Speech

Becoming an Innovation Nation: Driving up private investment into research and development

Science Minister Chris Skidmore speaks about the role of private investment in achieving the Industrial Strategy ambition to invest 2.4% of GDP in R&D by 2027.

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It is a great pleasure to be here at this event, to celebrate the successes of the UK Research Partnership Investment Fund, and to reveal the

winners of the latest round of the scheme.

With 6 rounds of investment totalling £900 million, this flagship scheme continues to be a remarkable success story for the UK.

It is delivering some of the world's truly world-class research, from the ground-breaking biomedical research being done at The Sir Michael Uren Biomedical Engineering Research Hub at Imperial College, to the cutting-edge transportation research happening across the UK Rail Research Innovation Network.

Of course, one of the reasons behind the success of UKRPIF is its proven ability to leverage investment from university partners, especially from business.

Since the scheme was launched in 2012, government investment into 43 world-leading projects has 'crowded in' over £1.7 billion in matched investment from business and elsewhere.

And I am delighted to announce that £220 million is being allocated from UKRPIF to 11 new projects in this latest round, which will lever in a further £500 million in private R&D funding.

As a result, over £3 billion is now being invested in strategic R&D collaborations between universities, business and charities. This is truly phenomenal – a shining example of the leverage power of public funding. The work on show today shows us how, when public and private partners work together, cutting-edge, world-leading research and development happens in spades.

So, while today's event is rightly about celebrating these successes, I want to take this opportunity to tie these into a broader vision for how we must join the public and private spheres together, to deliver on our commitment to raising investment in R&D to 2.4% of GDP by 2027.

I have already given 3 speeches, setting out what we need to do to reach our ambitious 2.4% target. I've explained that we must:

- invest in people to ensure that the best and brightest minds are working on the problems
- work collaboratively, not just within the UK but across international borders, to tackle the greatest challenges of our age
- and in my last speech I emphasised a pressing need to ensure our funding and regulatory systems are nurturing new technologies and rewarding those that take risks

Today in this fourth and final speech in the series, I want to set out how we can best bring about the major increases in private investment into R&D that we need to see.

Where we are starting from

Let me first reflect on where we are starting from. The UK is already an incredibly innovative nation.

We have one of the most highly skilled workforces in Europe. We are home to an enormous number of doctoral graduates, second in the EU only to Germany, who are just ahead of us but with a much larger population. Our doctoral education system is a tremendous asset of ours, attracting huge numbers of foreign doctoral students. And the data also shows that our researchers are unusually collaborative compared with EU and G20 nations.

In addition, the UK's economy shows a phenomenal ability to transform itself to respond to emerging demand, and that built-in agility really makes a difference: we have above-average numbers of people working in the fastest-growing sectors.

However, if we are to deliver on our 2.4% commitment, we must be prepared to go much further and much faster. Overall investment in R&D will need to more than double in nominal terms, from current level of £35 billion per year to around £75 billion per year by 2027.

And at least two thirds of this investment will need to come from business. For many industries the need to invest in R&D is a pressing one – vital to competitive advantage. Businesses that thrive on the cutting edge are adept at making the most of basic research. They track down the brightest minds to seek answers to their most pressing problems. And they take the lead on experimental development and innovation, lifting new discoveries out of the lab and into people's lives, driving economic and social prosperity.

That isn't to say that the government won't play its part. In fact, we are doing more than ever.

I have already announced this year a number of vital investments, including £279 million in January for global research partnerships and collaborations, seed funding for 23 ambitious projects through the Strength in Places Fund, and £76 million in June to develop centres of excellence in universities all over England including the world's first centre for agri-robotics in Lincoln.

Most recently, I announced the first real-terms increase to quality-related research funding in a decade, helping universities play their fullest part in our economy and society.

In total, this government has committed to a total package of £7 billion in increased R&D spending up to 2021, with £1.7 billion allocated to Industrial Strategy challenges over two waves. That is an excellent start. But if we are serious about reaching 2.4% then we also need to see

private investment increase.

The good news is that we are seeing some excellent examples of that. For instance, just last week we saw Jaguar Land Rover commit to producing its new range of electric cars in the UK. That is a huge vote of confidence in the UK's economy. It also shows that business is getting behind the challenge of achieving net-zero carbon emissions. Bold government policy has led to bold business decisions.

And many of the projects being announced today demonstrate the significant ability and willingness for business to be bold in response to government incentives. It's a theme that runs through our Industrial Strategy Grand Challenges, and is backed up by findings of the UCL Commission for Mission-Oriented Innovation and Industrial Strategy.

But to get to 2.4% we need to see significantly more than this. To ramp up from today's levels to 2027, it is projected we'll need to see an additional £12 billion each year from business.

This is no small feat, and to achieve it we'll need a radical culture shift. Because we know that businesses face a number of barriers when it comes to investing in R&D. When it comes down to it, the long-term benefits of R&D are often in tension with choices that may bring more immediate returns in the short-term.

And businesses of all ages and sizes can face serious and complex challenges around skills, IP ownership, or access to finance, or overseas recruitment. These are just some of the challenges we must overcome if we want the UK to become an innovation nation.

Seven areas of focus

To help frame this challenge, I would like to suggest 7 key areas of focus for how we achieve the increases in business R&D and to deliver 2.4%.

Sparking new ideas

Firstly, we must create the opportunity for that first spark of creativity to arise. And this means encouraging a vibrant and diverse research system, with support for world-class, blue-skies research in universities and institutes.

We have one of the most incredible research systems in the world. Today's statistical release makes this clear: in terms of scientific excellence we continue to punch way above our weight. We are producing record amounts of research, with 11% more research being published in 2018 than was the case 4 years previously.

In terms of field-weighted citations, the UK's research has beaten every other country in the G7 every year since 2007, delivering over 50% greater citation impact than the world average and 30% higher impact than the EU27. And since 2010, no other comparator nation has had a larger proportion of its research among the most widely cited in the world.

It is right that the government is continuing to invest in this. It is about ensuring we are sparking the amazing ideas that will drive up innovation and productivity. We need to make that case clearly in this year's spending review, explaining the difference we are making by investing in ideas.

But as I said in my first speech in this series – this intellectual capital ultimately comes from people. So we need to invest confidently into postgraduate study, looking at all levels of our education system to getting more people into exciting R&D careers. This also means working tirelessly to put innovation and creativity at the centre of our education and training system.

I'm not just talking about young people going to university. I'm talking about encouraging ideas in all parts of our society, and getting more people into innovative work. I don't just mean those starting out in adulthood or at the early stages of their career in academia or industry, but those already well into the world of work.

Turning new ideas into new businesses

Secondly, we need to continually examine how our creative ideas are turned into new businesses, products and processes. This means developing our culture of startups. Making the UK the best place to start a new, innovative business.

The good news is that UK is a start-up powerhouse. We continue to see major expansion in the number of tech startups in the UK, where we are witnessing double-digit growth year-on-year. And the latest university statistics show well over 4,000 start-ups and spin-outs are being established each year across a wide range of science and technology areas.

If we are to build on this success, we must ensure we are at the top of our game when it comes to technology transfer. In my conversations with my overseas conterparts, I recognise that the UK has tremendous and underrated strengths in this area.

But we must aspire to go further when it comes to turning great ideas into great businesses. So I'm excited to see progress being made on a new Knowledge Exchange Framework, to give greater focus to the knowledge exchange missions of universities. And with an increased

weighting on impact in the next Research Excellence Framework, the UK's commitment to driving research commercialisation has never been greater.

But this isn't just about universities helping academics to push their ideas out. It's also about business pulling ideas in. We need to do all we can to close the gap between ideas and innovation, making it easier for business to know where to go to find partners, for people to move between academia and business, and for public funding to drive in private partners.

That is why schemes like UKRPIF are so important. And initiatives like the UK Innovation and Science Seed Fund. It is also why knowledge transfer partnerships are so important, for developing links between business and academia. And it's why we are continuing to invest £1.2 billion into our Network of Catapult Centres.

We should also recognise that expanding into international markets creates huge business and research opportunities. Yet differences in intellectual property environments create risk and uncertainty. That's why the Intellectual Property Office is working hard to leverage the UK's world-leading IP environment to create an international intellectual property framework that maximises the benefits of innovation and creativity for the UK economy and society.

Creating a scale-up culture

Thirdly, we must ensure that early-stage ventures can access the funding they need to scale up. It is a little-known fact that the UK is the top destination for venture capital in Europe, attracting around a third of total European venture capital investment each year.

This capital funding is paying dividends, including in emerging tech. For example, in artificial intelligence, the UK has seen a six-fold increase in investment between 2014 and 2018, and a more than doubling of the number of patents in the last decade.

The government is fully committed to the scale-up agenda. The Industrial Strategy Challenge Fund is now in full flow, with well over £1 billion supporting active industry engagement, delivering 14 major and pioneer research programmes and over 700 projects.

The third wave of the ISCF will focus on challenges such as:

- Industrial Decarbonisation to develop and deploy low carbon technologies
- Transforming Foundation Industries sector
- Driving the Electric Revolution to support innovation in electric motor technology

Building on this, I am delighted to announce a further £100 million funding for the Innovate UK Smart Grant programme. This funding will allow businesses to take game-changing, disruptive ideas through to commercialisation.

And we are piloting an exciting £75 million system of innovation loans for business through Innovate UK, to support innovations that are close to market in businesses looking to scale up by innovating.

The progress we are making is clear. For instance, here in London we have the fastest growing cluster in the world for tech scaleups. In fact, British Tech is growing over one and a half times faster than the rest of the economy, adding more than £130 billion to our economy every year.

So we should be proud that the British Business Bank is providing over £6.4 billion of finance to over 85,000 small and medium-sized companies, with another £200 million in loans and equity being made available this year for innovative businesses.

This is backed up by serious private investment, from the substantial funding being put into the future of fusion tech – including at Culham Centre for Fusion Energy – to the plethora of seed and scale-up capital funding from private investors such as the IP Group.

But compared with the US, we're quite some way behind. Barely a month goes by without a so-called 'unicorn' – a firm with a billion-dollar valuation – going public in the US with eye-watering levels of investment flooding in.

Of course, we in the UK are pretty good at finding our own unicorns. Just look at Oxford Nanopore, Deliveroo and Monzo. In terms of number of unicorns, we rank behind only the US and China.

But I have heard concerns about our high dependence on a small number of private investors in London and the South East – those with the appetite to take risks on fledgling companies and with the patience to see these through.

It's clear that we need to see significant growth in both the availability and the diversity of private financing into R&D.

That is why we launched British Patient Capital last year, with £2.5 billion public funding expected to unlock a further £7.5 billion of investment in innovative high-growth companies. And we remain committed to our ambitious Patient Capital Programme to unlock £20 billion of equity investment over the next decade.

In addition, we know that pension providers have considerable appetite to invest more in the UK economy. That's why it is so important that the British Business Bank is working with a sizeable group of UK pension

providers to explore how to collectively release the patient capital that finances innovative, early-stage companies.

And the work that London Business School are planning to train up a new generation of venture capitalists is potentially very important. We need to ensure we have enough people with the skills and expertise to make wise investments into our best ideas into flourishing businesses.

Driving up demand as well as supply

Fourthly, we need to look to existing and established businesses as a major source of innovation. This means ensuring that the government is correctly incentivising business investment into R&D – looking at both the supply-side and the demand-side of the question.

And as today's showcase reminds us, universities have a major role to play in this. Universities have been described in the past as 'anchors'.

But the image isn't quite right – it implies they are passive lumps of metal dragging everybody down. Instead, I see universities as 'protagonists', working with businesses to address problems where others cannot or dare not, and stimulating private investment.

Whether they are spinning out a company, licensing their IP, or undertaking contract or collaborative research with business, universities are remarkably skilled at identifying where they can have the greatest impact – locally, regionally, nationally and globally – and just getting on and doing it.

For example, the work being spearheaded at the University of Derby on environmental DNA, working with Surescreen, or the collaboration between Huddersfield University and Reliance Precision to develop cutting-edge 3D printing techniques.

Or Salford University's knowledge transfer partnership with Hilly Clothing, which has led to innovations in product development and increased market share. In these ways, universities are helping businesses of all sizes to drive increased value from their R&D investments and activities.

And the 4 new Prosperity Partnerships announced today really bring home the point that university partnerships drive business investment in R&D, with £12 million government funding leveraging in almost £18 million in business investment.

But we must also look forensically at how the government is supporting the business 'pull' that complements the academic 'push'. For instance, we know that tax credits have been incredibly effective in the past.

The amount of tax relief given via R&D tax reliefs has increased more than five-fold in the past ten years. But we should look at this afresh to

ensure that the system of incentives is working as hard as it should be to drive up business investment into R&D.

To foster a culture of innovation, we must innovate right across government. This means getting the balance right between government grants and other levers such as procurement - the Small Business Research Initiative has made good progress here but as the review by David Connell made clear, we must go further.

As we develop the detailed roadmap to 2.4%, we need to ensure the algorithm between public investment, government procurement and business performance is fine-tuned and optimised.

Supporting innovation across the whole UK

Our fifth area of focus is that we must play to our local and regional strengths. It is clear that the UK has some of the most incredible, dynamic, world-leading R&D clusters in the world, with a global reputation for excellence in research and innovation. This excellence has led to phenomenal successes over many years, acting as a magnet for business investment.

The recently announced £4 billion partnership between University of Oxford and Legal & General, to develop science and innovation districts with thousands of new homes, is a case in point.

As we move forward, though, I don't want us to lose sight of an important point. It is not enough just to scale up R&D investment. We must ensure that the whole of the UK sees the benefit of this activity.

For the vast majority of us, innovation brings tangible improvements to our quality of life, through better products. For many of us it brings the opportunity of exciting, highly skilled work. We need to ensure the long tail of small and medium-sized businesses are embracing the culture change, making the most of new developments, and continually innovating their processes, products and services to drive productivity in all parts of our economy.

But when we look at how R&D investment is spread across regions today, we see major differences.

Analysis by the Royal Society shows that here in London, for instance, we see the benefits of a whopping £5.5 billion of spending – right across basic and applied research and through to experimental development, and with funding coming from a wide range of public and private sources.

That's £629 for every person that lives here. But if we look at the North East, the level of investment per person is way under half that of an equivalent Londoner.

And the mapping work by Tom Forth shows a stark picture: public investment is just not following private investment – and he is right to question this. Because in our quest to build a future for the UK based on innovation, technology and new ideas, we cannot ignore these disparities.

We must make sure that R&D investment, whether it is public or private, makes a positive difference to people's lives all over the country.

And we know from the Science and Innovation Audits that we have scientific excellence and business R&D strength right across the UK.

That is why it is so encouraging to see the UKRPIF scheme invest in a stunning range of projects up and down the country, from the National Automotive Innovation Campus at Warwick, to the Energy Safety Research Institute at Swansea University, to the Drug Discovery Unit at Dundee and the Institute for Experimental Medicine at Queens University Belfast.

And I am delighted to see progress being made to deliver the UKRI Strength in Places Fund. This ties together excellence-based R&D funding to regional strengths, growing all-important collaborations between academia, industry and local partners.

It is also encouraging to see the rollout of Research England's Expanding Excellence in England scheme – providing new funding to small pockets of research excellence right across the UK, allowing them to grow.

Alongside this, we will need to see local leaders, businesses and universities work together to set out an ambitious, long-term vision for driving up R&D investment in their area. This is why we are working with places to develop Local Industrial Strategies.

And we will be backing small, high-growth businesses all over the UK through the British Business Bank Regional Angels scheme. It is about time we recognised that there are strengths all over the UK and do everything we can to nurture and grow these.

Focussing on Grand Challenges

There is an important counterpart, though, and that is the pressing need to give sufficient focus to large-scale research and innovation missions. So it is right that we should maintain our focus on grand challenges that drive innovation and productivity, and seek to drive up business R&D investment around these.

That is the logic behind our grand challenges in the industrial strategy, and the additional investments I have announced today. And, as Mariana

Mazzucato would probably agree, our grand challenges don't have to be in tension with our need to ensure that all of the UK benefits from R&D; indeed, missions can provide a focus for everyone.

And key national challenges, such as achieving net zero emissions by 2050, will be felt everywhere, and this means designing missions that allow everyone to play their part.

One area where concentrated efforts have clearly worked is the compound semiconductor cluster in South Wales. The award-winning Institute for Compound Semiconductors at Cardiff University is allowing researchers and industry to work together to exploit this amazing tech. Together with the Compound Semiconductor Applications Catapult, the science is crowding in significant business investment, with real-world results.

The partnership with IQE Plc will create a large-scale semiconductor materials foundry in Wales, creating 500 new skilled jobs by 2023 as part of a world-first compound semiconductor cluster. It is just one example, and the investments announced today will lead to many more.

Putting R&D at the heart of Global Britain

And lastly, we must ensure that research and innovation is right at the heart of Global Britain. This means ensuring that the UK is a magnet for foreign direct investment. This means looking across all aspects of public policy, across all departments, to make sure the UK is as attractive destination as possible for large, multi-national businesses looking to relocate or scale up their R&D operations.

The top 20 R&D-performing firms spend over 200 billion US dollars on R&D each year. And across all OECD nations, business is spending north of half a trillion pounds on R&D. If we could lever in even a fraction more of this colossal investment to the UK, we'd make a giant leap towards our 2.4% target.

Our policies and funding streams should therefore focus ruthlessly on driving up our global attractiveness to overseas investment. This is how we get business to stick around, to turn great ideas into great jobs and change people's lives for the better. This is of course one of the clear strengths of schemes like UKRPIF, where businesses and universities are forming partnerships for the long term.

And what UKRPIF shows is that public investment can lever in private R&D funding at more ambitious ratios. We should seriously consider how to build on this, learning from what works in other countries, and asking ourselves what more we can do to harness the leverage power of public investment.

But it is also incumbent on us to be better at marketing ourselves overseas. An important part of this is being open to talent. It is something businesses tell me constantly: the UK urgently needs an immigration system that encourages those with the best ideas and the most innovative minds to come and work here.

The evidence is unarguable: skilled immigration drives innovation. We mustn't lose sight of this as we exit the EU. If we are to thrive, we need a genuinely international approach, a 'freedom of talent' approach that allows highly skilled people the flexibility to move and collaborate across borders.

That is the purpose of our international education strategy, providing focus and clarity to our ongoing educational exports – a vital part of UK Plc. And it is the thinking behind our international research and innovation strategy, which sets out what we need to do to ensure we work at a global scale.

The UK is the second most internationally collaborative country in the G7, second only to France and with considerably more collaborations than the OECD average.

In fact, in the last 2 decades, the proportion of UK publications that arose from international collaborations has gone from 26% to 55%. It's clear that we need to maintain an ambitious, international focus to everything we do if we are to thrive over the coming decades.

Rising to the challenge

So to conclude, delivering on 2.4% requires focussing on all parts of the innovation lifecycle, and looking at our policies and investments through multiple lenses. And we must keep a ruthless focus on evidence, to inform the choices we make as a nation.

This means we need to access the latest thinking on what works, and ensure we have the best and latest metrics so we know when we have succeeded. And it means listening to what businesses and academics are telling us, and acting accordingly.

That is why I want to explore how we can best bring together the experts from business to look with forensic precision at the evidence, to find the gaps in our analysis, and to inform future policy.

It is essential that we keep a long-term sustained focus on this question, keeping up momentum after we leave the EU, and not losing sight of the opportunities to go even further as we move to 2.4% and 3%.

We cannot duck this challenge. Other nations are adopting aggressive approaches to R&D investment, driving significant increases in both

public and private R&D performance. I'm not just talking about Israel and China - 2 obvious outliers. I'm also looking at Germany, who are ramping up public spending on R&D, committing to 3% annual increases every year for the next decade.

Let me be very clear, this isn't just something that affects R&D-intensive businesses in hi-tech sectors. We are on the cusp of a major industrial revolution, and the developments in emerging technologies such as artificial intelligence and robotics have effects that are potentially so far-reaching that in the future we won't be talking about a narrow, 'vertical' hi-tech sector.

The technological revolution will stretch horizontally across our economy – every company will become a tech company of sorts. The companies which take R&D most seriously will be the ones that survive and prosper – it's that simple.

So it is clear that we have to work harder – not just to keep pace with our competitors, but to make the most of the huge opportunity that lies ahead of us. That is why I want to see the UK commit to a long-term strategy for R&D investment, informed by the latest evidence and advice, and underpinned by cross-government action on business R&D incentives.

The announcements I have made today represent around £850 million additional public and private investment into research, development and innovation.

But we should be in no doubt that we have a major challenge ahead of us. Alongside moving to a net zero economy by 2050, and setting ourselves up to succeed after Brexit, the 2.4% commitment represents the greatest policy challenge of our generation.

Today I have outlined our ambitions – to turn the creative spark of a new idea into a roaring flame that drives economic growth in all parts of the UK and turns us into an innovation nation that is respected all over the world.

To respond confidently to the unfolding industrial revolution ahead of us, and put businesses all over the UK at the forefront of this.

To bring the public and private spheres together in the amazing new ways, to walk the road to 2.4% and become the innovation nation that our future will rely upon. Thank you.

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