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Regulation and innovation

Promoting growth through regulatory reform

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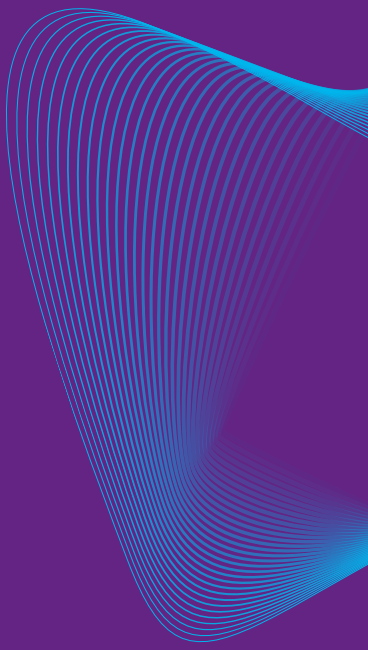

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Foreword

I was appointed to chair the Regulatory Innovation Office (RIO) in March 2025. This account of regulatory issues draws on my experience so far. I have learned a lot from working on particular cases brought to RIO by individual companies and technologists. I have enormous respect for regulators themselves balancing a range of conflicting pressures. I am also grateful to expert representative bodies such as Tech UK, the CBI, the Start-Up Coalition and the Bessemer Society. However it is my personal view: it is not an offical statement of policy. The opening analysis also draws on our work at the Resolution Foundation. I am also grateful for my association with the Policy Institute at King's College London.

1. Getting growth going again

Britain's growth rate has not recovered from the financial crash: indeed, our performance was already weakening from about 2005.[1, 2] Although our performance has been particularly bad, other Western countries also have a growth problem. The poor performance really becomes clear after the 2008 financial crisis. GDP per capita rose by 0.5 per cent per year from Q4 2007 and Q4 2019 in both the UK and the OECD. But we have been performing particularly badly since our departure from the EU. GDP per capita fell by 0.1 per year in the UK between the end of 2019 and 2024, while rising 0.6 per cent per year in the OECD.[3]

Economic growth involves economic change and dynamism – businesses growing or shrinking, people moving jobs into better performing sectors and places. The 1980s were the last decade with strong rates of economic change, which were associated with a high growth rate.[4] There is still intense political argument about whether the benefits of that growth – and the burdens of adjustment – were shared fairly, but the decade's economic dynamism is undeniable. It involved a high-amplitude economic cycle with a recession hitting many traditional manufacturing industries, and then strong growth and 'irrational exuberance' driving a surge in business creation and investment, all accompanied with powerful price signals to get people to move jobs. That rate of economic change has not been matched since, though there was another good decade from about 1995 to 2005. There are many reasons for our lower rates of economic dynamism since then.

One factor is the increase in the number of older people, and their adult children's continued dependence on them, which may reduce labour mobility. Another factor is the increase in the number of working-age adults living in the private rented sector, so that in areas with higher wages the gains are increasingly captured by

landlords through higher rents, weakening incentives to move to higher-productivity areas.[5] Overall, there are now greater obstacles to economic change than there were.

The shock therapy of the 1980s was a reaction to the poor growth and stagflation of the 1970s. The political economist Mancur Olson provided a persuasive account of what was going wrong. A modern liberal democracy has a strong civil society, thick with social ties and local and group identities, which in many ways is a good thing. But these groups can also organise to protect their position and block economic change.[6, 7] Reforms with wide benefits but narrow, well-defined groups of potential losers get harder and harder – it is the political economy of NIMBYism. Olson's argument is back in fashion as one reason for the fall in the growth rate is the sheer difficulty of getting stuff done. Britain has low levels of public and private investment, and one reason is that major investment projects, public or private, encounter many obstacles. (Britain's first water reservoir since 1992 is now at last being constructed in my former constituency of Havant.)

Abundance: How We Build a Better Future by Ezra Klein and Derek Thompson is a vivid, updated account of these arguments.[8] Doing things in government or in business has become a permanent negotiation with well-organised groups. They have become even stronger as they can now exploit legislation giving broad protections, which the courts then interpret without any regard to wider economic benefits. Process also matters more as the courts take on the role of assessing whether every public decision has been taken properly; otherwise they will strike it down. So regulators, businesses and government departments put more and more effort into ensuring and demonstrating they have taken a decision properly, which as a result takes much longer.

Sometimes handing the decision over to an outsider seems the safest thing to do. So ministers (and business leaders), find more and more of their official advice is about process, while the substance disappears over the horizon. Politics ends up in a downward spiral as it becomes harder for governments to do things. That feeds disenchantment and frustration

with politics, which in turn further weakens the capacity of governments to command any authority. And all this causes low growth which in turn makes more of politics a zero-sum game where extra resources can only come at someone else's expense, driving antipathy between groups and making it even more important for groups to organise to fight for their specific interests.

Regulation plays a key role in this story as a major impediment to growth. It can be captured by well-organised incumbents and become a barrier to doing things differently. Just slowing things down is an obstacle to change and rewards incumbency – well-funded beneficiaries of the current system can afford to wait, whereas start-ups with limited resources and impatient investors can't. As in the rest of life there is nothing worse than a slow no.

Innovative companies move away to places where things can be done faster – be it the US or Singapore or Estonia. One study estimates that the cumulative costs of regulations reduced the US growth rate by an average of 0.8 percentage points a year from 1997 to 2012.[9] The Canadian province of British Columbia, which had economic growth below the Canadian average, launched a bold deregulatory initiative and overtook the Canadian average, with growth increased by 1 percentage point.[10, 11] A review by Frontier Economics for the then Business Department distinguished the growth effects of different types of regulation. Environmental regulation came out as potentially beneficial, as it could promote innovation. Product market regulation showed the worst effects on growth because it was a barrier to entry.

Regulation that inhibits innovation appears particularly damaging.[12] One study of innovative British healthtech SMEs found 24 per cent aimed to launch their innovations in the US, rather than the UK, due to its market size and more favourable regulatory environment.[13] Britain's regulatory regime should promote innovation, not be a barrier to it. Market dynamism depends on new entrants doing things differently and the willingness of incumbents in the market to innovate. That drives improvement in productivity and gets growth going. Regulation

that obstructs innovation and supports the status quo holds back productivity and growth.

As well as economics, regulation affects politics as well. The loss of confidence in politics leads politicians to hand decisions over to outsiders – notably regulators. (And consultants, who may do the substance while Whitehall does the process). Sometimes regulators take decisions which in the past would have been matters for ministers. But ministers still end up with responsibility for the outcomes of their decisions – few people believe their denials that the decisions are anything to do with them and still expect them to act. So what began as an attempt to restore trust in politics can just exacerbate the problem. It is a legitimate and important role for parliament and government to shape the regulatory regime and take responsibility for its outcomes.

There are deep questions behind all this about a society's attitude to risk. We need to accept some risk to enable innovation and progress – it is a key role for ministers and parliament to set that risk appetite. But we won't accept dangers we might have accepted before. Indeed reducing these risks and dangers is part of progress, as Charles Dickens conveys in his sharp account of the attitudes of employers in *Hard Times*.

> 'They were ruined, when they were required to send labouring children to school; they were ruined, when inspectors were appointed to look into their works; they were ruined when such inspectors considered it doubtful whether they were quite justified in chopping people up with their machinery; they were utterly undone, when it was hinted that perhaps they need not always make quite so much smoke.'[14]

However, sometimes poorly formulated regulations, supposedly reducing risk, can be part of the problem and can actually making things worse. For example, the EU Clinical Trials Directive (2001) and its UK transposition required strict approvals and documentation to protect patients. By making trial approvals slower and more rigid, researchers often stuck to less flexible, less informative trial designs. Adaptive designs (where unsafe treatments could be stopped earlier, or successful

ones expanded faster) were discouraged because of the heavy regulatory burden. That meant patients sometimes remained longer on unsafe or ineffective drugs than they would have under a nimbler regulatory regime. The subsequent EU Clinical Trials Regulation (2014, implemented from 2022) and reforms by the Medicines and Healthcare products Regulatory Agency (MHRA) in the UK are trying to fix this by streamlining approvals and encouraging adaptive approaches.

So we need to get regulation right – protecting people from unacceptable risks but also promoting innovation and growth and the benefits they bring. There are deep cultural forces at work making over-regulation a real danger. But just blaming such cultural change can become an excuse for inaction. A more useful approach is to see these problems as partly the result of policy failures which can be tackled. We should be able to set regulatory regimes which give people confidence that they will be protected from imprudent risks but that at the same time promote new technologies, innovation and growth where the benefits far outweigh the risks. That is not an insuperable challenge. We should be able to do it. And if we succeed, that could in turn promote economic dynamism and growth, which in turn would help tackle so many other problems.

2. What the Regulatory Innovation Office does

There are several ways of reducing regulatory barriers. One is simply to reduce the numbers of regulations. That can be done by a 'one-in, two-out' rule or some version of it. Regulatory budgets can be set across Whitehall, limiting the economic costs of regulation. The costs of compliance with new regulations can be scrutinised in a regulatory impact assessment. So the government has set a target of reducing administrative costs of compliance for business with regulation by 25 per cent.[15] A useful set of such initiatives was given powerful new impetus in this government's *Regulatory Action Plan*, launched in March 2025 with a Progress Update in October.[16, 17] Alongside the Treasury, the Department for Business and Trade (DBT) leads on this.

The Regulatory Innovation Office (RIO) was set up in October 2024, implementing the pledge in the Labour manifesto:

> 'Regulators are currently ill-equipped to deal with the dramatic development of new technologies, which often cut across traditional industries and sectors. Labour will create a new Regulatory Innovation Office, bringing together existing functions across government. This office will help regulators update regulation, speed up approval timelines, and co-ordinate issues that span existing boundaries.'[18]

Our job is to ensure that wherever possible, regulation promotes new technologies and innovation and is not a barrier to them. We draw on wise advice from the Regulatory Horizons Council and try to turn their magisterial reviews into practical action by regulators. We also draw on direct encounters with and messages from companies, technology entrepreneurs and investors. We are always after practical information

about specific regulatory obstacles are being encountered now. When the RIO was created, four key priority technologies were identified – drones, AI and digital in healthcare, engineering biology, and space. We can add to these, and as progress is made some may also require less attention.

It makes sense for the RIO to be in the Department for Science, Innovation and Technology (DSIT), close to experts on science and technologies, as new technology is key to growth. Sceptics worry about incumbent businesses capturing regulatory policy and industrial strategy. This is a real risk. But new technologies are inherently disruptive and shake up markets. Speeding up the route for new technologies to get to market is one of the most important things we can do to promote economic change and growth. Every month we can shave off the time for getting a start-up product to market is a gain for innovation and disruption. It also brings more rapidly to British citizens the benefit of cleaner technologies, better health interventions, and more actionable data.

The RIO is in DSIT with a focus on science and technology for another reason too. Some of the issues around low growth and lack of innovation are acute in science itself. Has the pace of invention and scientific discovery slowed? Robert Gordon's *The Rise and Fall of American Growth: The US Standard of Living Since the Civil War* is a powerful warning. The extraordinary achievement of delivering Moore's Law (the doubling of the number of transistors on a microchip every two years) for decade after decade has given us a sense that this performance just carries on in the same way. But an important research paper put this into perspective, asking *Are ideas harder to find?* It showed that the amount of research resource needed to deliver Moore's Law has increased 18-fold. There is a similar story with advances in life sciences,[19] which face the opposite of Moore's Law, Eroom's Law – the doubling of the cost of developing a drug every nine years. So even science itself faces a growth challenge, and it is now getting increased attention.

New technologies are also key to delivering public services better with limited resources. One of the most exciting changes in Whitehall policy work over the past few years is the abandonment of the old assumption that technology was already fixed for the timescale covered by the policy formation. I remember my frustrations as science minister trying, for example, to get a review of polices for disabled people to incorporate pursuit of advances in assistive technologies. That was not how Whitehall approached policy for disabled people. Now things are getting better. The Department for Energy Security and Net Zero backs technologies to deliver clean growth. The Treasury sees new technologies as key to lower the cost and improve the quality of public services.

The 10-Year Health Plan for the NHS embraces new technologies, but there are still barriers to getting them into the health service. For years we have had high hopes of using ambient AI, for example, to bypass the paperwork and instead convert a GP's consultation with a patient into a communication from the GP to a hospital consultant. Some models have been approved and are being used. Indeed the RIO is providing funding to the Care Quality Commission to use ambient voice technology in inspections. But other examples of such software are strictly regulated and there is confusion about when and how these can be used.

NHS England sent out a letter in June 2025, which while encouraging ambient voice technologies (AVTs), also warned that even if they were just being used for summation they were regulated by the MHRA as Class 1 medical devices. That is not quite the MHRA's approach. This sort of uncertainty means there is still not a clear path through for many AVTs or other applications of AI, nor clarity about the circumstances in which they become a medical device. A new commission was set up in September last year to advise the MHRA on the regulation of AI in healthcare, chaired by Professor Alastair Denniston, who sits on our Regulatory Horizons Council. It is expected to report within six months and finally bring clarity to this important issue.

Two of the most traumatic events in British politics over the past decade influence our approach to regulation today. Brexit overall has made Britain's growth problem worse. But at least it has given us opportunities to promote new technologies. The EU over-interpreted the dangerously vague precautionary principle so it came to mean the EU could only permit a new technology after it had been proved in advance to be completely safe. That is very hard to do. A better approach is sensible management of risk and uncertainty with close monitoring of outcomes. Brexit enables the UK to move forward faster in key technologies. We now have, for example, legislation permitting precision breeding – the Genetic Technology (Precision Breeding) Act 2023 – which goes beyond what the EU would have allowed, even though it only licenses genetic changes that could have happened through conventional breeding techniques rather than allowing full genetic modification (GM). Britain can appeal to technologists and investors as a place with a better approach to regulation than the EU.

However, GM is also a warning that we should not just assume the barriers to innovation were all in Brussels. The real impediments to GM are domestic attitudes. Regulation ultimately rests on political and public consent, which has to be earned. I saw schoolchildren at a science festival presented with an array of tomato plants and asked to identify the one which had some genetic modification: almost all the kids chose the most mis-shaped and manky plant. In reality of course it was the tomato plant which was flourishing best. In the US you can buy nutritionally enhanced purple tomatoes, which are developed by Norfolk Plant Science and spun out from the John Innes Centre in Norwich but cannot be sold in the UK. The RIO is not reopening the wider GM debate but regulators can learn lessons from that failure to engage with public concerns and to communicate the benefits of a potential innovation.

Covid is the other traumatic event. Sir Patrick Vallance, who was the minister responsible for creating the RIO in DSIT, was crucially involved and keen for us to apply key lessons from that crisis. British scientists, policymakers, and businesses heroically delivered a new

vaccine at extraordinary speed. Sometimes that required a change to regulations – a new provision allowed 'temporary authorisation' of unlicensed medicinal products, such as Covid vaccines, during public health emergencies, bypassing the need for standard marketing authorisation. But many changes to speed the process up were possible without changes to the text of regulations – for example, the MHRA allowed companies to make applications using the same forms they used in the US, which had largely the same details. A lot was achieved by reassessing risks within the set legal and regulatory framework and going for speed. The shift in the attitude to risk was key as there was another big risk – an epidemic – to be included in the assessment. That shows that governments and regulators can put the wider benefits and risks into the implementation of a regulation and move very fast. Lessons from our response to Covid can be applied more widely now.

As the RIO tries to track down the exact regulatory obstacle which needs to be overcome to speed up use of a technology, we do not assume that the problem is legislative. When we start digging into a problem, alongside regulators, it is hard to predict the nature of the obstacles we will uncover.

We may find it is custom and practice interpreting broadly drafted regulations. We found, for example, that regulators were very concerned about noise from drones. There are references to noise in the Civil Aviation Authority (CAA) regulations for aircraft and drones. But there is then a judgement for the regulator to make about how much weight to attach to each noise complaint. It might have been that at some point the regulator was pressed about the noise of drones and perhaps ministers got involved, so it then became sensitive to the issue.

This can lead to unintended consequences, with regulators interpreting some broad duties on noise to the extent that noise complaints can put a drone trial at risk, even when the drones are providing a life-saving service in a major city, where the use of drones replaces loud motorcycles.

Moreover, local authorities are now claiming that because there is an absence of a national position on noise, they can't give commercial-scale drone operations permanent planning permission. They are concerned they are open to challenge if they can't point to a national statement they are following when they approve drones, despite everyone knowing that drones are at worst no more noisy than the legacy technology (vans, mopeds, etc), which never required any such statement. Thus barriers are set for a new technology which never applied to its predecessors.

Sometimes there really is a problem in primary legislation. A major obstacle to the expansion of pavement delivery robots is the 1835 Highways Act, which prevents 'carriages' from being driven on the pavement. The courts have not yet assessed whether this covers delivery robots and there is a risk they could decide it does. Innovative councils such as Milton Keynes nevertheless get on with their pilot projects, but the legal uncertainty can deter investors. It does look as if that primary legislation needs to be amended to create clear provisions for pavement robots, to give business the certainty they need to invest here. After the passage of the Automated Vehicles Act 2024, there is now a call for evidence on such issues. Our excellent team at the RIO are skilled at working with regulators to track down exactly what the barriers really are, and then making the case for legislative reform where necessary.

Previous deregulation initiatives also help us understand better what doesn't work and what does. For example, the current requirement in the 2015 Deregulation Act for regulators to have due regard to growth does not appear to have had much impact on the behaviour of many of them.[20] DBT have now publicly committed to reform the growth duty, and are engaging with business via a questionnaire on how regulation and regulators can support growth and innovation. There is more we can do – as we will see in Chapter Five.

There have been successes from previous initiatives too. Regulatory sandboxes are controlled environments in which firms can test new products, services and business models with real conusmers, without immediately incurring all the normal regulatory consequences associated with such activity. They were launched by the Financial Conduct Authority (FCA) in 2016 and have proved very effective in revealing exactly where regulatory barriers impede innovation. We are working with departments to fund more of them across key technologies. The Digital Securities Sandbox operated by the FCA has a unique power set out in primary legislation to disapply some current legal requirements in order to run pilots: there is a case for similarly liberalising the regime for other regulators.

Sandboxes should not just produce reports for future action. They should involve working through regulations in real time with real companies and changing the interpretation and operation, and where possible, the text of the regulations as they go, during the life of the sandbox. So, for example, we provided the Food Standards Agency (FSA) and Food Standards Scotland (FSS) with £3m to support a sandbox to streamline regulations for the most innovative novel foods while the sandbox is working.

We should not be depriving consumers of the opportunity to enjoy novel foods which may well be greener and have health benefits. But of course they have to be safe. The launch of this sandbox in March 2025 set us on a road to a much more globally competitive approvals process for business: we're on track to halve the time taken for applications for the most innovative novel foods by 2027. (Though just to keep this in perspective and to show the scale of the challenge we face, the regulatory process at the moment takes five years. The target is therefore to reduce this to two and a half years.)

Many regulators tell us they would love to help promote innovative new technologies but they are busy and under-staffed so don't have the capacity. The Food Standards Agency, for example, has been overwhelmed since Brexit with work setting up a UK food standards

regime. We have helped them focus as well on a regime for the most innovative novel foods, derived from cell-cultivation and precision fermentation. We can help regulators such as them with specific funding for new initiatives through open competitions for grants from the Regulators' Pioneer Fund. So, for example, it is funding the British Board of Film Classification develop an AI tool that speeds up accurate age rating classifications.

There is also a striking diversity in funding models for regulators. The FCA is funded by a levy on financial institutions, and in return there is a clear mission for its regulations to keep the City at the forefront of global financial centres. Other regulators depend more on public funding and may also have a less clear focus on promoting UK markets. The MHRA was operating as a trading fund until 2019, when the Office for National Statistics (ONS) reclassified it as a public sector body. As a result, its status as a trading fund was revoked and its budget became part of the Department of Health and Social Care's public spending, which has constrained its freedoms. Sometimes such an ONS decision prompts Whitehall to relinquish control so the entity can once more be classified outside the public finances and regain greater flexibility. Some entities have specific budgets voted on by parliament.

The Regulatory Horizons Council (RHC) was established in 2020 to provide independent expert analysis on new technologies and their regulation. Their more reflective expert work on key technologies is a great asset which the RIO draws on. It is already yielding benefits. A 2021 report from the RHC authoritatively explained that nuclear fusion is fundamentally different from and inherently safer than nuclear fission, and that it should therefore have a very different regulatory regime. The RHC's authority and credibility meant that ministers could act on that advice and our nuclear regulatory regime does not cover fusion. That gives us a major competitive advantage over some other countries which have mistakenly applied regulations for nuclear fission to fusion.

There is however a twist to this story. The Lloyds insurance market is not currently matching RHC advice, and instead does treat fusion as being like nuclear fission for insurance purposes – though we have hopes they will act on the RHC analysis. This sort of mistake shows how we must spread the work we do on sensible regulation out into the wider economy. This particularly matters for companies of a typical size for the UK. Insurance of risk influenced by regulation is an important issue for technology start-ups. By contrast, big American tech companies often self-insure so they are not dependent on what the insurance market will insure and on what terms – one of the under-appreciated advantages of their deep-pockets and incumbency.

We can also draw on a series of very useful short vivid reports on regulatory issues affecting science and technology which fed into the Government's regulatory action plan. The Council for Science and Technology, co-chaired then by Patrick Vallance and Nancy Rothwell wrote to the then PM in September 2018 about 'Reforming the Governance of technological innovation'. They had four recommendations:

1. More technology horizon-scanning.

2. Focus on standards, not just regulations.

3. Try to deliver a one-stop shop.

4. Do more research on how to regulate.

Patrick Vallance as chief scientific adviser also wrote to the chancellor of the exchequer in February 2023. His letter sets out five problems to be tackled: fragmentation, pacing, skills, capacity, and incentives. These were then followed up with the Pro-Innovation Regulation of Technologies Review, leading particularly to some extremely valuable recommendations in reports from Dame Angela Maclean, Patrick Vallance's successor as chief scientific advsier.[21] The key recommendations were:

- Pacing so that regulators keep up with the speed of technologies but do not try to fix regulations too soon.

- Capacity and skills to understand and engage with new technologies.

- Risk aversion and incentives so that regulators can balance risk proportionately.

The incoming government then published a punchy Regulatory Action Plan which reflected these key points.[22] Those crisp accounts of what needs to be done are our guide.

The Regulatory Action Plan describes the RIO's role as:

> 'to position the UK as the best place in the world to commercialise technologies and innovation. Its key functions are to: Work with innovative businesses, regulators and departments to address regulatory barriers that are holding back innovation; and Drive wider change in regulators' behaviour and attitudes towards innovation.'[23]

We try to apply these lessons in two ways. One approach is simply to get stuck in to tackle specific problems and help regulators change or re-interpret specific regulations which cause real problems. Sometimes the critics dismiss this as 'whack a mole' but it is a good thing if we find a specific regulatory problem and can work with the regulators to tackle it. Our report published in October last year, *The Regulatory Innovation Office, One Year On*,[24] shows we are already having real impact working with regulators in our current four priority areas such as:

- **Drones** – the CAA gave its first permanent approval for a drone service operating beyond visual line of sight.

- **AI in health** – promoting use of generative AI to develop actionable radiology reports.

- **Space** – the CAA has committed to explore a mission-wide 'operator licence' with only mission-specific information requested to license new operations, removing significant information burdens.

- **Engineering biology** – accelerating timelines for novel foods to progress through the regulatory process, without watering down our high standards of food safety.

As well as specific problems caused by particular regulations, the RIO also tackles wider issues in the regulatory regime which we will now turn to. First we will investigate the problems facing an innovator as they encounter the wider regulatory regime, looking horizontally across our many regulators. After that we turn to how regulation links with the other stages of the long journey from lab to market, looking vertically at how regulation fits into the process from early-stage setting of standards to later-stage access to government procurement.

3. Tackling regulatory fragmentation and complexity

'Who is our regulator?' or more likely 'Who are our regulators?' is one of the big questions facing technology companies, large or small. This is to some extent an inevitable consequence of applying the sensible doctrine that you don't regulate a new technology as a whole: you regulate its uses. But it does entail several different regulators covering one technology depending on how it is being used. And there are also difficult issues in how regulators categorise a new technology – such as whether software for healthcare should be regulated as a medical device.

Engineering biology is a vivid example of the multiple regulator problem. Synthetic biology applies engineering techniques to biology. Specific sections of DNA designed with an identifiable functional effect are inserted into an organism so as to produce a desired defined outcome. That could mean increased production of a vitamin, or resistance to a disease, or to produce energy. It is a general-purpose technology which clearly needs careful regulation. There is some wariness about it but it can be very beneficial indeed: the mRNA vaccine development is one practical outcome of the technology. This work is now being extended to vaccines other than Covid.

The technology's applications are still being scaled to full production and commercialised. A number of these will probably go into production in the next two years, followed by an increasing spectrum of products being commercialised. So now is the time to get the regulatory regime right. The regulation will depend on the way it is being used. Using it as part of medical treatment is different from using synthetic biology to grow organisms that can convert biomass/sugar into fuel or

food. So it is a good example of the strategy not to have one all-purpose regulator.

But it means several different regulators all have to understand this new technology. It can also leave individual start-ups unclear which regulator to go to given the multi-purpose nature of the technology. They may not know in advance exactly how an organism they have developed in the lab is going to be applied. The Design-Build-Test-Learn process can help them focus on a particular application, but even so, the engineered organism might subsequently have other applications as well. If, for example, it promotes luminescence to track a cell as part of medical diagnosis, that might then also be used to make a pot plant glow at night.

If several regulators are involved, their reporting and information requirements may be very different. That is why one of the strongest messages from researchers and experts such as the House of Lords Science and Technology Committee has been to bring the different regulators together in a group which can pool information and guide start-ups to the right place. So now we have the Engineering Biology Regulator Network with a single website and clear advice on who does what.

The original and most substantial attempt to bring regulators together is the Digital Regulator Co-operation Forum (DRCF). Following a pilot of a multi-agency advice service, the RIO has supported the DRCF with £800,000 to set up a digital regulation library that makes the right rules easy to find, interpret, and navigate for businesses. And we might be able to make this initiative even more effective if we were to link the digital regulation library to the digital standards library of national, European and international standards used in the UK, particularly those standards designated for use with regulation. This is a vivid example of the link between standards and regulations, which is considered in the next section.

Were they able to capitalise on all the benefits of the co-operative approach, such groups could significantly improve the regulatory process. They can set common standards for the data they need and share it. They can remove repetitive processes. We can go further in promoting such groupings and encouraging them to be more user-friendly. They can apply the 'no wrong door' principle so a company gets guided to the best place. That would make these networks part of a concierge service for innovative companies with new technologies. They can go further and develop a single case management system. There might be circumstances where they could move to operator licensing for a technology rather than specific assessment of each use.

As part of these regulatory reforms we can also move from sequential to simultaneous assessment by regulators. So, for example, drones can be used to fly over fields to distribute slug pellets. This requires a two-stage process, with the CAA responsible for permitting the flight itself, and the Health and Safety Executive (HSE) providing clearance to distribute pellets in a new way. Drone companies got through the CAA assessment for the flights. This meant that although they had approval for part of the operation, they still needed to go through an additional, entirely separate process for the other. The delay from that extra step would have meant losing the autumn planting window and cost a start-up that had received CAA approval a year's revenues, all just to check that already-proven substances to limit slug populations work, even though that was already established. That led the RIO to check if this was really needed. We were delighted to get confirmation from the HSE that no further assessment was needed and that the company could go ahead.

There is at least one other regulatory system which runs in parallel. The Ministry of Defence (MoD) conducts safety and regulatory assessments of technologies for military use, overseen by the Defence Safety Authority. There are good reasons for this being a separate system, but greater links between them and civil regulators can help both sides. Sometimes start-ups assume that going for a military application of their

technology will be more difficult, but actually MoD urgent operational requirements can speed things up.

Civil regulators can do more to nudge people to this faster option. Facilities and expertise can also be shared. For example, the UK's largest drone testing facility on the coast in Cornwall began as a Royal Navy site. It is well provided with safe areas and the capacity to test drones in a range of different circumstances. It has been part-privatised and is the first site to be approved by the CAA: it can boost our domestic industry and perhaps nudge some new drone technologies to fast military assessment and use. Defence is specifically identified as a key sector in the industrial strategy. The interface between civil and military regulation makes it harder for defence to draw on some civil technologies and equally hard for some defence technologies to be put to civil use. We at the RIO are keen to promote more alignment of these regulations. Progress to increase the alignment of civilian and military standards has also been slow, and there could be closer cooperation between UK Defence Standardisation (DSTAN), NATO standards and the British Standards Institution (BSI) on this to ensure that military technology is using the latest industry standards wherever possible, to enhance interoperability and supply chain resilience.

As well as domestic regulators, there are also skilled regulators in other countries, and we could do more to recognise them – perhaps as part of trade deals. As well as recognising standards set by major trade partners, we can also look to examples such as Singapore and Estonia. They are models partly because, as small countries, they are not trying to protect domestic producers but instead just ensure their citizens get the best access to innovative but safe technologies from across the world. Singapore got ahead of us on regulating novel foods – though they do not have any farmers and food security is a national priority. Applying regulatory models developed by trusted countries could be another way to speed up our processes. The MHRA, for example, will be shifting to greater willingness to accept regulatory approvals of medical devices from countries such as Australia and Canada. They also plan to consult on the indefinite recognition of CE-marked medical devices.

The US is an obvious possible partner and we could look at mutual recognition as part of future negotiations. But our model of regulation is very different from theirs. Their approach can be more prescriptive – if you can tick all these boxes then you get approval. The British approach is more open – explain to us what you do and why you believe it is safe. American companies sometimes object that it leaves them unsure what the criteria really are. British regulators say it is more flexible and pragmatic than the American approach. But there is greater predictability in the American model, and we should find other ways of providing that. That problem is tackled by some of the most exciting and substantial initiatives now underway to provide better guidance.

There is a corpus of regulatory rules and decisions. Much of it is publicly available. It is a great machine learning project to analyse that and provide advice on regulatory decisions. There are tricky issues, however. Not all regulations are yet in a machine-readable form. Decisions on specific applications are often treated as commercial in confidence, but including them in the dataset to be analysed enables better, more granular advice.

What exactly is the authority of the results from the AI system? Is it guidance or can it be an actual decision, subject to certain conditions being met? Some regulators are already using such systems, and we are promoting more. There has been much debate about the regulation *of* AI but insufficient attention to AI *for* regulation. Regulation is one of the key areas for the government's initiative to use AI for more efficient public services. At the RIO we have recently put £500,000 of funding into initiatives to promote this, such as to streamline clean energy infrastructure approvals through a new AI tool to be developed by Ofgem.

We can do much more to promote the use of AI in this way and tackle tricky issues of exactly what raw data can be used and to what effect. The RIO is funding such initiatives now. Our upcoming hackathon hosted by IBM will identify practical ways forward.

4. Standards, regulators and a better route to market

We are not supposed to think of the journey from lab to market as neat and linear, but actually it can be a useful systematic way of tackling the obstacles innovators face. And we do help researchers and businesses if there are better links between the different parts of the innovation process. It was one of my aims as science minister to make that journey easier. Specific initiatives, such as Catalyst Funds that provide a single grant for the whole journey from lab to market, have shown very high returns, suggesting there are gains from improving this process. Patrick Vallance has rightly made linking up the different stages a priority and is making real progress.

It can be thought of as a relay race in which the baton of an idea is passed from the sweaty hands of one institution to another, often with at least some public funding. We can also think of it as a journey through the 10 technology readiness levels first formulated by NASA.[25] The RIO could help link regulation to prior stages of grant funding and standard-setting and subsequent stages of public procurement, aiming to speed the whole process up and lower its costs. And getting regulatory approval for the application of a new technology should give the public sector greater confidence to procure it – the 2023 Procurement Act makes this easier.

Standards and measurement often precede regulation. Rigorous measurement can be key to innovation and scientific progress. I visited a lab in a northern university working for a domestic appliance company trying to reduce the cloudiness sometimes observed on glasses emerging from a dishwasher. Their first step was to develop a measure of cloudiness – the true Baconian spirit of rigorous scientific enquiry. The

National Physical Laboratory (NPL) was set up to help measure and set standards and is still at it – it led the creation of the atomic clock, without which precision in satnav would be impossible.

The BSI is an independent body outside the public sector which sets standards domestically but also joins the international standard-setting bodies. One of the UK's advantages from being at the cutting edge of science is we can play an influential role in international standard-setting as science advances and new standards emerge. Key to the rise of Vodafone as a successful global company was a brilliant effort, led by the then Department of Trade and Industry, for British then European then global standards to be set around its model.[26] We are fortunate to have in NPL, BSI, UKAS and LGC internationally respected standard and measurement bodies. Getting the standards right and only then turning them into regulations involves close collaboration between standards setters and regulators.

Nowadays countries engage more with standard-setting. Often their aim is to write a standard which is as close as possible to a process or technology which their own national companies are patenting. This helps get national players embedded in global supply chains. The US and China are both very skilled at this. The UK is also influential in global standards but could do more. International standard-setting is not all about national advantage. It also contributes to international collaboration, as precise standards are written for anything from defining a piece of DNA in such a way that instructions for modifying an organism can be sent to the other side of the world, through to ensuring a common standard for access to a satellite so that a space tug can come to refuel it or deorbit it as junk.

Good standard-setting involves a level of linguistic rigour Wittgenstein would appreciate. Trying to attribute a precise meaning to colloquial language is very tricky. What exactly does it mean for digital regulations to state that data must be anonymised or pseudonymised? What is the difference between contained use and deliberate release of an organism – the terms were formulated when it meant a lab or a field but there

are now many types of containment so how big can the container be and what is a container? What is a spaceflight activity – what kind of ground-based activities are covered? Uncertainty about what these terms mean can leave innovators unsure about exactly what they can do. And standards lacking rigour can hold back progress and growth because that often involves interoperability – ignoring the issue is like trying to promote railways without setting a gauge for rail track.

The deeply frustrating saga of the difficulties using NHS data is partly due to the failure to mandate data standards for true interoperability. The recent launch of a new Reference Biofoundry at the NPL is one way government can help drive interoperability in synthetic biology. The biofoundry's toolkit will provide the standards, reference materials and analytical methods needed to translate engineering biology innovation from the lab to commercial success. The RIO can do more, working with standard-setters and regulators such as the BSI, to enable rapid, open-access 'reference standards' in priority technology areas and to promote clear interpretations of these terms to make innovation possible.

If this all goes wrong, technological advance is held back. Then there is the issue of patents. The Americans in particular grant more patents than we do – their economy is five times larger than ours and their patent rate is 10 times higher. But while patents serve to incentivise investment and innovation, multiple patents in some jurisdictions may be a barrier to growth globally. CRISPR technology, for example, is trapped in an IP minefield as there are thousands of patents on the subject in the US. Lawyers for British start-ups using CRISPR have been known to advise that the risks of using it are so great as to be prohibitive. And the cost of licensing from existing patent holders could be a barrier to innovation. It should be possible for the original inventors of CRISPR and other genome editing technologies to formally declare that their invention is openly licensed – this itself is of course a matter of dispute between them.

So when the British government promotes technologies, the various agencies involved need to help companies develop a plan for standard-setting, regulating and patenting. And there should be much better links between them. An RHC report on regulating applications of quantum technologies is an excellent example of how smart regulation can keep a lead in a new technology. I first proposed that Britain should develop a capacity for space launch in 2013 and by 2018 we had the Space Industry Act, setting out a framework for launch which gave us a competitive advantage in the race for a European launch site. But some of the formulations and regulations following that are defective and need revision – a warning that getting too prescriptive too early can be a mistake in a fast-moving technology. We can also fast-track standards-making in order to pilot the best approaches for industry in collaboration with the regulators, and then take that into the international standards system to become a global standard, as other countries do.

These initiatives do not always work out. £125m of public money leveraged a further £175m of private spending on the Future Flight Challenge from 2019 to 2024. It promoted new technologies in aviation, including drones. It was a good initiative and the evaluation was published last year.[27] It has boosted turnover in the sector – up to £772m on one estimate. But it is also a case study in Britain's problems in technology innovation. There are lots of great ideas and projects but two key constraints are cited – regulation and financial barriers, especially for SMEs. And lessons for the future are the need for regulatory clarity and for large-scale demonstrations as part of programmes to promote new technologies.

There was an awareness of the regulatory issues facing drones, but they were not resolved during the five years of the Future Flight Challenge and continue to hold back the UK drone industry. One of the problems was that the testing had to be done in special controlled environments so did not involve drones operating in typical, messy air environments – the challenge is to get relevant data from gradually introducing drones to more diverse environments. FCA-style sandboxes, where some rules

can be suspended in certain circumstances, are much better, provided there is a reasonable safety regime.

Another reason why there is excessive caution is the belief that regulations need to be right first time. This is unrealistic at the cutting edge of new technologies. Instead there needs to be data collection, feedback on performance and subsequent adjustment to regulations. The BSI offers a range of approaches to develop specifications and processes for industry that can enable regulators to explore where and even whether regulation is actually needed. Some of these processes have timeframes of months to deliver a consensus that can be trialled before regulation is fully developed.

Randomised controlled trials (RCT) are the benchmark of assessment in many cases, but even these are open to challenge. Regulations may prove to be stricter than necessary or a technology may reveal an unexpected danger. The Global Centre for Healthcare Convergence at the University of Cambridge is a bold attempt to move beyond classic RCT models of what works to context-specific measures which in turn need to inform standards and more flexible regulations – for example, 'This drug works best with people who are predominantly vegetarian' or 'This works best with Asian women'. It should be easier to amend regulations, either to restrict or liberalise, as evidence on effects comes in – and that involves greater flexibility in parliamentary procedure. In discussions with the RHC chair, he put it very well:

> 'A clear rule of thumb should guide timing: standards and guidance at early technology readiness levels, adaptive tools at mid-levels, and stricter rules when risks are clearer and evidence stronger.'

It is not just a matter of thinking about the right regulatory regime earlier so as to make it easier to get technology out of the lab. There also needs to be more continuing support and follow-up after companies have got regulatory approval. The British Business Bank and the National Wealth Fund both play a role in promoting British companies as they scale up. It should be easier for regulators to share information

with them on the performance of particular companies and technologies. Grant-givers such as Innovate UK should also be part of this.

If a company has got regulatory approval then that should be a powerful signal promoting public procurement. At the moment, the National Institute for Health and Care Excellence (NICE) is the only body which links regulatory approval and a requirement for public procurement – from the NHS. The Covid crisis was the most vivid example of this, with advance procurement helping to fund development. But a more modest form of this should be possible with, for example, regulators communicating to public bodies about initiatives for which they have given approval. Government should be an anchor customer whenever possible. The framework of the industrial strategy could help ensure regulatory outcomes are linked up for key sectors or technologies.

5. Benefits, risks, and growth – who decides?

Imagine a new technology with substantial benefits which are forecast to outweigh the costs. But the costs are concentrated among, for example, companies using the old technology and the places where they are based. The benefits are more widely spread over individuals, businesses and public services. The benefits could be in services far removed from the current users of the old technology and some will be hard to predict. To make things even trickier. there may be some cases where the new technology will fail to deliver, including exposing some users to risk – even though those risks may well be less than those from current technologies. Our current regulatory system finds it very hard to handle such cases. It evaluates new technologies on much stricter criteria than were used for old ones. And it is hard to make an overall assessment of risks and benefits.

To investigate the problem properly we need to define a few key concepts. Risk is roughly predictable ways in which things could go wrong, for which we can estimate a broad probability. Risk needs to be managed. Hazard is risk times dose. It is a risk which comes with substantial damage. A massive dose of a chemical may do serious harm when tested on a mouse, which suggests there could be a risk, but if the dose is much higher than a human is likely to experience in real life it may not in normal circumstances be hazardous. Uncertainty is the truly unknown. These uncertainties can be good or bad.

Now consider a regulator trying to assess a new technology. In theory the new technology should get a fair hearing. The Treasury is, as so often, the custodian of the doctrine which is set out in *The Orange Book: The Management of Risk – Principles and Concepts*. It includes a

requirement to 'assess the costs, benefits and risks of alternative ways to meet objectives' and says that risk judgements should be 'reviewed regularly'.[28] The head of the Government Risk Profession says:

> 'We need to take good risks in pursuit of innovation opportunity. Effective risk management increases the chances of successful innovation.'[29]

The *Better Regulation Framework* of 2023 states that regulators considering new regulations need 'clear evidence that it will yield net positive outcomes for society'. It requires regulatory impact assessments, which should include 'total net present social value of a change' in regulations. So far so good. Legislation in 2015 also required regulators to have due regard to growth. But that did not appear to feature much in their decision-taking. Last year the Chancellor launched an action plan to ensure regulators and regulation support growth with the bold statement:

> 'We want a regulatory system that not only protects consumers and supports competition, but also encourages new investment, innovation, and growth'.[30]

So there is an impressive set of documents and official guidance asking regulators to look at the big picture and include wider benefits and proportionate risks in any assessment of new regulations and new technologies. However, this is not necessarily how the system works in practice. When regulators look at a new technology, they think of the potential risks and may not give so much attention to potential benefits. And in assessing risk they apply the ALARP principle – making risk *As Low As Reasonably Practicable*. That can operate as a powerful ratchet, reducing risk as technology progresses. 'Low' is a scale along which it is always possible to be lower. It means that the benefits of improvements in technology are often taken in the form of lower risk when sometimes there may be trade-offs with other gains such as lower cost.

Technological improvements can also make measurement easier, and it is tempting to use this to set a more precise and more demanding standard even before the regulator is involved. A rather different interpretation of ALARP would be *As Low As Reasonable and Practical*. So there is a test of reasonableness which is separate from what is practical. The Treasury's doctrine could usefully engage with these issues and provide better guidance on the optimal interpretation of ALARP – a problem John Fingleton also wrestled with as part of his review of nuclear regulation.[31]

An additional consideration is what qualifies as ALARP can be highly sector- and technology-specific. For example, the interpretation and application of ALARP in the nuclear industry can differ quite substantially from how it is approached in sectors such as aviation or water management. Each area has its own operational realities, regulatory culture, and tolerance for risk, which shape what is deemed 'reasonably practicable' in practice. That variability makes consistent interpretation difficult and can influence how innovation and proportionality are balanced across different regulatory regimes

This is not some technocratic debate. These judgements have ultimately to rest on public consent. Public attitudes to risk do not suggest one single consistent measure. Instead we appear to attach a lot of weight to how much outcomes depend on our conscious decisions – we expect much lower risk as passengers in an aircraft than as drivers of a car. Popular attitudes are also very dependent on circumstances – Covid increased our tolerance for risk in vaccines. Regulations do not always capture all this. Cancer Research UK warn against interpreting medical regulations to mean low tolerance for adverse reactions. For certain very aggressive cancers, such as bowel cancer, patients will accept adverse reactions much more severe than with some other cancer treatments. The regulations are very strict on radioactive isotopes even in dosages which are not hazardous – that impedes their use in clinical diagnosis, which could save lives.

One way forward is for regulators to take this broader view. That means broadening the interpretation of the responsibilities of many regulators. In discussions with the RHC chair, he makes this observation on the attempt to give a broader interpretation of the responsibilities of regulators:

> 'The Regulators' Code (2014) and the Growth Duty similarly provide useful anchors, but their focus is narrow, primarily focusing on compliance and enforcing behaviour. They do not address the wider question of how to balance risk and benefit in decisions about innovation. The foundations exist, but they are incomplete and insufficient for the pace of technological change. If adapted, however, they could serve as more useful focal points providing a foundation for embedding benefit–risk judgement, clarifying ministerial appetite, and enabling regulators to act within defined boundaries. This would require not just reinterpretation, but structural reform to ensure these codes support innovation as well as protection.'

The doctrines and guidance we've already got should help, but it should be made even clearer that regulators need to account for and assess the full range of potential benefits. The growth duty was a start but it is not applied in practice as much as it might be. We could go a step further, and individual departments sponsoring regulators should encourage them to be tech-positive. There could be a specific ministerial steer to them to favour technological innovation where possible.

There are other tools which can help regulators take a broader view and manage risk. They can manage uncertainty through adaptive tools and learning. As the RHC chair points out:

> 'Other countries are adapting quickly. The United States has expanded adaptive approvals in health and digital sectors, positioning itself as a magnet for investment. Singapore has pioneered regulatory sandboxes in financial services, attracting global fintech firms, despite the UK's early lead. Australia has used mission-based approaches to coordinate regulators, academia and industry around national goals.

> Each of these examples recognises that risk cannot be avoided, only managed. The countries that manage risk dynamically will shape future standards, attracting capital, talent and influence.'

We can and should match that – adjusting standards and regulations as new evidence comes in. If we are slow, we end up as rule-takers, accepting assessments of risk made abroad.

There should be a clear statement by the minister responsible for each regulator that there has to be an acceptance of risk when benefits outweigh it. Zero risk comes at very high cost if it means benefits are not gained. Not all risks deserve the same response. Some innovations, such as renewable energy or digital payments, bring large benefits with manageable hazards. Others, such as health-related biotechnology, need to be controlled more strictly.

The sponsoring department must play a role. Many currently work on the basis that regulators need to be almost completely autonomous, but it is OK to have real political engagement from democratically accountable ministers and parliamentians through, for example, select committees. It is legitimate to set and revise the framework for regulators and monitor and assess their decisions.

Ministers could publish explicit risk appetite statements for specific regulators. Where relevant, they could be linked to industrial strategy sector plans and operationalised through regulators' annual steers. Ministers can set the framework for regulators and their annual letters can emphasise a balanced approach to risk and a welcome to new technology because of the wider benefits it brings They can shift culture by signalling in public statements and official statements of policies for specific regulators that there is a willingness to accept risk. Mandating assessment of benefits from new technologies and incentives for regulators are powerful tools.

However, regulators are busy and have particular expertise in current technologies and the sectors where they are currently deployed. It is hard for them to consider wider issues and potentially very different uses of new technologies. Some of these other issues may be the responsibility of a different regulator. And the gains from a new general-purpose technology may be hard to predict. Here are some real examples from drones, one of the technologies we focus on at the RIO. It is not to suggest that the CAA has some specific problems. They are typical of regulatory problems across technologies.

In 2023-24, 50 workers died in workplace falls from height, a third of all workplace fatalities. They occur doing things such as inspecting tall structures. Drones could replace some of these tasks. Preventing such tragic accidents is the responsibility of the HSE, which reports to the Department for Work and Pensions (DWP). The DWP may not necessarily be included in assessment of the costs and benefits of drones. Regulation of drones is for the CAA, reporting to the Department for Transport.

The CAA is understandably focused on risks in airspace, such as a drone colliding with a hobbyist's plane. (Our relatively liberal regime for established flight technologies is one reason it is hard to get drones introduced in the UK: if we had tougher regulation of airspace now it would be easier to fit drones into, for example, specified airspace.) The CAA have expertise on the remote, but not zero, risk of someone dying from a drone accident. It is harder for them to think of someone else falling off scaffolding while inspecting a wind turbine blade, when that could have been done by a drone. A local builder trying to use a drone to inspect a roof will find doing it legally is quite onerous. The CAA are experts on airspace safety. They are not expert on the contribution of drones to the overall safety of British people, which requires a different and much wider analytical framework.

The CAA understandably have extra regulations on drones carrying dangerous items. But then a Swiss company developed a drone carrying a defibrillator to get rapidly to someone with a suspected heart attack.

They were first used in Sweden four years ago – only now are they being trialled here. These wider assessments of benefits against risk are not easy for regulators with a particular focus on managing risk directly associated with a particular technology. Very low risk in airspace might involve higher total risk for British citizens.

It is hard to expect a regulator as currently structured and staffed to take account of all these wider factors. Drones are just an example of an issue affecting many regulators. Last year the Department for Environment, Food & Rural Affairs were close to implementing tougher EU regulations on PFAS or 'forever' chemicals. It seemed obvious to ban these chemicals. However, they are also used in medical procedures and equipment, such as catheters and inhalers, where frictionless flow matters. So before implementation, the draft regulations went back for further work.

It is hard for regulators to take this wider, more balanced approach. Many may already have adopted it in principle but say they don't have the expert staff to apply it. They can't calculate all the benefits themselves. They may also be nervous that if something goes wrong they will be held responsible with no public support. We have ended up with a system in which every individual regulator has their particular responsibilities, but it is hard to get an overall coherent understanding of the potential benefits – and risks – of a new technology.

Somewhere there has to be some mechanism for taking the wider view. John Cunliffe's report on the water industry shows this problem with a range of regulators with specific responsibilities but no government capacity to think about the system as a whole and balance different objectives such as water purity, cost, and natural benefits.[32]

He offers another example of the difficulties from rigid interpretation of regulations and of how, even when sensible objectives are set, their measurement can itself cause new problems. One way to tackle phosphates in run-off water is to build large concrete storage tanks and filter them out. Another way is to plant and protect reed beds,

which over time can do the same job. But even though reed beds have been shown to work in the long run, the regulator requires frequent detailed measurement of results which cannot be delivered in a natural environment: concrete tanks are easier to monitor and measure. It takes a different perspective to see that implementing the regulation needs to be more flexible to permit a natural solution.

There is a radical option which some advocate: go for a super-regulator that has the power to override individual regulators and take the overall view of costs and benefits. Sometimes this is called the n+1 option, as an extra super-regulator is put on top of the existing group. (And just to be clear, the RIO is not such a super-regulator.) This could potentially tackle the problem, but there are clear risks. It might make the whole regulatory process longer, with an extra stage of assessment. It would also require legislation to change the balance of legal responsibilities. Meanwhile, it could undermine existing regulators, which would look like subordinates to another body. It does not get to the heart of the problem – ultimately it is for democratically accountable politicians and ministers to take responsibility for these decisions. One of the most important roles of government is to assess and bear risk – that is why we have a welfare state.

Regulators can use evidence on public attitudes to specific risks from, for example, citizen juries. They can also be explicit about the risk threshold they are operating with – the FCA boldly pressed the Treasury Committee on how much risk of people losing their savings they would tolerate. However, ultimately it is in the best sense of the word a political decision about how much risk citizens can be expected to bear. Moreover, if something goes wrong – as it does – regulators may fear they will be left on their own with no public figures defending the risks they took. All this suggests that there has to be a role for democratically accountable ministers and parliamentarians. They can provide clear authoritative guidance to regulators about the willingness to accept some risk, but ultimately ministers are the custodians and bearers of risk in the system.

There is another reason for wider political and ministerial engagement. There are often unexpected benefits from a general-purpose technology, as innovators develop new uses which even the inventors of the technology may not have thought of and which are very unlikely to be included in an assessment by the regulator. One of our key tasks at the RIO is to try to bring these wider factors into consideration when assessing regulations so they do not impede innovation and new technology.

Many considerations go beyond one department. There needs to be a mechanism for working across departments and reaching an overall assessment of risks and benefits. That decision has to be subject to proper political accountability. The real authority bringing these all together could be a group of ministers who between them represent the main departments which can potentially benefit from a new technology.

The Treasury should also be represented, not just to be pro-growth but because they are custodians of doctrine on risk. These democratically accountable ministers, drawing on expert advice, would be deciding on the right balance of risk and benefits – as they did during Covid. It should be recognised as a legitimate part of their role to send a letter of instruction to one or more regulators which would take a much broader view of the national interest than a regulator with a narrow focus would be capable of. The ministerial letter would also provide officials working within a regulator the protection they need if something goes wrong, as it could.

Most of the time most regulators would then be able to implement these decisions within their current statutory responsibilities. But if there were a serious legislative obstacle there would need to be a decision about amending legislation, and again that falls naturally to ministers. The RIO could play a role in bringing key issues to this ministerial group if we had not been able to resolve them with the individual regulators. Other key players could also contribute, such as DBT, which has the overall lead on regulation.

Such an arrangement recognises there are difficult judgements on the balance of risks and benefits on which elected ministers and parliament must pronounce. These are not just technocratic issues – they involve wider questions, such as whether to value growth over the status quo. The model we have at the moment is dysfunctional because regulators are not obliged to take a wider view of risks and benefits, and there is no real mechanism for overriding them in that wider interest. So we all lose out.

6. Conclusion: what the RIO can do

The RIO can work energetically with regulators to tackle specific regulatory barriers to innovation. We can help change the culture and priorities of regulators by making the case for new technologies and identifying their wider benefits. We can direct our modest budgets to boosting the capacities of regulators. We can encourage regulators to work together so that innovators get to the right place at the right time. We can promote speedy decisions rather than a slow, sequential process through different regulators. We can promote the use of AI to make the body of regulation more comprehensible and accessible. So there is lots we can do already to ensure we have an effective regulatory regime for new technologies. But relatively modest changes in the way government handles these issues could enable us to do even more.

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