's cell and gene therapy industry stays internationally competitive by providing support for manufacturing, clinical trials, new standards and global collaborations
- help businesses working in drug discovery and data science to identify potential new treatments that are more predictive and precise, and accelerate them into clinical development
- provide support to the agriculture and food industries through initiatives including the Centres for Agricultural Innovation and the AgriTech Catalyst that addresses both local and global markets.



Clean growth and infrastructure

Encompassing clean energy, better urban systems and smarter infrastructure and food production, clean growth is one of the greatest challenges of our time; this is recognised in the Industrial Strategy through the creation of the Clean Growth Grand Challenge. With the Intergovernmental Panel on Climate Change (IPCC) recently projecting that the world needs to be at net zero carbon by 2050, potential exists for the UK to generate clean-growth opportunities for businesses by making rapid, far-reaching changes across every aspect of society.

With its major clean-growth and infrastructure businesses and strong base of highly creative companies that offer expertise in adopting new methods and delivering solutions across multiple domains, the UK is well-placed to harness this opportunity. We will therefore help businesses that can have a transformative impact on society's essential infrastructure and that can seize the opportunities presented by the global low-carbon economy.

We will:

- deliver an air-quality innovation programme that supports the goals of the Department for Environment, Food and Rural Affairs' (Defra's) Air Quality Plan to tackle all sources of air pollution, making our air healthier to breathe, protecting nature and boosting the economy
- launch the Innovation Exchange – a process to connect offshore wind, nuclear and energy-system companies with innovative suppliers outside their usual supply chains who have technological solutions to their challenges.

Mobility, manufacturing and materials

Mobility is fundamental to business and society. For example, people need to get to work, see their friends and family, go to school or get to a doctor. But, driven by extraordinary innovation in engineering, technology and business models, the world is on the cusp of a profound change in the way we move people, goods and services. Electrification and autonomy are the driving factors across our roads, rail, marine and air transport.

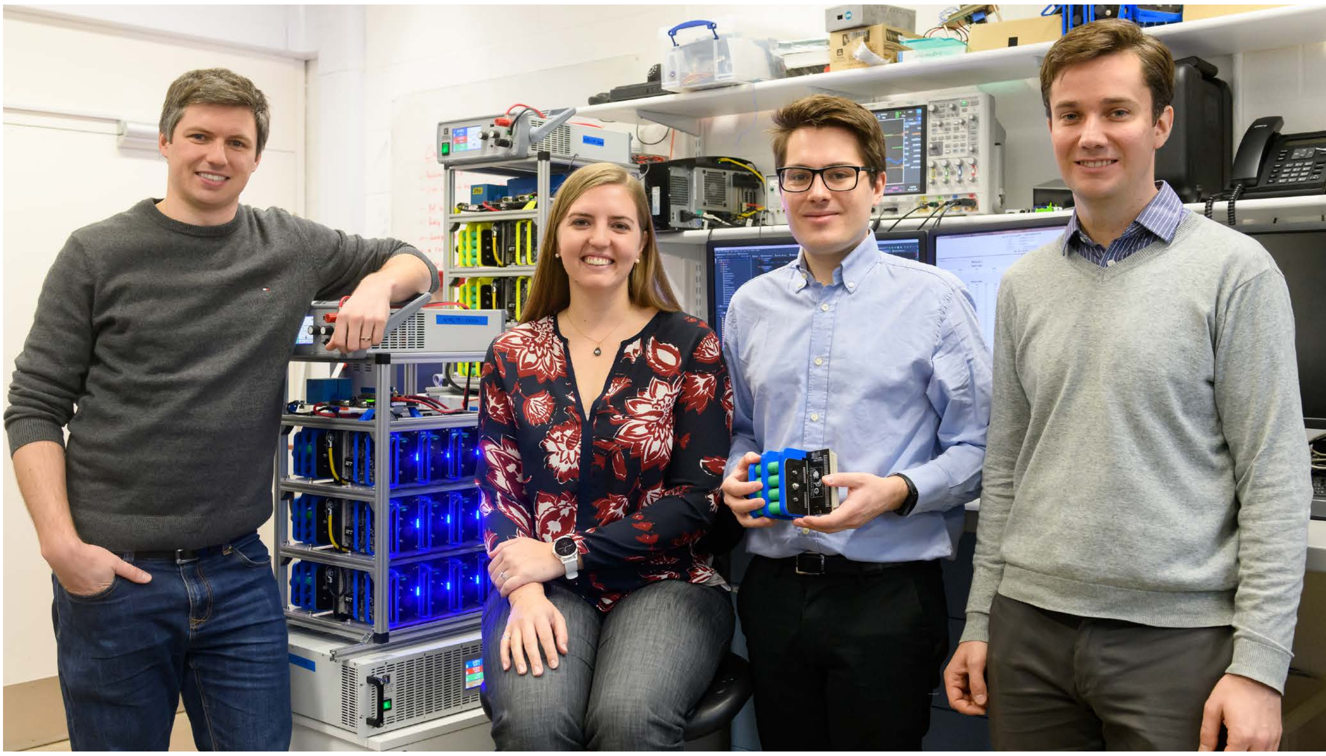
Advanced materials will enable people and goods to travel faster, cheaper, more safely and with less environmental impact by light-weighting, energy efficiency, enhanced functionality and improved operating lifetimes.

The world is also moving from a highly regulated, well-defined transport system to a future of autonomous land, air and sea vehicles. To help realise this, we will focus on the infrastructure, operations, materials and other hardware, and data systems required. We will work closely with experts in digital technology and other parts of the UK's world-class research base to ensure these technologies align with manufacturers' needs.

Strengthening manufacturing is vital to the strength of the UK economy. The sector currently accounts for 10% of the total economy, 44% of exports and 70% of R&D. As well as delivering advanced materials and innovation for the future of mobility, we will invest in innovation in manufacturing, anchoring this vital activity in the UK through, for example, the High Value Manufacturing Catapult.

In 2019-20 we will:

- deliver the UK Aerospace Research & Technology Programme, in partnership with the Aerospace Technology Institute (ATI) and the Department for Business, Energy and Industrial Strategy (BEIS), to maintain and grow the UK's competitive position in aerospace design and manufacture
- continue to partner with the Advanced Propulsion Centre in delivering £500 million of investment over 10 years to the UK automotive sector
- work in partnership with the Office for Low Emission Vehicles and the Centre for Connected Autonomous Vehicles (CCAV), to ensure the UK is at the forefront of R&D for the future of mobility.



3.2 Support and invest in innovative businesses and entrepreneurs with the potential and ambition to grow

We will identify and back potential high-growth businesses, taking an investment-driven approach to funding innovation, anchoring the value of our investment in the UK and enabling growth through our networks, with a focus on scaling-up businesses.

Context

Successful innovation is about more than great ideas and invention. It is characterised by commercialisation, resulting in economic growth. There is vast evidence both on the importance of innovation for long-term economic growth and on the barriers to investment faced by businesses. Government support is designed to mitigate market and systems failures that lead to underinvestment in innovation by the private sector.

Our strong emphasis on backing quality innovation enables companies to take more risks, invest more in innovation and bring their innovations to market. In light of the commitment to increase the UK's R&D intensity to 2.4% by 2027 from its current rate of 1.7%, we need to be bolder in our efforts to stimulate private sector investment in innovation.

We want innovators to have the opportunity to succeed and businesses to realise their ambition to grow through innovation. Our new approach will place more emphasis on identifying and investing in potential high-growth SMEs that will take risks and scale up, and supporting businesses of all sizes as major participants in global supply chains. To do this, we need to ensure our processes are optimised to identify the right businesses, and bring together a systematic offer that provides funding, connections, skills and access to the facilities and expertise required to enable innovation.

Investing in innovation

To innovate and grow, different businesses need different forms of financial assistance, depending on the technology, the sector, the level of risk involved and the maturity of the business.

Our Smart programme aims to fund the best and latest ideas from all sectors and across the UK to help great businesses get to market faster. It helps single companies and collaborative projects, helping innovators work with other businesses or benefit from the strength of the UK research base. But grants are not the only, or always most effective, form of funding for innovative firms. They are excellent for early-stage companies but, as businesses become more developed or as innovation projects reach a higher level of maturity, there may be better ways to provide support.

We have introduced Innovation Loans as a pilot programme for late-stage-development businesses about to become, or just becoming, revenue earning. These loans are providing direct returns to UK taxpayers through repayments and interest, as well delivering external investment from private equity and company funds.

We have also developed the Investment Accelerator, matching grant funding with private equity finance. Our assessment of the innovation in parallel with the investor's due diligence creates a lower risk profile that brings forward private equity investment.

As we implement our new strategy, we will consult with partners including the British Business Bank and the business community to explore other mechanisms, such as repayable grants, to anchor activity, investment and return

Smart grants for innovative businesses

Smart grants are available to innovative businesses of any size and working in any sector. We run regular competitions offering between £25,000 and £2 million for projects with high commercial potential.

Over the years grants such as Smart have proved that success can result even from small amounts of funding. For example, Swiftkey's keyboard app has been installed hundreds of millions of times, with its development dating back to a £15,000 Innovate UK grant. Now part of Microsoft following a reputed US$250 million purchase, Swiftkey has offices in Seoul, San Francisco and London.

in the UK. Providing the right support for businesses at the right time, they form a core part of our new approach to financing innovation, ensuring we work alongside other sources of finance, aligning with venture capital funds and bringing forward private investment in innovation.

Achieving growth through innovation

We are committed to helping businesses realise their potential through a coherent, integrated offer across our innovation networks and the Catapults. This involves much more than just funding and will be enabled through our business innovation networks as well.

We provide access to business growth experts across England, Northern Ireland and Wales (with an aligned network in Scotland) through the Enterprise Europe Network. These experts regularly talk to the SMEs that we fund, and signpost them to further support according to their needs. They also offer coaching and mentoring as part of the Innovate 2 Succeed programme piloted in 13 regions in England and we are now exploring rolling it out across the UK.

Since 2010, we have funded 264 companies that have now scaled-up as high-growth firms (using the OECD definition of ‘high-growth’). Working closely with the Scale-Up Institute, we have piloted a new tailored approach for businesses with the potential to scale up through innovation.

How loans unlock innovation

Following a successful £50 million pilot to test innovative businesses’ appetite for low-cost, long-term loans, we will continue our loan programme. Here are two examples:

As aftertreatment emissions specialists, Catagen are delivering advanced solutions that will have direct impact on our cities and air quality. Reducing tailpipe emissions remains one of the biggest challenges facing the global automotive industry.

Reaching a solution involves precision testing and Catagen are using their expertise, developed from research at Queen’s University Belfast, software and patented testing technology to meet the needs of customers for a ‘clean air partnership’, with support from an innovation loan.

Invented by a gynaecologist, Callaly's patented Tampliner is a novel combination of tampon and pantyliner. It has already been nominated for an Inda Hygienix Innovation Award, which champions the most disruptive hygiene and personal care products.

Thang Vo-Ta, Callaly's Chief Executive Officer, says: "Innovation Loans are ideal for us. It's one thing to invent a product, but for full and successful commercialisation you need to be able to produce it consistently, economically and at speed."

Long-term ambitions

- take an investor-style approach to supporting innovation, exploring a range of financial products for innovative businesses and working with the British Business Bank to investigate how the UK taxpayer could take a share in success to retain the economic value of our activities in the UK
- increase emphasis on funding excellent innovation in businesses with the potential and ambition to grow through innovation, reflected in the way we assess, fund and evaluate innovation projects and wider support delivered by our Enterprise Europe Network and for scale-ups
- through working alongside other sources of finance, aligning with traditional venture capital funds and other forms of public and private business support, stimulate more R&D investment in the UK, crowding-in and bringing forward private sector investment by reducing and sharing risks as well as returns.

Near-term actions

- develop and enhance our current assessment process to ensure we identify the best ideas from businesses with the ambition and potential to grow through innovation
- deliver our new Smart programme of R&D grants to help enable the best ideas from all sectors and all parts of the UK, supporting both individual companies and collaborative R&D projects
- explore expanding the pilots of Innovation Loans and the Investment Accelerator as a major element of our innovation finance to help businesses grow and scale
- promote the Innovate 2 Succeed programme as a UK-wide offer, helping high-potential UK businesses develop their innovation and business capabilities
- develop the Scale-Up pilot to offer tailored support for businesses with high potential to scale-up through innovation.

3.3 Maximise the commercial impact of world-class knowledge developed in UK industries and its research base

We work across UKRI to enable seamless collaboration between research and industry in order to commercialise the knowledge developed in the UK's research base. Our programmes will evolve to realise opportunities for joint-working across the research councils and Research England, and to support commercialisation beyond the research base, connecting businesses, providing access to skills and facilities, and encouraging demand for innovative solutions.

Context

The UK research base underpins, directly or indirectly, a significant amount of business innovation. Business-led innovation and commercialisation can involve developing ideas from entrepreneurs within the business, or directly taking forward and developing intellectual assets emerging from universities, such as through spin-outs or licensing, or collaboration between businesses and researchers to develop new ideas. We are in a unique position to develop a coherent approach across the spectrum of commercialisation, including the research base, Public Sector Research Establishments (PSREs), innovative SMEs, entrepreneurs and the UK supply chain.

Commercialising university research

The Dowling Review of business-university research collaborations found that businesses reported numerous challenges in working with the research base to develop and commercialise ideas. These included intellectual property arrangements, identifying partners, funding to support collaborations and perceived cultural differences.

We have a long history of working with the research councils to help overcome these barriers. As part of UKRI's work to look across the full remit of commercialisation activity we will seek to further develop existing pilots and programmes and will explore new ways to commercialise academic research in the UK. A number of our programmes

work at the interface between university research and business innovation, enabling great ideas to flow both ways.

- the Catalyst programme offers funding for translational activities to researchers and businesses working in specific sectors or technologies
- knowledge Transfer Partnerships (KTPs) build partnerships between businesses looking to address specific problems or opportunities and researchers in academia with the skills and expertise to help
- Innovation and Knowledge Centres (IKCs) provide a shared space and entrepreneurial environment for academia and businesses to work together on commercialisation
- the Innovation and Commercialisation of University Research (ICURe) programme aims to tackle several barriers to the commercialisation of university research, helping determine what the right path to commercialisation is, whether that be through licensing, spinning out a new business, or conducting further research to make an idea market-ready.

An effective ICURe for commercialising research

In 2014, ICURe was set up to tackle barriers to commercialisation by enabling academic researchers to take commercially promising research projects to market. Here are 2 great examples of its impact:

- University of Bristol spin-out Ziylo took advantage of ICURe support to help develop safer, more effective treatment of diabetes. Following on from EPSRC research funding, the Ziylo team were able to use £500,000 to explore the commercialisation of their work and, in 2018, Danish pharma giant Novo Nordisk bought the company in a deal potentially worth up to US$800 million.

- Technology developed by a business set up with ICURe's help less than 3 years ago could transform a wide range of plastic products. University of Warwick spin-out Interface Polymers has developed Polarfin® additive technology that modifies the surface of commonly used plastics and allows adhesion between otherwise incompatible materials. With applications in packaging, crop protection and construction materials, it allows mixed plastic waste to be recycled into useful products.

Connecting and collaborating

Commercialising ideas requires more than just funding. Businesses need the right people, facilities, expertise and connections to turn their ideas into profitable goods and services. Experts in our KTN help businesses identify and understand opportunities from emerging technologies or from other technology or sector developments, brokering relationships and building collaborations to maximise impact.

Accessing skills and facilities

As technologies become better established and confidence in them grows, the scale at which they need to be made available to the business community also grows. Businesses wishing to move beyond small-scale or laboratory-scale work, to test whether their innovations are credible at a level nearer to commercial requirements, can lack access to the expertise and equipment necessary for the next stage of scaling up.

We created the Catapult network to meet this need. It comprises a series of physical centres that aim to transform the UK's ability to innovate in key areas and drive economic growth and job creation. We have seen clusters emerging around them and businesses emerging from them and, in 2018, we agreed a further 5 years' funding for the Catapults, with well-defined delivery plans aimed at cementing their place at the heart of their sectors.

Innovation through customer demand

Customer demand is a key driver of innovation. We want to help UK businesses provide the innovative solutions for the problems that industry and government face. In this context, the UK-wide Small Business Research Initiative (SBRI) challenges industry to develop innovative solutions for public sector needs, encourages public procurement of those solutions and provides a first customer for businesses to help them create competitive advantage. SBRI spans the full range of technology development from ideas to procurement. Crucially, it enables government departments to meet their policy objectives by identifying, evaluating and potentially procuring new technologies to improve delivery of public services.

Government is an important customer of innovation. But demand for innovation from customers outside the public sector, including those in other businesses, also offers opportunities. Our programmes can work to stimulate demand for innovation, incentivising businesses to innovate to win custom. Demand-led innovation can be an important means to increase private sector innovation activity as the UK moves towards its target of 2.4% R&D intensity.

KTP helps create new defence vision

A KTP can transform a business's ability to innovate by enabling it to harness university expertise and support from a talented graduate, known as an associate. Photonics supplier Qioptiq has secured a Ministry of Defence (MoD) contract worth £82 million (the largest the company has ever won) that will ensure UK armed forces have access to essential night-vision equipment. As well as helping troops stay safe, it is predicted that Qioptiq will enable the MoD to save £47 million over six years. The associate, an expert in forecasting and inventory control at Cardiff Business School who began working with the company through a KTP, is playing a key role in the work.

Long-term ambitions

- ensure our support for innovation aligns fully with the research base, including through development and implementation of a new Catalyst programme spanning UKRI, enabling commercialisation of the most promising technologies and working with the research councils to achieve this
- ensure our business networks function to support commercialisation in all its forms, including through closer working across UKRI, helping transfer business management excellence from business schools and operationalising it within industry
- explore and develop new means to drive demand for innovation, creating stronger market pull for innovation and R&D by enabling customers to set ambitious new demands on suppliers.

Near-term actions

- increase our investment in KTPs, including in the area of management skills, and introduce management KTPs that boost the number of researchers and entrepreneurs with business-relevant knowledge to understand the route to commercialisation
- explore developing the Innovation to Commercialisation of University Research initiative to become a truly national programme for commercialising university research outputs
- work with the newly appointed CEO of the Knowledge Transfer Network to develop the knowledge transfer adviser role to provide UKRI with a team that can connect the research base more effectively with innovative UK businesses
- work with Government departments to revise and develop the SBRI programme to solve public sector challenges with innovative ideas from industry and also encourage increased investment.

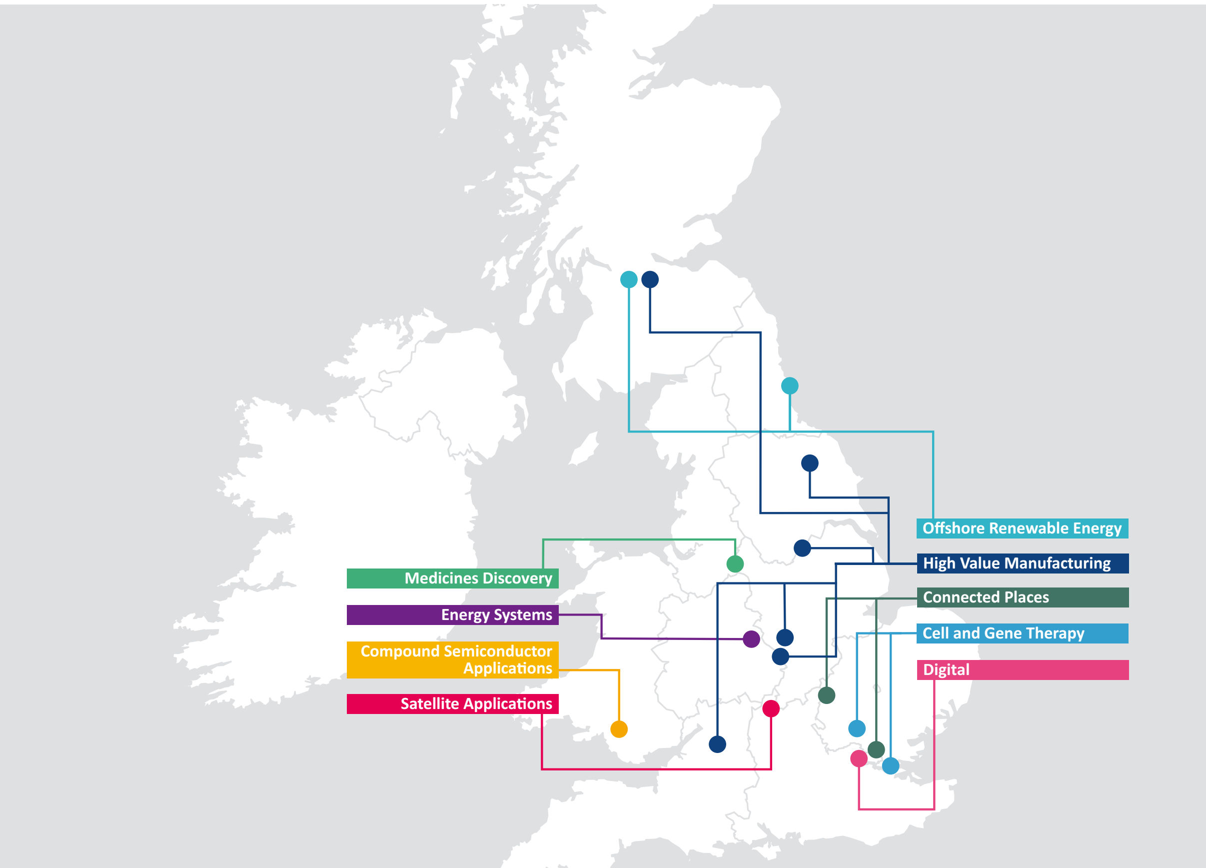
3.4 Identify, support and grow transforming and emerging industries through innovation

We will support the industries and technologies in which the UK has or can build a globally competitive industry base, working across UKRI to better identify those with greatest potential for the UK. We will invest in the expertise, facilities and conditions to accelerate the transformation and emergence of industries to maximise UK economic growth.

Context

The UK has strengths in major global industries such as automotive, energy and pharmaceuticals. We will continue to back innovation at an industry level, providing access to facilities and equipment which individual businesses could not afford, including through the Catapult network, and building a critical mass of skills and expertise to enable commercialisation of innovative ideas. This will help UK industries continue to excel and transform in order to meet new challenges and opportunities. We also provide support for emerging technologies with potential to be the industries of the future. The creation of UKRI enables us to identify and support these emerging technologies more easily.

By spotting clusters of research and emerging ideas for their application, we can evaluate their potential for commercialisation. Past examples include micro-biome, synthetic biology, and quantum technologies, an area now supported by EPSRC in the UK National Quantum Technologies Programme. Analysis of our Smart programme, open to all ideas from any sector, provides a way to identify these clusters and form focused programmes.



Early-stage technologies often lack coherent communities or networks. So we work through the KTN to bring together the right people and assess opportunities in new challenge areas. It has 10 teams working across the UK to support sectors and also manages Special Interest Groups (SIGs) which have a proven track record in driving forward new areas such as synthetic biology.

With true platform technologies, while a great many end-uses are conceivable, in most cases no-one knows at the outset which of these will turn out to be viable in practice; for example, there are well over several dozen proposed uses for graphene, but the technology required to manufacture graphene at scale represents a significant challenge for industry. Moreover, most products or services are not built just on one technology. To explore an emerging technology's potential in a number of applications, an innovator needs access to a very wide range of companion technologies.

Building on strengths

Different industries face different innovation challenges. For some, early-stage innovation can be conducted relatively quickly, with limited sunk costs. In others, dedicated capital investment is needed in order to test new ideas, technologies or products, which increases the expense and therefore the risk of innovation.

For areas where high-cost capital investment is required, we aim to de-risk innovation by providing affordable access to the facilities and equipment, as well as the expertise required. The Catapult programme was specifically established to aid our mission to help bridge the gap between research and commercialisation, combining sector and business expertise with an agile and flexible approach that has led to world-leading capability.

Catapult to success

By providing state-of-the-art access to facilities and expertise, the Catapult network of world-leading centres bridges the gap between businesses, research and government. For example, GE Renewable Energy is working with the Offshore Renewable Energy (ORE) Catapult on a 4-year £9 million research partnership aimed at minimising the time people working on marine-based renewables projects have to spend offshore.

The focus is on 3 areas: reliability by design, mainly validating wind turbine components; enabling full remote operability and troubleshooting of turbines through advanced digital functionality, to reduce the need to go offshore for unplanned events; and use of robotics for planned maintenance, specifically repetitive tasks, inspection activities and activities in difficult-to-access areas. The initiative aims to cut the operating costs of offshore wind, which will in turn benefit electricity consumers.

Each of the Catapults operates in a sector where the UK has a particular strength or the ingredients exist to grow a multi-billion-pound industry straddling Grand Challenge areas. In the 5 years since the programme's launch, the Catapults have leveraged their core funding to develop facilities worth £850 million and to utilise their unique convening power in bringing thought-leaders together with industry and SMEs to drive their sectors forward.

Our support must also go beyond traditional R&D sectors. The services sector makes up 80% of the UK economy and is an increasingly important complement to manufacturing and product innovation. We will explore the innovation barriers and opportunities relevant to the services sector, to understand how we can nurture innovation in this sector.

Working across government to support high-potential industries

We work across government to help key industries to grow or transform through innovation, in line with government priorities and national strengths. This includes our work with central Government departments to deliver grants for major programmes supporting the aerospace, automotive, life sciences and agri-tech sectors.

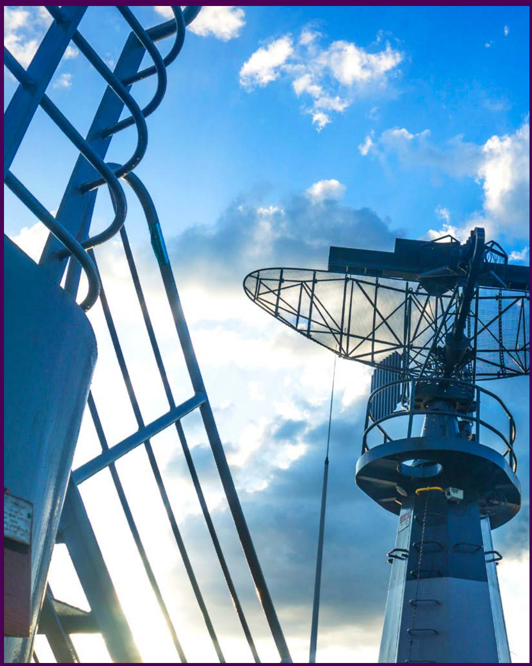
For all sectors, regulation can play an important role in stimulating and enabling innovation. We are working with the BEIS Better Regulation Executive and partners across government to help build a regulatory environment which enables innovation in the economy. We also work closely with regulators to ensure the UK regulatory system enables early introduction of technological innovation, including through our work with the British Standards Institute, and the Catapults play an important role driving innovation in regulation for their sectors. This makes us well-placed to assist in delivering a more supportive regulatory environment.

Working with regulators

We are co-delivering the RPF with the BEIS Better Regulation Executive. The fund has awarded £10 million to 15 regulator-led projects that will develop innovation-enabling approaches to emerging technologies.

For example, the Maritime & Coastguard Agency is working with the UK's world-leading Maritime Autonomous Surface Ship (MASS) and smart shipping industries to develop regulation for the testing of autonomous vessels in UK waters; the global market for autonomous vessels is predicted to reach US$136 billion by 2030.

This project will reduce uncertainty in regulation, provide regulatory guidance and set the international pace in this arena, with the ambition of leading the International Maritime Organization (IMO) in the field of autonomy and putting the UK at the forefront of maritime autonomy.



Long-term ambitions

- build on the success of the Catapults, recognised by a commitment to provide a further £1.29 billion of funding through to 2022-23 to continue their mission. The Catapults are committed to leveraging £1.8 billion in external income, more than doubling our investment in innovation in the key sectors they cover. We will strengthen the links within the Catapult network and between Catapults and the wider innovation system
- explore future opportunities for new IKCs dedicated to exploring the potential in emerging technologies, working across UKRI to build stronger links between research and business in key areas
- build innovation communities in high-potential areas including digital manufacturing, cell and gene therapy, and artificial intelligence, create technology roadmaps for future industries, identify and answer unresolved research questions, create a supply of graduates, postgraduates and entrepreneurs with relevant skills, and channel investment into areas critical to future success.

Near-term actions

- use internal expertise to conduct horizon scanning to assess future opportunities, including through analysis of trends in applications to Innovate UK programmes and wider market insight analysis
- help academia and business work together on commercialising emerging technologies through the Innovation and Knowledge Centres
- continue to work with the KTN to identify and build Special Interest Groups in priority industries and technology areas
- support the UK National Quantum Technologies Programme to accelerate translation of quantum technologies into the marketplace
- continue to deliver our innovation programmes with government partners, including ATI, APC, CCAV and Agri-Tech Centres, to assist business research and development aligned with Industrial Strategy priorities
- work with BEIS to deliver the Regulators Pioneer Fund (RPF). This is designed to enable regulators to work with innovators to enable greater experimentation, testing and trialling of innovations.

3.5 Build a coherent, supportive environment incentivising R&D investment and enabling people and businesses to innovate

Innovate UK will provide a strong voice for entrepreneurs, SMEs, and scaling businesses, and will advocate the value of innovation to the UK economy. We will assume a strong role in building the foundations for excellent innovation in the UK, fostering an environment that enables and incentivises R&D investment. We will explore how we can develop a broad systems approach allowing innovators to realise their ambitions by developing the people and skills they need, building on local excellence and succeeding on a global stage.

Context

To achieve our vision, we will need to build beyond the companies and industries we support. Successful innovation is built on the strong foundations of an innovation environment that gives innovators every chance to succeed. The UKRI Strategic Prospectus sets out the importance of getting the foundations right for excellent research and innovation.

Talent and skills

The investment needed to deliver the Industrial Strategy and the target of 2.4% of GDP invested in R&D will have to fund more than capital infrastructure and kit. We also need to develop the human capital that will deliver high-quality innovation in businesses throughout the country.

The availability of talent, skills and capability within the workforce accounts for around for one-fifth of productivity growth.[3] But most businesses cite 'skills gaps' or 'skills deficits' as one of the main barriers to innovation. A report for the UK Commission for Employment and Skills found the nature of work and the workforce is changing. It is possible that many of the jobs that will be needed in the future do not yet exist and businesses are recognising that repeated re-skilling of staff could become the norm.

There is strong evidence that vocational skills, deployed in conjunction with high-level skills, can drive innovation, and that the balance between the need for postgraduate, graduate and technically qualified people in the workforce is shifting.[4] In many sectors, a lack of management capability and business skills, including innovation management, is also limiting growth.

Through engagement with businesses, we have long understood the importance of skills to innovation and now is the time to take a more active role in highlighting the importance of skills for business innovation and success. To deliver the Industrial Strategy, we cannot afford to ignore the future skills implications for UK businesses. The consideration of talent and skills needs embedding in everything we do.

Equality, diversity and inclusion (EDI)

Diversity within businesses is proven to contribute to enhanced performance and commercial success.[5] A great idea for innovation can come from anyone and we have worked with under-represented groups through our Young Innovators programme, working with The Prince's Trust, and the Women in Innovation campaign, to make our programmes more inclusive and more visible to new audiences. We will continue to look for opportunities to make our work more effective, aiming to boost the UK economy by encouraging more diversity in business innovation, and providing support for those groups currently underrepresented. This will include:

- building understanding of challenges and opportunities, to drive positive change
- building on the research that helped design the Women in Innovation programme, it is clear we need to create role models and raise awareness of support for new and diverse audiences
- finding future leaders with exciting ideas and backing them to realise their potential
- working with partners such as the Princes Trust, Founders4Schools, and the UK Business Angels Association to deliver support and learn from good practice.

Women in Innovation

We launched our Women in Innovation campaign in 2016, in response to the discovery that just 1 in 7 lead applicants for our funding were women. Fifteen female business leaders received financial support and mentoring, and 7 women in tech went on an entrepreneurial mission to Boston, Massachusetts.

Overall, the campaign achieved a 70% increase in women registering for Innovate UK funding and, building on this momentum, a second competition looked for innovators tackling society's biggest challenges. 2019 winner Sheana Yu is the creator of Aergo, a dynamic seating system for wheelchair users. This detects movement by measuring pressure differences, inflating and deflating air cells to reposition the user. Aergo promotes healthy posture, allowing the user to adjust their position without needing physiotherapist assistance. "I like that my work is about empowering people to live to their fullest potential through innovation," Sheana says.

[3] Department for Innovation, Business and Skills. 'UK skills and productivity in an international context – BIS research paper 262' https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/486500/BIS-15-704-UK-skills-and-productivity-in-an-international_context.pdf 17 December 2015

[4] Skills for innovation and research, Executive summary, OECD, 2011 https://www.oecd.org/innovation/inno/47164461.pdf

Championing innovation across the UK

We have a key part to play in championing the importance and value of innovation across the UK business community. We will conduct outreach and engagement to boost the appetite for innovation across the business community. We will identify and mitigate barriers to innovation arising through market failure and catalyse innovation investment, working across government and regulators and with other influencers and investors. We will also learn from UK and international best practice in implementing our strategy.

Over the last 2 years, we have established a regional presence to give us more insight and awareness of those research and innovation clusters of greatest national importance, and to increase our engagement with local innovation leaders right across the country. This helps us develop an integrated, consistent offer for businesses, working closely with local partners. The team supports our co-delivery of the UKRI Strength in Places Fund (SIPF) with Research England, which helps accelerate clusters demonstrating the greatest economic benefit to their area by aligning research and innovation opportunities to local industry's capabilities. It also helps align strategies and resources from public investment in innovation, such as the innovation aspects of City Deals or devolution policy.

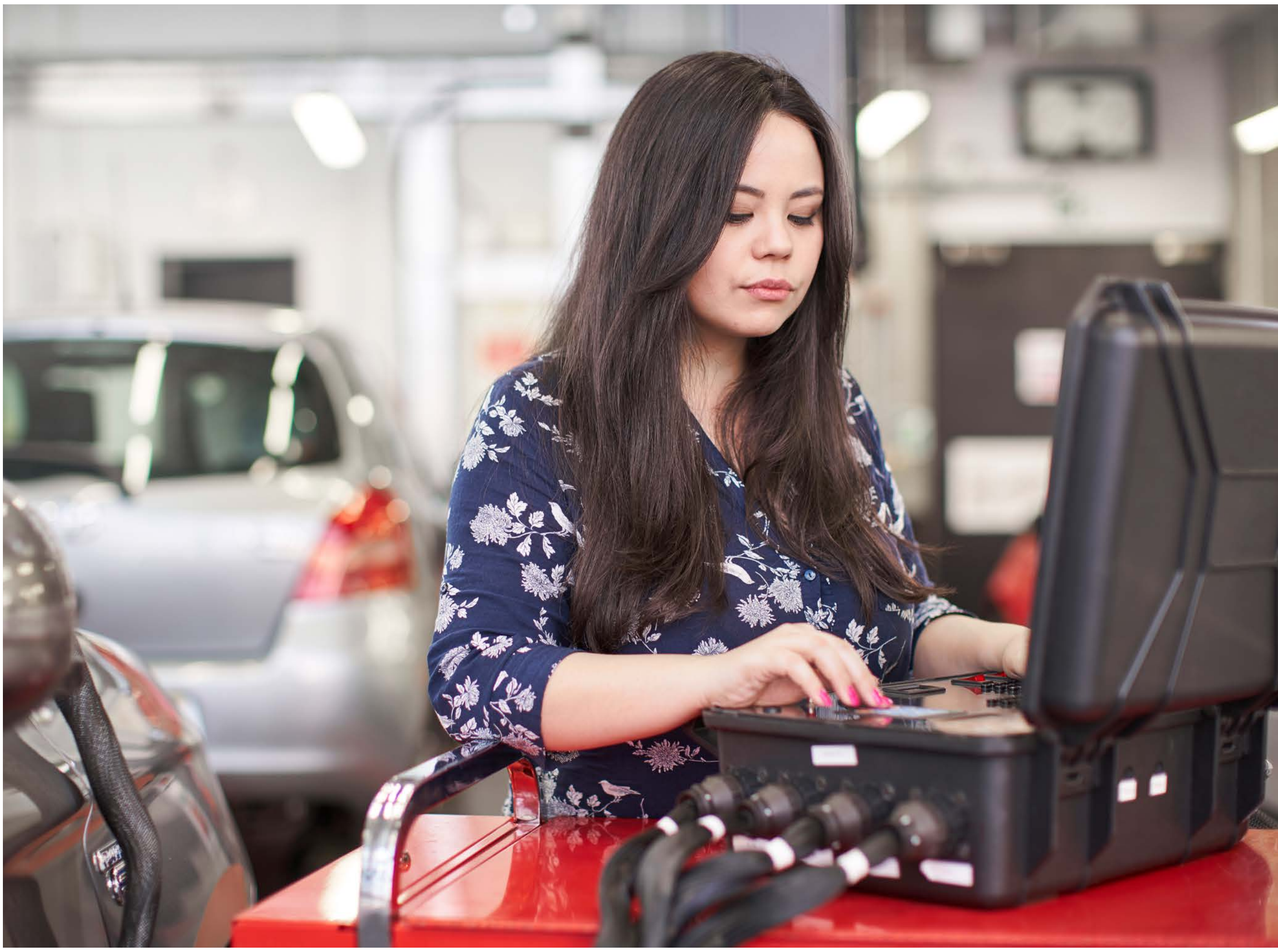
This is a two-way strategic dialogue that ensures regional stakeholders are aware of and consider national programmes and priorities, and ensures we are aware of and consider regional capabilities and investments.

Long-term ambitions

- be a leading voice for business-led innovation in the UK, forging strong links between national, devolved and local innovation and business support programmes.
- implement an innovation talent and skills strategy to enhance the impact of our wider investment in innovation, by helping businesses to understand, access and develop the skills they need to grow through innovation
- foster diversity and inclusion across all our activities, leading to stronger innovation and economic growth.

Near-term actions

- adopt an advocacy role for business innovation, and determine how the UK's innovation support system compares to competitor nations
- map the talent and skills landscape for innovative businesses and, where skills gaps exist, work with the appropriate partners to develop solutions
- work across UKRI and with external stakeholders, including the Office for Life Sciences, to develop and test new approaches to increasing the availability of apprenticeships and their uptake by SMEs, to increase the availability of skilled technicians
- expand the Women in Innovation and Young Innovators campaigns to inspire more innovators from these under-represented groups, and promote participation in innovation by people with disabilities and from all ethnic communities and backgrounds
- deliver a programme of communications and outreach to highlight the potential of innovation and increase levels of engagement with our support, including working with our regional partners to strengthen opportunities throughout the UK.



[5] Mckinsey. Lareina Yee, Sara Prince and Sundiatu Dixon-Fyle 'Delivering through Diversity', https://www.mckinsey.com/business-functions/organization/our-insights/delivering-through-diversity January 2019

4. Delivering and being accountable as an outstanding organisation

UKRI's values guide the way we work and deliver innovation funding and support across the UK:

Collaboration

Build and lead strong partnerships across the full range of organisations and sources of support that can finance, connect, and accelerate UK innovation

Promote innovation across government and the public sector, and enable the best ideas to improve delivery of public services

Innovation

Work with agility and flexibility, adapting and responding quickly to meet the needs of the innovation community

Be ambitious and creative, exploring emerging ideas with strong potential to accelerate business innovation

Search for and back the ideas that have greatest potential to deliver positive economic and societal impact

Integrity

Act professionally and responsibly, with policies and processes that are robust, transparent and fair

Be committed to EDI and provide support across all parts of the UK and all sections of society

Excellence

Be committed in our support for UK business innovation, encouraging commercialisation of ideas through our dedication and thought-leadership

Build on what works, using evidence and rigorous assessment to make decisions and undertake robust monitoring and evaluation to assess our impact

Efficient and effective operations

To enable world-class innovation, we ourselves have to be efficient and effective. Like any organisation, there are both challenges and opportunities for us in terms of leveraging the people, processes and technologies available to us. We are always seeking to do better.

Our Business Change Team supports us to automate processes and augment our capability with tools like machine learning algorithms to add insight and intelligence to processes and decision-making, and to identify the areas where we cannot and should not automate or augment what we do. We will work with all parts of UKRI to ensure our processes are aligned in the most effective and efficient way. The outcome will be streamlined internal processes that lead to faster, better decision-making to the benefit of the businesses we support.

In 2019-20 we will:

- examine how we can simplify our offer, making it more accessible, minimising the burden and making faster decisions
- transform our digital services to:
  - streamline payments and the way we manage our financial systems by implementation and adoption of our new finance and human resources system
  - provide an end-to-end customer journey for applying for and managing projects
  - make use of innovative solutions to improve how we do things and standardise ways of working, such as machine learning for assessor allocation and financial forecasting
  - make operational and financial savings by migrating to a new cloud-based hosting service, with legacy systems replaced
- lead a programme of continuous improvement that, alongside transformative changes, maximises opportunities for refining ways of working, saving the organisation money and helping us become more efficient.

Measuring progress against the UKRI success framework and this plan

Rigorous evaluation of our programmes demonstrates the value for taxpayers' money we create. We have implemented a comprehensive, robust evaluation programme to determine our economic impact on the businesses and sectors our activities support. In 2018 we published our first ever evaluation framework, setting out the principles we follow in designing and implementing evaluations. We will continue to publish evaluation reports to ensure transparency and will improve and publish regular reports to provide timely updates on our performance.

We are also a founding funder of the Enterprise Research Centre and the Innovation Growth Lab, and together with ESRC we established the Innovation Caucus to increase the use of social science tools to improve the way we work.

In 2019-20 we will:

- publish the first evaluations of the Innovation Loans and Investment Accelerator pilots
- publish evaluation reports for the Biomedical Catalyst, Innovation Vouchers and Smart, and a process evaluation of the Catalyst programme
- continue to fund world-class research through the Enterprise Research Centre
- expand and enhance the Innovation Caucus, working with ESRC.

To support delivery of this strategy, we will implement a new series of annual performance reports transparently showing where our funding is going and what it is achieving. We will report annually on progress towards our success measures and enhance our current reporting with more data on outcomes and impact. The evidence we create, fund and shape will actively drive our strategy, enabling us to make better decisions as to how to achieve our mission and drive sustainable economic growth in the UK through business-led innovation.

The Innovation Caucus

Funded with ESRC, this initiative supports innovation-led growth and promotes greater engagement between the social sciences and businesses. Comprised of 66 academics and led by Professor Tim Vorley, the Innovation Caucus provides research insights on innovation and champions the contribution of social science to the broader innovation landscape.

Through briefings, workshops, small-scale research projects and PhD placements, it has mobilised social science knowledge to help shape and support the design, development and evaluation of policies and programmes for sustainable, innovation-led economic growth. Working collaboratively and flexibly, it has engaged in a range of projects, from diversity and inclusion to sustainable development.

5. Financial allocation

Innovate UK		2019-20
Research and Innovation Budgets		**742.6**
ODA		**19.8**
o/w	GCRF	6.8
	Newton Fund	13.0
NPIF		**469.7**
o/w	ISCF	384.3
	Skills	14.0
	Funds For International Collaboration	4.4
	Strategic Priorities Fund	5.7
	Plastics Research & Innovation Funding	7.8
	Other	53.3
Innovation Loans		**23.6**
IUK Programme		**1,255.8**

Innovate UK drives productivity and economic growth by supporting businesses to develop and realise the potential of new ideas.

We connect businesses to the partners, customers and investors that can help them turn ideas into commercially successful products and services and business growth.

We fund business and research collaborations to accelerate innovation and drive business investment into R&D. Our support is available to businesses across all economic sectors, value chains and UK regions.

Innovate UK is part of UK Research and Innovation.

For more information visit innovateuk.ukri.org

–

Telephone: 01793 361000

Email: support@innovateuk.ukri.org

innovateuk.ukri.org

Follow us

18.1139.180

Images used in this document:

Front cover: Sage Tech, team, pictured within the production lab located within Sage Tech's head office. From left to right: Steve Wileman, Sebastian Brown, Leslie Casey, Melanie Priston, Ged Yardy, Mark Rushworth

Inside front cover: BankEnergi, Head Project Partner Rajvant Nijjhar (left) and Co-Founder of Qbots Energy Vijay Natarajan (right) on the roof of the K2 building, South Bank University, London

P10: A cyclist outside the Active Building Classroom at Swansea University

P11: Damien Frost, Carolyn Hicks, Adrien Bizeray and Christoph Birkl from Brill Power working within the Faraday Battery Challenge

P12: John Hingley, Managing Director of Renovagen, mobile solar power innovator

P15: Thang Vo-Ta (CEO & co-founder) and Ewa Radziwon (Product Development Lead) of Callaly

P16: Researchers at the School of Metallurgy and Materials, University of Birmingham, From left to right Laura Driscoll, Phoebe Allen, Rob Summerville, Daniel Reed, Zubera Iqbal

P17: Interface Polymers' Chief Scientific Officer and Founder Dr Christopher Kay in their laboratory at Loughborough University

P18: Thanos Goltsos, KTP Associate – Qioptiq

P19: SBRI recipient Saturn Bioponics' CEO Alex Fisher and Head of Research, Development and Technical Support Arnoud Witteveen

P23: ACT Blade's Managing Director Sabrina Malpede at the Levenmouth wind turbine near Edinburgh, Scotland

P25: Women In Innovation winner Sheana Yu, founder of Aergo

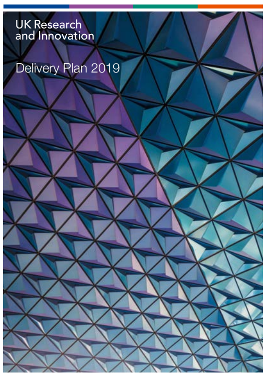
P26: Young Innovator award winners 2018

P27: Women In Innovation winner Cintia Kimura, founder of KG, photographed at City of Westminster College in London

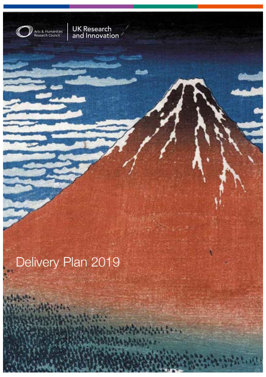
P29: Women In Innovation winner Agnes Czako, founder of AirEx, photographed in their office in Sustainable Workspaces, London

P31: KTP partners Computer Science Professor Udo Kruschuitz, University of Essex, Dr Miguel Martinez, Founder and Head of Research, and David Benigson, Founder and CEO, of Signal Media photographed at their offices in Shoreditch, London

UK Research and Innovation Delivery Plans

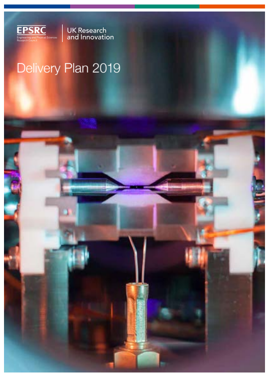


UKRI

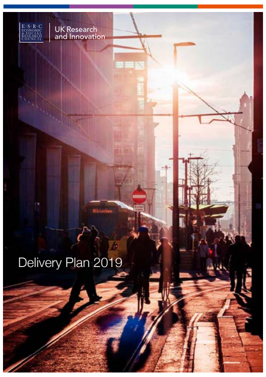


AHRC

BBSRC

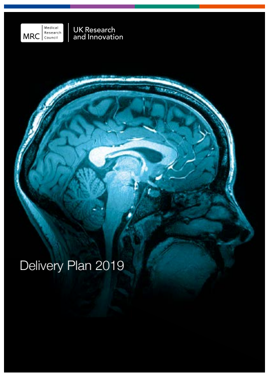


EPSRC

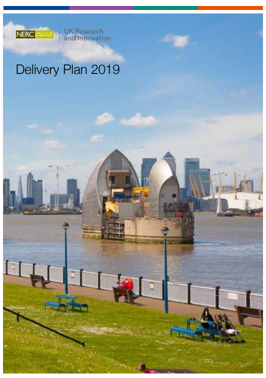


ESRC

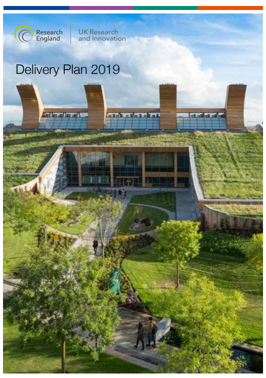
Innovate UK



MRC



NERC



Research England

STFC

Innovate UK | UK Research and Innovation