Speech: Reaching 2.4%: supporting emerging technologies

Thank you for the opportunity to speak to you today.

While I realise this is meant to be a speech on the importance of quantum, I hope that you will indulge me today and allow me to set out a wider vision for how I believe quantum fits into the government's approach to emerging technologies as part of its Industrial Strategy.

On Monday, building on significant investments in this area, the Prime Minister committed to £150 million for quantum.

This means total UK investment through the National Quantum Technologies Programme is set to pass a major £1 billion investment milestone.

Our Quantum Programme is admired by many around the world. And our Quantum Hubs led by the Universities of York, Glasgow, Oxford and Birmingham are showcasing this innovation excellence.

The Quantum Sensing Hub led by Birmingham, for example, is leading work on new types of magnetic sensors using quantum properties. These could dramatically enhance our ability to diagnose brain and heart conditions, such as dementia and heart disease.

And our future plans for quantum are truly exciting. The National Quantum Computing Centre will speed up development in this area and allow businesses to explore the applications of these new technologies.

We'll be encouraging business involvement early on.

Ensuring industry understands how they will be affected by these new technologies. And helping firms shape these new technologies so that when they hit the market they will meet business's needs.

Thanks to our work thus far, these technologies are on the brink of commercialisation. And we are now seeing the industry emerge, with investment piling in.

River lane, for example, a pioneering quantum software developer, has today announced that it has raised over three million pounds in seed funding. They are on a mission to use quantum computers as a platform for innovation. Creating digital twins of materials or protein-drug interactions. Allowing new materials and pharmaceuticals to be designed instead of discovered.

The UK's leading position in quantum proves the success of the approach we have taken. And it is one we are mirroring across many areas.

Because we are committed to investing in the future, something of which we know quantum, and other emerging technologies will be an integral part.

So as well as backing quantum, we are keen to back other technologies for the future. Including technologies that may not yet have commercial potential, but that we support because we know that, not to do so, may be detrimental for the UK's future economy.

We are protecting the UK's world-beating fusion capability, for example. Announcing £86 million in 2017 to develop a globally unique set of fusion research facilities. And last year we announced £20 million to begin development of the next generation of UK fusion reactor, STEP, while working to safeguard our international collaborations.

This puts us in a prime position to develop this safe, clean and virtually inexhaustible energy for the future.

We have invested heavily in robotics too. Today, the University of Lincoln's agri-robotics centre has been announced as one of thirteen government backed projects to benefit from a share of £76 million from Research England's Expanding Excellence in England Fund, a key part of the Industrial Strategy.

This will be the world's first centre for agri-robotics. Since the government announced robotics as one of the 8 Great Technologies in 2014, an astounding £366 million of government funding has catalysed new venture capital funds and over £1 billion of industry investment, including from household names like Ocado and Dyson.

And as we invest, we need to be mindful of how the benefits of new technology can be shared between businesses of all sizes. High Performance Computing for example could transform new and existing industries and business of every size.

We want to ensure future investments in High Performance Computing deliver benefits across research and innovation, including tech start-ups and SMEs. So I am pleased to announce that both BEIS and UKRI, working with TechUK, will engage closely with industry over the coming months to help smaller, innovative businesses understand the benefits of this new technology.

And while I've just mentioned a few of the emerging technologies we are backing through our Industrial Strategy, there are so, so many more. From Agri-tech to bioinformatics. From autonomous vehicles to energy storage. From immersive tech to precision medicine. These technologies are the future and developing them will create the industries of the future.

As a Government, we have committed to investing directly in the development of new technologies. Supporting new industries and supply chains and facilitating disruption and diffusion in established sectors.

Not all new technologies of course. But those with very wide applications. Where the development costs are great but so is the potential impact. Where investments are long term. The benefits dispersed. Where the market, quite frankly, won't provide. And where, as I have said, we may suffer in the future if we do not invest today.

Such open-ended investments can take you in exciting and unexpected

directions. When we started funding space technologies, for example, we couldn’t have known some would ultimately be used to diagnose cancer. But that is the case.

This is not to say that we can guarantee success. Investing in new technologies is inherently risky. If it weren’t we could comfortably leave it to the market.

But so long as the UK has R&D excellence on which we can build. So long as there is an international business case and we base our decisions firmly in expert advice, we should seek to continue to invest in emerging technologies. This is a fair risk to ask the taxpayer to bear given the enormous economic opportunities on offer.

And these can be great. Of the new technologies we are backing, for instance, robotics could be worth nearly half a billion dollars by 2025.

And it is thought that, ultimately, the quantum technology market as a whole could be comparable to the consumer electronics manufacturing market today – a global market worth £240 billion.

Nevertheless, we need to spell out a clear strategy for our future investment.

This is crucial for the government’s commitment to spending 2.4% of GDP, both public and private, on R&D by 2027 – the OECD average. For we need to not only raise our investment, but decide the direction of this investment and what we are aiming for.

If we do not do so, we potentially lose the opportunity to retain our world leading status in areas like Fusion. And we potentially miss the opportunity to become the future leaders in technologies like quantum.

This is the third of 4 speeches I am making on our 2.4% target. I’ve already spoken on investing in people and forging new international research partnerships. I further intend to speak on public vs private investment and scaling up research.

But today my focus is on the importance of emerging technologies to our vision for reaching the 2.4% target. The importance, not just of how we invest in emerging technologies such as quantum, but of how to support them as well.

The role of government must be more than acting as seed funding, or simply functioning as a state bank investing where others dare not to.

We need to be clear that it is government’s role also to create the conditions by which new emerging technologies can flourish.

David Willetts once said that it isn’t the job of government to pick winners, but we can pick the race.

I would go further- we now have the chance to design the race course, and the

track itself.

New technologies provide us with that once in a generation opportunity, to shape not just the future, but the policy landscape in which they will flourish.

Much is made about the application of technology, defining how we can take scientific research and apply it to the problems and challenges of the modern world in order to successfully commercialise research.

The application of government should also not be forgotten.

For 2.4% to succeed, we will need to ensure that emerging technologies can grow from their scientific potential, into realisable and scalable commercial opportunities. Only by taking products to market will the benefit of the investment in research and development be proven, incentivising business to make a sustainable commitment for the longer term to R&D.

But to return to designing the track: how can we remove or reduce the barriers to emerging technologies developing successfully?

Aside from investment, I heard a concern reiterated at a Tech Nation roundtable on Monday. A concern that I know is shared amongst many of you: regulation.

For if we do not get regulation right, we will make it impossible for emerging technologies to establish themselves, even hindering their development for the future.

New technologies always create new regulatory issues. And we need to get the environment right.

Last year, for example, the Microsoft Company President called on the US Congress to take on the task of regulating the use of facial recognition systems.

And here in the UK the Law Commission has kick-started a review to identify legal obstacles to the widespread introduction of self-driving vehicles.

We understand that we need to create the right regulation to enable new technology to thrive.

That’s why I’m delighted that on Tuesday, the Secretary of State announced the publication of the government’s white paper on Regulation for the Fourth Industrial Revolution. Setting out plans to transform the UK’s regulatory system, to support innovation while protecting citizens and the environment.

This builds our wider work to ensure regulators keep pace with, and support the introduction of, technology. With initiatives like the Regulatory Horizons Council and the Regulators’ Pioneer Fund.

And once the right regulatory conditions are in place, we must ensure that new technologies can be tested and evaluated effectively.

We all know that this means better, faster, data.

Data lies at the heart of ensuring that new technologies are able to prove themselves.

The government has identified AI and Data as 1 of 4 Industrial Strategy Grand Challenges – seeking to maximise the potential of data and artificial intelligence to enhance our lives in powerful and positive ways.

We also want the UK to be at the forefront of global efforts to harness data and artificial intelligence as a force for good.

We have established a new Centre for Data Ethics and Innovation, which will look at how to improve the way data and AI are used and regulated.

We are setting up Digital Innovation Hubs – the NHS, academia and industry working together to improve access to, and the quality of, NHS data. We have published draft guiding principles for the use of NHS data for research and innovation. And we are working with the NHS, academia, health charities and industry to refine these and allow the full benefits of data sharing to be realised.

Providing effective, meaningful support for emerging technologies, requires understanding the challenges faced by creators, inventors, researchers. So we can design that racecourse that I spoke about, but for the particular race that they are running.

Since becoming Science Minister, I have had the opportunity to visit over 30 universities, and many other research infrastructures, science parks and companies conducting research.

And a topic that has come up again and again is Intellectual Property. For once scientific proof of concept has been established, I find unresolved issues remain. How best to move to a commercial proof, for example? And who should own the IP rights to emerging technologies and their application?

Many universities have established incubators or spin outs, with some really inspiring success stories. I've been impressed, for example, visiting RCA Innovation, the University Enterprise Zone at UWE, Launchpad in Falmouth, the Hive at Nottingham, and many others over the past 6 months.

The government is keen to encourage more enterprises such as these. That is why I launched the University Enterprise Zone competition in March, to help fund up to another 10 zones across the country.

However, while there are many examples of great work going on across the country – inspiring innovation through university and SME collaboration – there are no agreed principles around which the rights to innovation have been firmly established. Some universities retain a share of the IP, to varying degrees, and others do not.

I believe that we will need to do more to establish a better, strategic focus, for IP when it comes to helping to harness emerging technologies in

our Industrial Strategy.

I could not be more convinced that IP is central to fostering a vision that puts innovators and creators at the heart of our mission to grow and retain talent.

For a strong and healthy, not to mention clear, IP system is central to a value system that rewards success, hard work with the benefits of ownership.

Just as they disrupt existing ways of thinking and present industries, emerging technologies are also challenging how we ensure effective IP protections for the future.

I'm delighted that next week, the World Intellectual Property Office have chosen London to host a key conference on AI and IP, looking at just these challenges.

And I am looking forward to meeting Dr Francis Gurry – the President of WIPO – to discuss how we can ensure IP protections are prepared for the fourth industrial revolution.

And today, we must consider how our Industrial Strategy will help us lead the fourth industrial revolution, as we did the first.

Last month I attended the launch of the landmark report of the UCL Commission for Mission-Orientated Innovation and Industrial Strategy, chaired by Mariana Mazzucato and David Willetts.

It sets out eloquently the fact that industrial strategies have traditionally involved horizontal policies to improve the conditions across the economy, such as skills and infrastructure. As well as vertical policies targeted at specific sectors such as automotive or aerospace.

But, it argues, mission-based approaches to innovation have the opportunity to redefine that vertical approach, realigning it to focus on problems that affect many different sectors.

And helping to ensure that a range of emerging technologies can be deployed to achieve a specific goal. Meeting a defined challenge for the future.

It is in pursuit of these ends that we have placed 4 Grand Challenges at the very heart of our Industrial Strategy.

These reflect the major forces shaping the world today, to which the UK – with its academic and industrial strengths – is in a prime position to respond.

Alongside AI and Data, which I mentioned earlier, they are:

- harnessing innovation for an ageing society
- setting the UK at the forefront of the future of mobility
- maximising the opportunities from clean growth

We want the UK to be at the fore of meeting these challenges so that, as the world moves towards a low-carbon economy, and as societies age, we have the technologies it needs to adapt. Opening up enormous global markets.

We need our finest minds on the job if we are to solve these challenges. This includes some of the youngest.

So I am pleased to announce the Government will be investing almost £1 million in the expansion of the Longitude Explorer Prize, working with NESTA Challenges. Targeted at 11 to 16 year-olds, this will encourage young people to use their entrepreneurial skills to address our Industrial Strategy's Grand Challenges.

As we face these defining challenges of the next 10, 20 and 30 years, we will need to harness every ounce of talent, from every person, of every age, in every part of the UK.

And the enormous benefit of the challenge approach at the heart of our Industrial Strategy, is that it encourages partnerships.

Partnerships across industry and academia, and across different sectors, disciplines, and technologies. Which will be critical to meeting the complex Grand Challenges we face.

For complex challenges require complex solutions and the greatest gains often come from enabling new and emerging technologies to converge.

It is quantum combined with AI, and robotics, for instance, that can revolutionise autonomous vehicles. Rather than just one technology alone.

Setting challenges in this way is a tried and tested approach. Proven to drive collaborations, boost markets and provide excellent returns.

Look at the Human Genome Project. Where a challenge by government, backed by public funds, saw engineering, informatics and biology come together to unravel one of the great human mysteries.

With huge returns: for every dollar the US government spent on the Project, they saw a return of over $140 for the US economy.

It's no wonder this is an approach we want to replicate today. And we are already seeing the results play out – with technologies applied to novel problems and collaborations flourishing.

Take, for example, initiatives like the quantum Gravity Pioneer Project. A consortium of industry and academic partners, backed by £6 million of government funding.

Developing a prototype cold-atom sensor with the potential to be used in infrastructure projects such as roadworks and rail, significantly improving the ability to detect hazards under the ground.

We are seeing this challenge-led approach succeeding across different

technology areas.

But we want to go further and faster.

That's why we have set 'Missions' within each of our Grand Challenges: defined goals to be met in a set time.

Driving faster solutions.

So, for example, by 2030 our AI and Data mission will have transformed the prevention, early diagnosis and treatment of chronic diseases. Generating a whole new industry of diagnostic tech companies.

Again, this is a tried and tested approach to accelerating innovation, collaboration and private investment. Driving new markets and new – sometimes surprising – technologies.

When NASA set its mission to put man on the moon few people's first thought would have been that nutrition and textile innovations would abound.

It is these 'moonshots', as Professor Mazzucato, calls them, which we now need to seek to help establish the successes, failures and the unexpected potential of emerging technologies for the future.

As we celebrate the 50th anniversary of the moon landing next month, it is worth reflecting upon that vision that Kennedy set, back in the Rice Stadium in September 1962. A grand vision, yet with a mission so specific, even his words shine with its precision:

> If I were to say, my fellow citizens, that we shall send to the moon, 240,000 miles away from the control station in Houston, a giant rocket more than 300 feet tall, the length of this football field, made of new metal alloys, some of which have not yet been invented, capable of standing heat and stresses several times more than have ever been experienced, fitted together with a precision better than the finest watch, carrying all the equipment needed for propulsion, guidance, control, communications, food and survival, on an untried mission, to an unknown celestial body, and then return it safely to earth… and do all this, and do it right, and do it first before this decade is out–then we must be bold.

We too must be bold if we are to meet our own Grand Challenges for the 21st century. That is why the Prime Minister has now set our nation the challenge – that I announced yesterday – for the UK to become the first major economy to reach net zero carbon emissions by 2050. This we must achieve to save our own planet.

It's a mission which we simply can't afford to fail. And yet our success, along with the future success of our Grand Challenges, together with meeting our 2.4% target, will depend on us embracing the emerging technologies for the future.

And we will do that through listening to you, the innovators, so that the racecourse is expertly designed – with the regulation, the data and the IP system you need to thrive. We will do it by being brave enough to invest in new technologies, accepting that some may not succeed. And we will do it by setting challenges and missions for industry and academia, driving the collaborations we need to see.

That is how we will support emerging technologies, and ensure our future. Thank you.

Press release: 100 cycle path schemes clocked up in the Bristol area

Highways England has reached a significant milestone of installing 100 cycle schemes to improve the safety of cyclists and walkers around the country's busiest roads.

Press release: 100 cycle path schemes clocked up in the Bristol area

As well as improving and maintaining the country's motorways and major A roads, the company is committed to providing more attractive, safe, accessible and integrated cycling facilities, to encourage more people to cycle. It aims to install 150 cycling schemes by the end of March 2020 and today, to coincide with national Bike Week, it has announced more than £5 million of safety improvements to benefit cyclists and walkers living and working near Bristol.

Funding for the schemes comes from a £175 million pot dedicated for cycling, safety and integration improvements.

Vinita Hill, Highways England Designated Funds Director, said:

> We're committed to significantly improving safety across our road network, and the new and improved cycle and footpaths will make it much easier and safer for cyclists and pedestrians.
>
> Our designated funds programme was developed so that we can invest in projects beyond our traditional road build and maintenance.

> We’re delighted to be partnering with Sustrans and business and local authority partners to realise these cycling projects and this is a glowing example of how this funding can have a positive impact on people and communities.

To date, a total of 101 cycling schemes have been completed, with a further 49 schemes to be delivered this year. A scheme already delivered in the Bristol area has provided safer journeys for cyclists around M5 Junction 16 at Almondsbury, and elsewhere, the designated fund has assisted in delivering schemes around the A540 near Ellesmere Port in Cheshire, the A64 near Musley Bank (near Malton) and Tadcaster Bar and the M11 near London Stansted Airport.

Earlier this year, Highways England announced £17 million of funding to enable Cornwall Council to deliver four major cycle routes alongside the busy A30 and this latest announcement will pave the way for cyclists and walkers living and working around the Avonmouth area of Bristol to benefit from £5.18 million of infrastructure improvements.

The latest initiative, which will see the upgrade of three routes spanning a total of 10.7 kilometres around the M49, is being developed by Sustrans, the sustainable transport charity, in partnership with Mott MacDonald, South Gloucestershire Council, Bristol City Council and local social enterprise SevernNet.

Sustrans and SevernNet are also working with local businesses, the community and Travelwest to promote walking and cycling on both the new and existing routes within the local cycle network around Bristol. They are looking at bike loan schemes, better information, confidence-building activities and travel hubs to help more people out of their cars and onto the National Cycle Network.

The Government allocated £675 million of funds to Highways England over a five-year spending period covering 2015 to 2020 – a series of ring-fenced funds designated to address a range of issues including Environment, Cycling, Safety and Integration, Air Quality and Innovation, and separate to funding for road improvements, repairs and maintenance.

Michael Ellis, Cycling Minister, said:

> Cycling and walking should be a natural choice, which is why in England we are delivering crucial infrastructure and making active travel easier.
>
> I’m delighted that this scheme will deliver improvements to nearly 11km of cycle routes around Bristol, allowing residents to benefit from transport links that are safe, accessible and sustainable.

And James Cleeton, England South Director for Sustrans, said:

> This is an extraordinary walking and cycling project. The funding not only covers design and construction, but business engagement, behaviour change, monitoring and future maintenance, to maximise usage of the new infrastructure.
>
> This investment coming to Avonmouth and Severnside will have a huge impact on the ability for local people to access the jobs in the enterprise area without contributing to congestion or poor air quality.

For more information regarding Highways England Designated Funds go to the website.

General enquiries

Members of the public should contact the Highways England customer contact centre on 0300 123 5000.

Media enquiries

Journalists should contact the Highways England press office on 0844 693 1448 and use the menu to speak to the most appropriate press officer.

Press release: Statement from Harriett Baldwin on Ebola in Uganda

International Development Minister comments on the cases of Ebola in Uganda, near the border with the Democratic Republic of the Congo.

Speech: Speech at the CBI Diversity and Inclusion Conference

Alok Sharma addresses leading employers on the government's initiatives to support disadvantaged groups into work and support greater diversity.