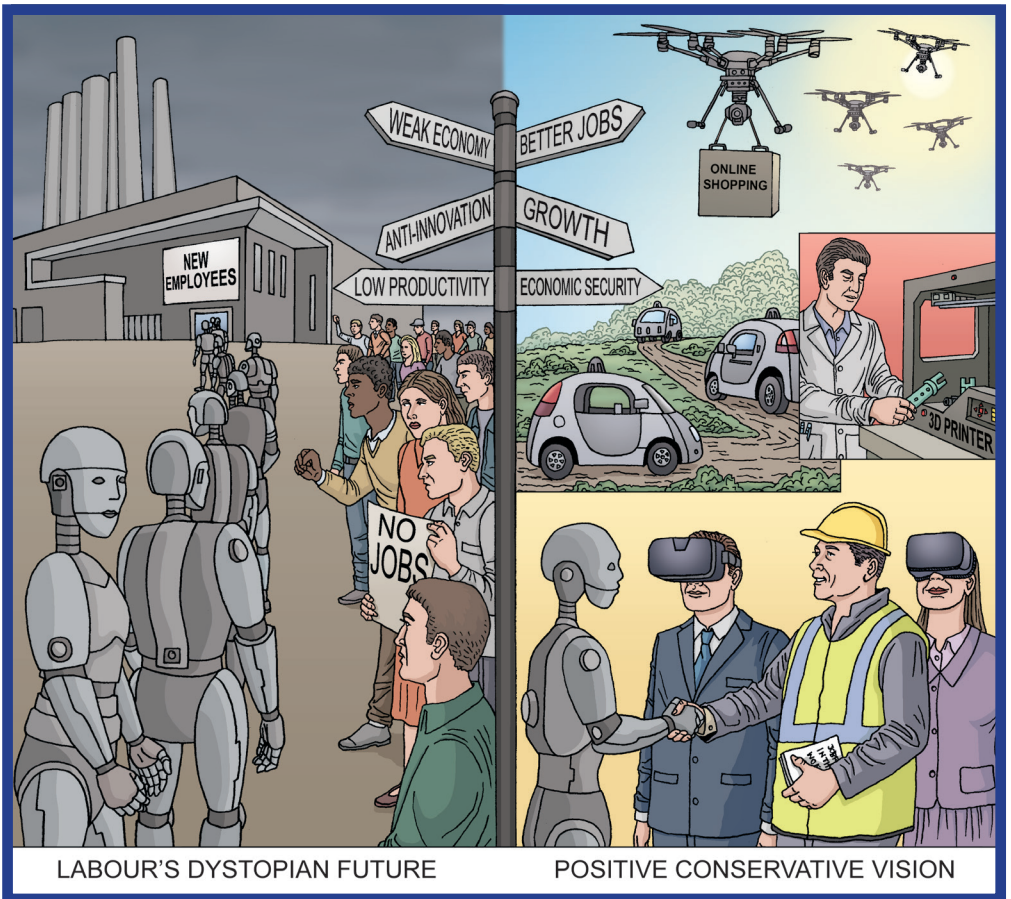


# Getting to the Future First: How Britain can lead the Fourth Industrial Revolution



**By Alan Mak MP**

**Foreword by Paul Goodman  
Editor, ConservativeHome**

## About Alan Mak MP

Alan Mak was elected as the Conservative Member of Parliament for Havant in May 2015, succeeding former Cabinet Minister David Willetts, and re-elected in June 2017. He led the first ever debate on the Fourth Industrial Revolution (4IR) in Parliament in September 2016, founded the APPG on the 4IR in October 2016 and formally launched it in March 2017 with the Chancellor Philip Hammond. Alan's main political interests are the economy, technology and social mobility. He is also Co-Chairman of the APPGs for Entrepreneurship, and for Apprenticeships; and Chairman of the 1922 Committee's International Trade Policy Sub-Committee, and Vice-Chairman of its BEIS Policy Sub-Committee.

Before his election, he started and ran his own business having begun his career at Clifford Chance LLP in the City. He has invested in a number of tech start-ups. Alan was born and grew up in York, and read law at Peterhouse, Cambridge University where he won the ECS Wade Prize for Administrative Law.

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# Foreword

From Paul Goodman  
Editor, ConservativeHome



When I began in journalism some 25 years ago, our office wasn't hooked up to the internet, there was no social media, computers were shaped like cardboard boxes, and mobile phones were the size of boxing gloves.

Readers will have their own experience of living through technological, workplace and social transformation. That experience is part of mine. In his ConservativeHome series on which this pamphlet is based, Alan Mak makes the point that while such change is constant in a developed economy, the pace of it is speeding up in an increasingly interconnected world.

“Characterised by the unprecedented fusion of technologies that blur the traditional boundaries between the physical, digital and biological spheres, breakthroughs – and new products – in fields such as artificial intelligence (AI), robotics, the Internet of Things, driverless cars, drones, 3D printing and nanotechnology are already transforming our economy and society,” he writes.

But while even human beings themselves may change (some claim that we will be cyborgs by 2030), human nature doesn't, or at least hasn't yet. There are optimists and pessimists in this age of the Fourth Industrial Revolution, just as there were in the other three. The latter fear mass unemployment and low productivity. The former enthuse about new growth and more leisure.

A virtue of this pamphlet is that it is based on something more solid either than pessimism or optimism - namely, hope for the future, based on a solid plan, with no more party politics than is strictly necessary. Bits of it are obvious, or at least should be. Alan wants schools, Local Enterprise Partnerships and employers to adapt to the 4IR.

That implies the shift from higher to technical education foreshadowed in the June 2017 Conservative manifesto, as well as getting the basics right in primary and secondary education. The reforms pioneered by Michael Gove and his successors were a start, but much more needs to be done.

He also advocates launching a new 4IR Emerging Technologies Investment Fund, spending three per cent of GDP on research and development by 2030 to match our international competitors, and a new National Institute for Artificial Intelligence and Robotics. Whether you agree with these particular suggestions or not, he is right to highlight the role of government.

Alan has been knocking on the door of the Government's Industrial Strategy, so to speak, and I know that Philip Hammond, Greg Clark and other Ministers have opened it just a bit, and want to hear what he has to say. As I write, they are wrestling with one of the structural weaknesses of our economy: low productivity.

Low productivity means low wages. Low wages mean political discontent. Political discontent means the possibility of a Corbyn government, just as it has already led to the rise and fall of UKIP. But the taking of power by Britain's first Marxist administration would be an infinitely more serious matter.

Improving productivity and raising wages is thus among the great political as well as economic challenges of our time. Adapting to and leading the 4IR is an integral part of it. So this pamphlet is of more than abstract interest; it is of political urgency. Our site wishes it every success.

A handwritten signature in black ink, appearing to read 'Paul Goodman', with a long horizontal flourish underneath.

**Paul Goodman,**  
**Editor, ConservativeHome**

# Introduction

## From Alan Mak MP



As Britain implements a new Industrial Strategy to secure our prosperity and enhance our productivity after Brexit, we shouldn't forget that we're building on strong foundations. Around 250 years ago, it was Britain that launched the world's First Industrial Revolution, powered by coal and steam – and accelerated by new railways, roads and innovations such as Stephenson's Rocket – heralding a new era of British industrial strength.

But we mustn't rest on our laurels. Today, after two further industrial ages, driven first by electricity and then by electronics and the internet, we find ourselves in the early stages of a new, Fourth Industrial Revolution (4IR).

The world is witnessing an unprecedented fusion of new technologies that blur the traditional boundaries between the physical, digital and biological spheres. Breakthroughs – and new products – in fields such as artificial intelligence, robotics, the Internet of Things, driverless cars, drones, 3D printing, personalised medicines and nanotechnology are already transforming our economy and society.

As Conservatives, we must be the first to respond – and help Britain get to the future first. Ensuring Britain leads the 4IR is the greatest economic opportunity – and challenge – of our generation, and we mustn't let Labour steal a march on us.

Conservatives win elections when we are seen as the most credible stewards of the economy, and when the public trust us with their family finances. This means that setting out a pro-innovation vision for Britain's future in the 4IR is not a niche policy area – it is a political imperative for the Conservative Party.

Jeremy Corbyn and John McDonnell are already mobilising their supporters against a dystopian vision of the 4IR which they have themselves created. Their Luddite agenda involves “managing” new technologies, taxing innovation, and heavy regulation that attempts to put the future on hold.

Their approach would damage our economy and ensure Britain loses out on a massive opportunity to boost productivity and trade. Banning Uber in London is just a foretaste of a future Labour government’s approach to the 4IR. We Conservatives must be different. We must set out compelling policies that allow us to seize the initiative and set the agenda on the 4IR.

This is what my series of essays published by ConservativeHome attempts to do. Editor Paul Goodman and Executive Editor Mark Wallace have been steadfast in their support for my work, and share my view that Conservatives must embrace the 4IR and help Britain lead it. I am grateful to them for their continuing support, and to Paul especially for his Foreword.

Leading the 4IR will not be easy, especially as our competitors are already investing in the technologies of the future. The global race for success in the 4IR is already underway.

For Britain to succeed, a significant effort from the private sector, industry, academia and investors is required. But there is a central role for Government, and for the Conservative Party, too. I hope these policy proposals will not only stimulate further debate within our Party, but also act as a blueprint for action that helps Britain get to the future first.

A handwritten signature in black ink that reads "Alan Mak". The signature is written in a cursive style, with the first name "Alan" and the last name "Mak" clearly legible. The name "Mak" is underlined.

**Alan Mak MP**

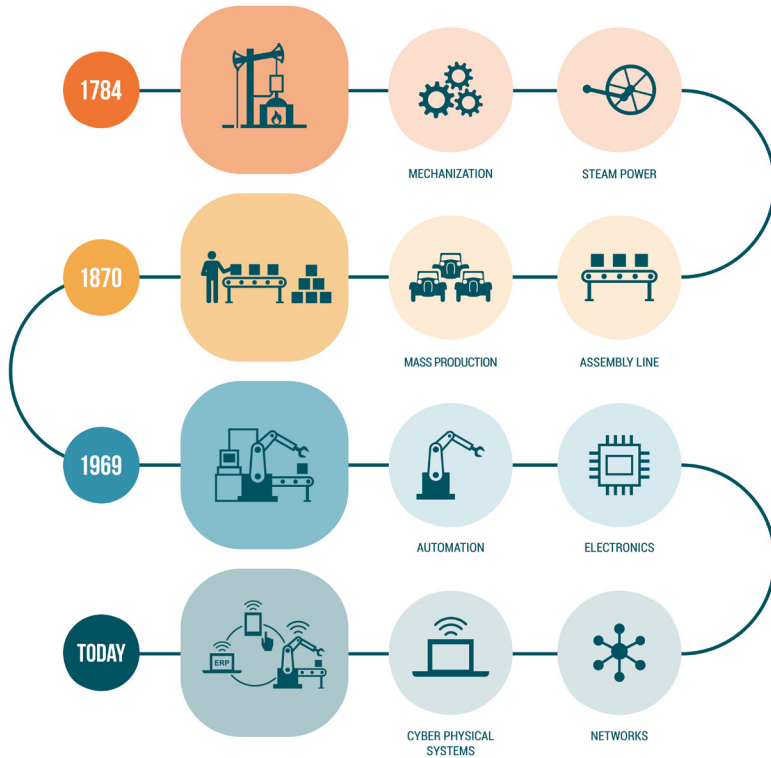
**Member of Parliament for Havant**

**Founder & Chairman, All-Party Parliamentary Group on the  
Fourth Industrial Revolution**



# 4IR Timeline

Drawing on the work of Klaus Schwab, Executive Chairman of the World Economic Forum, the 4IR can be seen in the following historical context:



- First Industrial Revolution [Late 1700s] – The mechanisation of production through coal, water and steam power, and more efficient communication and trade links due to railways and more reliable merchant shipping, acted as a catalyst for automation and connectivity.

- Second Industrial Revolution [Late 1800s] – Electricity enabled greater industrial and manufacturing automation through the development of mass production. Wireless and wired communication further improved national and international information networks.
- Third Industrial Revolution [1970s] – Electronics and the rise of computing allowed more sophisticated automation of production, and the birth of digital communication technology created global information networks such as the Internet.
- Fourth Industrial Revolution [2000s onwards] – The emergence of “cyberphysical systems”; the fusion of advanced digital technology and artificial intelligence with both people and machines. Additive manufacturing, robotics, and breakthroughs in materials science will revolutionise both heavy industry and the fabrication of consumer products. Advances in machine learning and data processing will vastly improve connectivity at all levels of society. Synthetic biology and genetic engineering have the potential to fundamentally transform the relationship between technology and the human body.

# 1

## Conservatives must champion and harness new technologies

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When Gutenberg invented the printing press in 1439 he eliminated an entire industry dedicated to hand-copying information. This generated rising demand for books that the previous labour-intensive means of production could never meet.

This technology-driven spread of information accelerated the emergence of a nascent middle class and transformed Europe's political, economic and social order in the centuries ahead. It contributed to the Renaissance, the Age of Enlightenment – and eventually, the First Industrial Revolution.

In Britain, this was characterised by water and steam power mechanising production, as new railways, canals and inventions such as Hargreaves' spinning jenny and Stephenson's Rocket improved trade and transport.

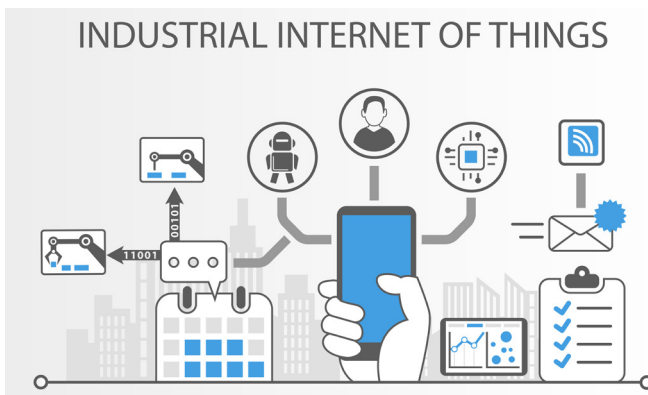
Electricity, enabling even greater automation through mass production, would herald a Second Industrial Revolution from the

late 1800s, whilst electronics and the birth of digital communication and the internet from the 1970s launched a Third Industrial Revolution.

## **Rapid pace of development**

While it took centuries for Gutenberg’s invention to break the information monopoly of an ecclesiastical and noble elite opposed to innovation – and decades for the Second and Third Industrial Revolutions to take hold – the scale of change delivered by the Fourth Industrial Revolution (4IR) is lightning fast.

Characterised by the unprecedented fusion of technologies that blur the traditional boundaries between the physical, digital and biological spheres, breakthroughs – and new products – in fields such as artificial intelligence (AI), robotics, the Internet of Things, driverless cars, drones, 3D printing and nanotechnology are already transforming our economy and society.



Professor Klaus Schwab, Chairman of the World Economic Forum, is leading work at a global level to ensure policymakers are prepared for the dramatic changes the 4IR will bring. When I welcomed him to speak in Parliament at the Autumn Reception for the All-Party Parliamentary Group on the Fourth Industrial Revolution Schwab made it clear that this is neither a niche policy area nor a challenge for the future.

Put simply, the Fourth Industrial Revolution is already happening, and it is a political imperative for us Conservatives. It will be the defining political and economic issue of the next ten years, just as the financial crisis shaped the last decade.

The 4IR is the field on which we must fight the next great battle over the value of free markets, just as a resurgent Left tries to re-open the debate on capitalism.

### **Building a Conservative vision for the 4IR**

Conservatives win elections when we present a positive vision for the future and are seen as the best stewards of the economy. The “long-term economic plan” was an effective message because it told the electorate we had our eyes on the bigger picture, not just the here and now. Helping Britain lead the 4IR – and winning the political narrative around its benefits – presents us with similar election-winning opportunities, which we must seize as a party.

The statistics around the 4IR alone are dramatic: whilst AI could add an additional £630 billion to the UK economy by 2035, PwC has estimated that up to 30 per cent of jobs could be at risk from automation in a similar period. The Bank of England has warned that 15 million jobs are vulnerable. We need to face up to the fact that the 4IR’s enormous economic benefits also mean significant restructuring of the employment market. How we respond to this dilemma will help determine the future of both Britain and the Conservative Party. What’s clear is we cannot let Labour steal a march on us.

### **Responding to the Labour threat**

Jeremy Corbyn and John McDonnell are already using automation as an electoral weapon, mobilising their supporters against a dystopia they have created themselves in which robots take

workers' jobs. Their Luddite, trade union-focused agenda involves "managing" new technologies, taxing innovation, and heavy regulation that attempts to put the future on hold. This would do untold damage to our economy and cause Britain to lose out on a massive opportunity to boost productivity and trade. Banning Uber in London is just a foretaste of a future Labour government's approach to the 4IR.

In response, Conservatives must advocate for a free-market, pro-innovation vision for the 4IR that emphasises its benefits: new jobs in new industries like 3D printing; greater productivity through automation; AI and data-driven supply chains; and more exports as we sell our innovations to the world.

Precision medicines will help us live longer, healthier lives. New energy technologies and a more efficient national grid will lower household energy bills. Driverless cars will make roads safer and reduce congestion. Innovation will raise living standards. Only by articulating a positive Conservative vision that seizes the initiative and sets the agenda on the 4IR can we retain our reputation for economic competence in future elections.

Moreover, we must put the 4IR centre-stage in our long-term political thinking about the economy. That's why, in the last 18 months, I've led the first ever House of Commons debate on the 4IR, published a Free Enterprise Group report on how Britain can lead the 4IR, and founded the APPG on the Fourth Industrial Revolution to kick-start the discussion in Westminster. But there is more to do.

Unfortunately, the 4IR is often viewed as a niche policy area – and this must change. We need not fear the 4IR – because we can rise with it. If we get our economic policies right, we can be masters of this revolution, ensuring it consists not of changes that happen to us, but which work for us all.

These policies include:

- Launching a new 4IR Emerging Technologies Investment Fund to help our entrepreneurs develop and commercialise new inventions;
- Introducing a new British Innovation Principle into UK law to counter-balance the effects of the EU's Precautionary Principle which can hold back innovation;
- Ensuring Britain spends three per cent of GDP on R&D by 2030 to match our international competitors;
- Establishing a new National Institute for Artificial Intelligence and Robotics, to focus the efforts of entrepreneurs, industry, academia and government on two key 4IR technologies;
- Reviewing our education and training systems so they prepare our workers for the 4IR; and
- Reforming and funding our Local Enterprise Partnerships to help our regions and nations adapt to the 4IR.

In the following chapters I will set out how and why Britain can – and must – lead the 4IR by implementing a positive Conservative vision.

Achieving this goal will not be easy, and it will require significant effort from the private sector – this is not something Government can do alone.

However, there is a clear role for political leadership, and if we fail to lay the foundations on which Britain can make a success of the 4IR, we will have ignored one of the Conservative Party's enduring missions: competent stewardship of our economy that gets our country to the future first.





# 2

## Technology can address Britain's productivity problem

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A self-driving electric vehicle delivers a just-in-time supply of raw materials to an automated production line, before collecting an outgoing shipment of goods for delivery around the Northern Powerhouse, the Midlands Engine or another part of the country. Inside the factory, a sensor detects a faulty piece of equipment by comparing the physical device to its digital history, and the artificial intelligence-powered supercomputer that monitors the building immediately contacts a human engineer to fix the problem.

This scenario sounds like science fiction, but it's only a few years away.

The Fourth Industrial Revolution (4IR) is the key economic and political issue of our time. And it will be built around stories like this: humans empowered by machines, and businesses harnessing Big

Data, automation and AI to create new revenue streams, develop new products, raise productivity, and drive down costs. Our Conservative vision for this dramatic economic transformation must be focused on advocacy for the positives of innovation as a means to greater national prosperity.

## **Tackling the productivity problem**

However, if we are to master the 4IR and harness its potential to turbo charge our economy as we leave the EU, we must make Britain more competitive. In particular, we must boost productivity, which has for too long lagged behind our competitors.

The global race for success in the 4IR is already underway, and other countries are not waiting for us to complete Brexit. They are investing in future technologies now – and so should we. It's time to move the 4IR from the margins of political discourse to the mainstream.

We must put it centre stage in our economic thinking, too. The Government's Industrial Strategy Green and White Papers have already set out strong foundations for a post-Brexit economy fuelled by regional growth, improved productivity, and rising skill levels. However, to secure our prosperity after Brexit, Britain needs to lead the 4IR, not just be shaped by it.

The Government should focus its efforts in the following key areas: investing in key technologies, and changing our regulatory mind-set.

## **Investment in Research & Development and key technologies**

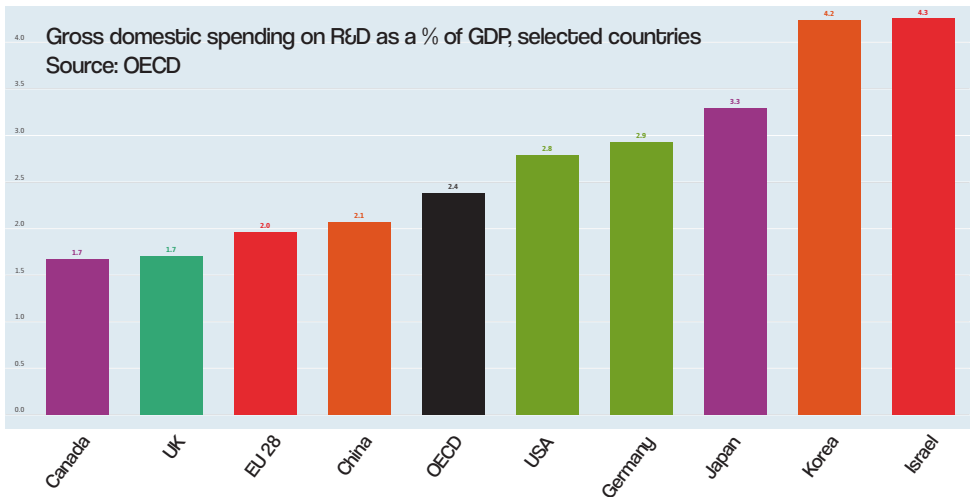
A new 4IR Emerging Technologies Investment Fund should be launched to help our entrepreneurs develop and commercialise new inventions. It would use public funds already allocated in the National Productivity Investment Fund and the Industrial Strategy

Challenge Fund to attract further private-sector co-investment, creating a growing pool of capital to support our technology businesses.

By supporting the growth of 4IR businesses, the Fund will help entrepreneurs create new jobs. A similar fund created under Boris Johnson as London Mayor has worked successfully, with £14 million of City Hall seed funding used to attract an additional £64 million of private co-investment. This model should be replicated nationally.

There is a widely-recognised link between R&D investment and productivity increases – and an emerging consensus amongst business groups like the CBI that Britain needs to invest more in this area.

In 2015, total UK R&D expenditure was £31.6 billion (or 1.68 per cent of GDP, of which 0.5 per cent came from public sources). In contrast, the OECD average is 2.4 per cent of GDP, with global innovation leaders such as South Korea spending more than three per cent. Most of the UK shortfall is in private sector investment.



The Government should work with business to develop a RoadMap for increasing national R&D investment to three per cent of GDP

by 2030, and commit to increasing the state's share to the OECD average of 0.7 per cent by 2027. This would allow us to keep up with our competitors, but on a fiscally responsible timetable. It would allow the Conservatives to demonstrate political leadership on this issue – Labour committed to reaching three per cent by 2030 in the June 2017 election – making clear that Government cannot solve this challenge alone. The private sector needs to step up and play its part.

Establishing a new National Institute for Artificial Intelligence and Robotics would focus the efforts of industry, investors, academia and government on the two most impactful, cross-sector, enabling technologies of the 4IR. They are complementary technologies, and will be prominent in every business and sector in the future, so Britain must lead the world in these two areas. A National Institute will help us achieve this goal.

The National Institute would take the form of a physical innovation cluster focused around a Catapult Centre-style hub for late stage R&D collaboration and commercialised research, co-locating academia and industry to work on projects in AI and AI-operated robotics. This would provide a focal point for the UK's AI and robotics ecosystem to attract further investment in the same way that the City of London has for centuries acted as the focal point for finance.

### **Changing our mindset: a new British Innovation Principle**

As we leave the EU, we should establish a new British Innovation Principle in UK law to provide a pro-innovation counter-balance to the EU's overly risk-averse Precautionary Principle.

Enshrined in the Lisbon Treaty, the Precautionary Principle can unreasonably burden innovators with having to prove the absence of danger regarding a particular product, service, or procedure. It does not require regulators to weigh potential risks against the

potential benefits that society might enjoy from technological development, and often constrains R&D.

This means Britain is currently subject to a lop-sided risk assessment process, which is expected to be replicated into UK law after we leave the EU. We can re-balance this with a new British Innovation Principle sitting alongside – rather than replacing – the Precautionary Principle. This will ensure our competitiveness outside the EU is no longer constrained whilst signalling that Britain is not abandoning health and safety standards.

The British Innovation Principle would place a statutory duty on all public-sector bodies to ensure that, whenever policy or regulatory decisions are under consideration, the impact on innovation as a driver for jobs and growth is assessed alongside any potential risks from technological development.

Reviewing our education and training systems so they prepare our workers for the 4IR, and reforming our Local Enterprise Partnerships (LEPs) to help our regions adapt to the 4IR, are both also key and will be covered more extensively in later chapters.

What's clear is that embracing and leading the 4IR can make Britain more competitive globally, boost economic growth, and turbo-charge our post-Brexit economy. Doing so is vital politically: Conservatives only win elections when voters believe we have a credible long-term plan for the economy.

While Jeremy Corbyn plots nationalisation and taxing robots, we must plan for productivity. By investing in the 4IR we give Britain the best chance of economic success in the future, harnessing the benefits of technology to create rising living standards, new jobs in new industries, and wealth to pay for public services. All are key to victory in future elections.



# 3

## We must prepare our workers for the changes that are coming

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Futurists, like Silicon Valley entrepreneur Elon Musk, regularly talk about the risk that artificial intelligence (AI) and robotics will trigger a mass wave of automation, causing unemployment as machines replace people. The PayPal founder predicts that in the future there will be “fewer and fewer jobs that a robot cannot do better [than a human]”.

Musk is among a growing number of commentators concerned that what the economist John Maynard Keynes termed “technological unemployment” – machines replacing workers – will be different in the Fourth Industrial Revolution (4IR) from what has come before. In many ways, he is right.

For many industries this will mean a paradigm shift in the kind of

tasks that can be done better by machines.

## **The autonomous revolution has already begun**

While the debate over London's taxi industry and the gig economy grabs headlines in Westminster, tech firms like Tesla and Uber have already moved on to the next phase: they're now competing with traditional vehicle manufacturers to quietly eliminate thousands of jobs in the transport and logistics industry.

In 2016, Uber's "Otto" self-driving truck successfully delivered 50,000 cans of Budweiser on a 120-mile trip down a highway in Colorado. To put that into context, there are more than 250,000 lorry drivers employed in the UK.

Meanwhile, companies such as Amazon are developing autonomous distribution centres, where with the click of your mouse, a product is bought, processed, packaged and delivered, all without the need for a single human. Across the wider economy the Bank of England has warned that up to 15 million jobs are at risk of being lost to the 4IR's new machine age.

However, it is important not to lose sight of the wider historical context: roughly 50 per cent of jobs in the US economy have been replaced with new forms of labour every 60 to 90 years. And as innovation and new technology have restructured the labour market, conditions and pay have also improved.

Compare the terrible conditions faced by the average British worker in the Victorian era, when workplace fatalities were 30 times higher than today, to an automated production line and the highly-skilled engineering and product design jobs that are needed to sustain it.

That's why it is vital that we Conservatives embrace new technologies and ensure the British people do not see the 4IR as a



binary choice between innovation and jobs. It need not be about replacing humans with machines, but combining the capabilities of both.

For example, over the last 25 years the Siemens factory in Amberg, Germany has been transformed into a fully digital “smart factory” with almost 75 per cent automation of the manufacturing process. This has produced an almost 1000 per cent increase in productivity – yet the workforce has remained the same size.

### **The debate shouldn't be People vs Robots**

We must stop thinking of technology as the enemy of employment – and start preparing our workforce to succeed in the 4IR's new economy. As Conservatives we have a vital role to play in selling this positive vision of the 4IR as an opportunity to empower workers. We must convince voters that the 4IR means a new generation of tools that will boost productivity and automate repetitive administrative tasks while freeing human workers to re-train and add value in other ways.

The alternative is a dangerous, Luddite, trade union-focused agenda led by a left-wing Labour Government, which would stifle innovation, destroy jobs and mean Britain misses out on the benefits of the 4IR. Jeremy Corbyn is already setting out an agenda for heavy-handed intervention in the economy – from taxing robots to mass nationalisation – fuelled by a dystopian narrative he has created that places workers in opposition to machines and raises the spectre of mass unemployment.

Conversely, we Conservatives must harness the 4IR to help people do their jobs better, rather than simply replacing them. These efficiencies should not be limited to the private sector, and we should use innovation to help us solve the puzzle of how to fund increasing demand for public services, without exploding the deficit or increasing taxes.

For example, Conservatives should pledge that, once the deficit has been eliminated, every administrative role abolished by automation in the public sector will be mean more funding made available for front-line staff: more doctors, nurses, police officers, and teachers.

However, we must also confront the reality that, just as in every industrial revolution that has preceded it, the 4IR will bring significant disruption to our labour market.

### **Upskilling our workers for the 4IR is key**

We must respond to the 4IR with a renewed focus on education and skills policy, to help Britain meet the challenge of automation. Alongside the Government's existing work, this should include:

- Conducting a National Skills Review (NSR) at the start of each Parliament, taking a strategic look at what skills are currently being automated out of the job market, and evaluating the readiness of our education and training system to prepare our workforce for the jobs of the future. Just as the Strategic Defence and Security Review (SDSR) examines the country's longer-term defence requirements, and the Comprehensive Spending Review (CSR) sets out our spending priorities, a new NSR would look at how we future-proof our skills base.
- Re-examining the case for ideas like lifelong learning accounts for individuals, or employee training tax credits for businesses, to incentivise workers and businesses to engage in a continuous process of skills development; and
- Exploring whether our 2017 manifesto pledge for a National Retraining Scheme for people whose jobs are threatened by technological change can be delivered despite the election result.

## **Government should not be “picking winners”**

While skills are of vital importance – and we must prepare workers for the changes ahead – as Conservatives we must respond to automation by being frank with voters about the scale and speed at which technology is likely to reshape what it means to have a job in Britain. We must not be tempted to prop up failing industries that are unable to compete with disruptive technologies, or limit innovation with overly burdensome regulation.

Instead, Conservatives should act as passionate advocates for the benefits that new technology will bring to our economy. The 4IR should not be framed as people versus machines. It can – and should be – people empowered by machines.

This positive vision sets us Conservatives apart from Labour’s pessimistic message, focused on spreading fear of technology amongst voters. Banning Uber in London is just one example.

Through a relentless focus on skills, we can face up to the challenges that AI and automation will bring to the jobs market, harnessing the power of technology to create new jobs and future-proof our economy.



# 4

## The case for embracing technological advances must be made now

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You have just shut down the computer after a long day at work and, like many commuters, you head off in your car to face the rush-hour motorway traffic, battling tiredness all the way. Once home, you open the fridge, only to find that you forgot to pick up milk on the way home.

Sound familiar? Only now, new technology heralded by the Fourth Industrial Revolution (4IR) is on the verge of causing a social and consumer revolution, where driverless cars will let us relax during the commute and smart fridges will order fresh groceries before they run out. That means less time doing mundane chores, a productive experience at work, and more leisure time at home.

For some, this might sound like a scene from a generic sci-fi movie, but in truth both driverless cars and internet-connected smart fridges already exist, and it is just a matter of time before they become mass-market products.

They are just a tiny portion of the widespread changes that the

4IR will bring to the consumer world, driving down costs for both businesses and consumers, and facilitating far more personalised products and services. For instance, personalised medicine will mean a new generation of targeted drugs that could usurp chemotherapy as the conventional method of cancer treatment, sparing millions of people from the brutal side-effect of healthy cells being attacked as well as tumorous ones. Equally, 3D printing will drive down the cost of niche products, as the break-even point for manufacturing in small quantities is slashed. From medicine to manufacturing, new technologies will make it practical and possible to improve quality as well as efficiency.

### **Selling a positive message about the 4IR to voters**

So as Conservatives we must convince voters that these new and emerging technologies will not just be positive at a macro-economic level, boosting productivity and exports as described in the previous chapters – but also useful tools that improve lives at a household level too. If we are to sustain public trust in the 4IR as an economic and social phenomenon, we must show people what's in it for them, and why they should let us lead it in government.

Partly that's about selling a positive message that the 4IR will bring about affordable and accessible technology – and implementing policies such as those outlined in this pamphlet to create new jobs, back new businesses, boost skills and keep wages high. History shows this approach works: people living in the UK are on average more than five times richer than their ancestors 100 years ago, after adjusting for inflation. Back then, the only people who could afford cars were the wealthiest, with even a Model T Ford costing around four times the average wage.

From better healthcare to lower energy bills to more affordable transport, we Conservatives must ensure the fruits of the 4IR are available to everyone, not just the wealthy few.

## Tackling the ethical and moral questions

Positivity can only go so far, so we must also ensure the ethical and moral questions around new technologies are tackled head-on. Answers must be found for ethical brainteasers such as the Trolley Problem. In a 4IR context, this will mean developing regulatory frameworks for AI-powered driverless cars faced with a split-second decision between killing a child that has stepped into the road or swerving and in all likelihood injuring a car full of passengers. This will no longer be a philosophical or theoretical scenario. It will be reality.

Similarly, when the news broke in October 2017 that the revamped billboard at Piccadilly Circus would incorporate concealed cameras tracking cars and pedestrians, it was dubbed the “Big Brother Billboard”. This kind of targeted advertising has been happening on the internet for years, but new technology gives advertisers the ability to project digital techniques into the physical world.

In the 4IR, computing, robotics and AI will be far too complex and diverse to be governed by a simple set of rules like Isaac Asimov’s “Three Laws of Robotics” – made famous in the Will Smith blockbuster *I, Robot*. From voice-controlled computers to automatic doors and laser weapons, science fiction has often preceded science fact. The best of this genre has tried to consider the ethical and social implications of new technologies before it is too late to shape their development and regulation. As the 4IR accelerates, governments – and political parties – will be confronted with, and must urgently tackle, issues that authors like Asimov have been writing about for decades.

In the 4IR, our economy will be as dependent on data as it was reliant on oil in the last century. The rules that will govern how we collect data and what businesses can do with it will be as important as more traditional political concerns like trade union rules and working time directives.

## **Conservatives must lead the national debate**

So we Conservatives must lead the national debate on issues like the ethics of AI, privacy in the digital age, and data governance – not cede the ground to a Labour Party intent on creating a dystopian vision for the 4IR. This should include input from business, government, charities, pressure groups and voters themselves. Having proposed a new National AI and Robotics Institute, this could also act as a base for a new National Advisory Council on AI and Robotics to co-ordinate engagement on policy and regulatory issues.

The scope of this debate should also include ways to ensure we make the 4IR inclusive of everyone, regardless of their income bracket or how far they live from major urban areas. The digital divide and the urban/rural divide must be bridged in the 4IR.

We are already laying some of the groundwork for inclusive growth with the Industrial Strategy, and we must do more. That includes building on the Northern Powerhouse and Midlands Engine as strategies for generating prosperity outside the South East, continuing the roll-out of superfast broadband, and funding major transport infrastructure investment such as HS3.

Only through this One Nation approach will we Conservatives ensure that the benefits of the 4IR are felt by everyone. While Labour might want to turn back the clocks with an anti-innovation agenda from the 1970s, we need to embrace the 4IR and make a proactive Conservative case for the benefits that new technology will bring.

To do so, Britain must lead the world in establishing the regulatory frameworks that will be adopted around the world as the future is formed. Just as Greenwich Mean Time became the global standard for time in the 19th century, with the right political leadership Britain can determine the parameters of the Fourth Industrial Revolution's social and ethical boundaries for years to come.



# 5

## A Global Britain must look to the future

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“As your Ambassador can see for himself, we possess all things. I set no value on objects strange or ingenious, and have no use for your country’s manufactures,” wrote Chinese Emperor Qianlong in a personal letter to King George III in 1793.

Under the Qing Dynasty, China was the world’s largest economy, and had been for much of the past millennia. However, new technologies were emerging in Western Europe that would soon break the link between the productive capacity of an economy and the size of its population.

As an expansionist Britain was looking for new trading partners to fuel her rapid industrial growth, China started to turn in on itself, becoming isolationist and stagnant, unaware that an economic and technological revolution was taking place in Britain. This First Industrial Revolution, as it would become known, would radically shift

the balance of global power for the next 200 years, at the expense of a once-innovative nation that had invented everything from paper and fireworks to the compass and porcelain.

Now, as we enter the Fourth Industrial Revolution (4IR), China has recovered in dramatic style, and is determined not to be left behind. The “Made in China 2025” programme is designed to comprehensively upgrade Chinese industry to harness new technologies like artificial intelligence, robotics, and 3D printing, whilst President Xi’s “One Belt, One Road” Initiative looks to place China at the centre of a new global trading network.

China views the race for success in the 4IR in global terms, and in Britain we must do the same.

### **Learning from the past to shape the future**

As the 4IR accelerates, we must remember the lessons of the past – early adopters and fast-moving nations will be rewarded, while countries that fall behind will feel the consequences for centuries to come. If we don’t embrace and develop new technologies, somebody else will.

Britain stands at a historic crossroads as it leaves the EU, and now has a once-in-a-generation opportunity to re-establish itself as a global trading nation. A national effort to embrace the Fourth Industrial Revolution is the answer.

When the Prime Minister set out her vision for a “truly Global Britain” at Lancaster House, she was right to identify the importance of strengthening our partnerships around the world. This emphasis on ensuring we remain one of the best places in the world for science and innovation will be crucial if we are to master the 4IR. As the Prime Minister said, “a Global Britain must be a country that looks to the future.” Nothing is more important to Britain’s economic fortunes than leading the 4IR.

We should be proud that Britain is the number one destination in Europe for foreign direct investment (FDI), with £197 billion flowing into the UK in 2016, according to the OECD. This includes important investments from major firms like Apple, planning to build its largest campus outside America in Battersea, and Boeing, building high-tech components for its next generation aircraft in Sheffield.

Global Britain will need to foster more of these relationships. A Brexit deal that gives us maximum freedom to trade with the EU is certainly important, but we must also look outwards to rapidly growing economies around the world.

## **Making the 4IR work for all regions of the UK**

If we are to make a success of Global Britain, and master the Fourth Industrial Revolution, then we must prepare the country to be more competitive and productive – and that means every region, not just London and the South East. That means showing the world that alongside Brexit, we are also laying the groundwork for a Global Britain empowered by optimism, open to talent, and driven by innovation. Alongside its existing work, new Government policies could include:

**1. Reforming Local Enterprise Partnerships to help deliver the 4IR in our regions.** Only by rapidly adopting 4IR technologies and embedding them into everyday life — across every community and region — will the UK lead the 4IR. LEPs have a key role to play in helping our regions adapt to the 4IR by adopting the 4IR. This could include every LEP being required to come up with a regional Industrial Strategy that sets out how that region will embrace the 4IR at home and promote itself abroad.

The Liverpool City Region 4.0 programme operated by the Liverpool LEP is an example for others to follow. The LCR 4.0 project provides mostly non-financial assistance to manufac-

turing SMEs wishing to adopt new and emerging technologies to improve their productivity and develop new products and services using 4IR technologies, whilst promoting themselves to overseas investors.

**2. Introducing a fast-tracked visa system for high-skilled 4IR workers.** Regardless of the particular approach the Government takes to immigration after Britain leaves the EU, we should continue to prioritise science and technology skills for both academia and 4IR start-ups. The Entrepreneur Visa and Tier 1 Exceptional Talent Visa demonstrate that the need to welcome skilled workers and ambitious businesspeople is well understood in Government. If the 4IR is to be a success for Britain, then we must retain this outward-looking, pro-business approach.

**3. Incorporating the 4IR into the Government’s hugely successful “Britain is Great” and “Exporting is Great” campaigns.** We must ensure that the UK remains a top destination for FDI by promoting Britain as a pro-innovation, pro-enterprise, free market economy with all of the right characteristics to turn futuristic technologies into profitable businesses.

## **Time for action is now**

As I’ve argued in each chapter, the Conservative Party must act with urgency to place the Fourth Industrial Revolution at the heart of our economic policy. We must demonstrate that Britain is the best place to invest in new technologies, and make it clear we are serious about leading this Revolution.

We need an optimistic and pro-active response to the challenges and opportunities presented by the Fourth Industrial Revolution. Whether by upskilling workers to face the threat of automation, or by encouraging more research and development to foster innovation, the Conservative Party can and should play a leadership

role in helping Britain prepare for the changes ahead.

It is impossible to resist the rise of the machines, so we must let them lift us towards a Global Britain that uses the Fourth Industrial Revolution as a springboard to a more productive, outward-looking economy. This will mean new trading opportunities, more jobs, rising living standards, and more money for our public services.

As Emperor Qianlong discovered, the lessons from history are stark. No matter the size of the economy, or the early advantages a country might enjoy, the consequences of inaction or an anti-innovation policy platform are disastrous. That is the path Jeremy Corbyn will lead us down.

For us Conservatives, we can only be the compelling alternative by leading the Fourth Industrial Revolution, and harnessing its benefits for the whole country.

***Contribute to shaping the Fourth Industrial Revolution  
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# Epilogue

## Building on the Autumn Budget and Industrial Strategy

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Both the Chancellor in his 2017 Autumn Budget and the Business Secretary in launching the Industrial Strategy White Paper have responded to calls to make Britain a global leader of the Fourth Industrial Revolution. I thank them and their officials for the time they have spent with me discussing and formulating policy ideas.

From financial support for AI, driverless cars, 5G and full-fibre broadband to meeting the OECD average for national spending on R&D and ensuring every secondary school has access to a computer science teacher, the Government has shown it understands the strategic importance of helping Britain get to the future first.

By investing in key technologies, skills, regional growth, and digital infrastructure, Conservatives in Government have laid the foundations for our future success as the Fourth Industrial Revolution accelerates.

But there is more to do.

At a local and national level, if the Fourth Industrial Revolution is to mean something to people it must have a positive impact in their everyday lives. So, as we implement our Budget plans and roll-out our Industrial Strategy, we Conservatives must ensure we commercialise our scientific and entrepreneurial breakthroughs. By ensuring good ideas, new discoveries and creative inventions are translated into more jobs, new businesses, and additional wealth we can regenerate communities, pay for public services and raise living standards. Our country's success in the Fourth Industrial Revolution must not just be abstract, but instead lead to real, tangible benefits for our people, improving their family finances, and giving them a reason to vote Conservative.

In particular, we must harness the power of new technology to improve

administrative efficiency in the public sector, diverting money away from back office administration towards more well-paid, front-line jobs in schools, hospitals, and our emergency services. We also must ensure our reforms and investments are targeted at every region of the country, to address regional disparities in productivity and wages – a 4IR that works for everyone.

At the global level, we should aim to set the world's standards and benchmarks for the Fourth Industrial Revolution. Britain shouldn't be satisfied with a position amongst the leading pack of nations – we should work towards being the stand-out leader amongst *all* nations. We can – and should – set the global gold-standards for the legal, regulatory, ethical and policy frameworks that will build up around the 4IR as the future is formed, whether that's the ethical governance of AI-directed autonomous vehicles or the protection of privacy and digital identity in the new machine age.

Just as Greenwich Mean Time became the global standard for time in the 19th century, centred on Britain's capital, with the right political leadership modern Britain can also determine the parameters of the Fourth Industrial Revolution's boundaries and benchmarks in the years ahead.

If you are interested in the Fourth Industrial Revolution, please contact me to see how you could get involved in the 4IR APPG, for example as a Parliamentary supporter, industry sponsor, or as a representative of the media, business, academia, or investor community. We welcome interest from all sectors.

As I have consistently said throughout this pamphlet – and in my wider work on this topic – ensuring Britain leads the 4IR is the greatest economic opportunity of our generation.

If we seize those opportunities, we can build a country that is not just fit for the future, but one that gets to the future first.

