

GEOFF MULGAN

DIGITAL: GROWING THE BEST, NOT THE WORST

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INTRODUCTION

The world is digital. Photos have gone digital for some time, as have communication systems; the modern workplace is constantly changing, and global knowledge can now fit into your pocket. In research and science, data-driven approaches determine project applications, the Bundeswehr, the German Armed Forces, are taking the Internet into their security policy portfolio, and fully automated driving is no longer a pipe dream.

The added value of digital technologies has become self-evident. Access to information and services at all times is indispensable for implementing business ideas and for managing our daily lives. No network? No way! Politics and the business world have placed digitalization at the top of their agendas. It is now a top priority as a key driver for ensuring future prosperity.

To the same extent that a digital society is establishing itself, there are growing fears that data and algorithms wield a destructive power, from which there is no escape. Like a self-fulfilling prophecy, data and algorithms are devouring jobs, privacy, and freedom, so as to ultimately replace us with artificial intelligence. For many, digital technologies and growing data mountains constitute a black box: complicated, complex and non-transparent. Politics, it now seems, cannot keep pace with the dynamics of technological developments and is powerless in dealing with a globally operative digital economy.

In this essay, Geoff Mulgan asks what needs to be done in order to exploit the benefits of digitization, without becoming hostage to its disadvantages. The author, an experienced policy adviser and Chief Executive of the Nesta Foundation, refutes the assumption that technology is deterministic. He urges us "to think digitally" instead of merely staring at new technologies. Iterative, collaborative, networked, and adaptive are keywords that are meant take the focus away from traditional analysis of structures and hierarchies toward stronger network behaviour.

For Geoff Mulgan, the ability to openly navigate and manage a complex network of supporting relationships is crucial in order to be better prepared for change: digitalization doesn't pose us a technical challenge, but above all a social one.

Berlin, May 2017

Tobias Wangermann

DIGITAL: GROWING THE BEST, NOT THE WORST

Geoff Mulgan

We're now well over half a century into the digital revolution. It's now as much a fact of history as a shaper of our present and future.

The modern computer took shape in the 1940s and 1950s; microprocessors in the 1950s; satellite communication in the 1960s. Later decades brought us personal computers, the Internet, smart phones and now a flood of new devices and tools, from sensors to microsattelites and everyday artificial intelligence embedded in phones and kitchen implements. Throughout this period Moore's law has been in operation, achieving dramatic improvements in capability at ever lower cost, an exponential pattern that is quite hard for our brains to understand, but gives us dramatic events like the defeat of the world champion of Go in 2016 by a computer using artificial intelligence, and the defeat of the world's best poker players in 2017.

Looking to the future, if the pace of change is sustained, we can, if nothing else, expect to be surprised, whether by the speed with which automated devices take over our jobs and lives, or by the emotional intelligence of robots, or by the dangers of new generations of virus, trolls or cyberattacks.

Making the best of this revolution has now become one of the greatest challenges for any society. Digital technologies have affected every area of the economy and much of daily life, from how we travel and shop to how we find partners. Every nation and every city has no choice but to learn how to master, and guide, the evolution of technologies to achieve the greatest payoffs in terms of prosperity and wellbeing.

But understanding the choices is hard. It's hard for a simple reason. The essential nature of digital technologies is that they amplify all of our capabilities – our ability to see and hear, to map and compare or to predict. As a result they can just as easily amplify the bad as the good. They can enhance the ability to kill as well as cure, to lie as well as inform, to abuse as well as to help. They can link people up and counter isolation – but they can also fuel loneliness. They can spread knowledge but also misinformation. And they can be a new tool for war – through cyber attacks of all kinds – as well as a tool for peace and understanding. They can strengthen rights and make it easier to fight back against oppressive regimes – but they can also undermine rights to privacy, rights of identity and rights of ownership. This is why the detailed design of everything digital matters so much, and why it is so wrong to assume that the technology has a deterministic effect. Instead the options are far more fluid, far more open to being shaped, than that implies. The future is something we can shape rather than being condemned to being passive observers. That's part of what makes this such an exciting time. It makes our era full of possibilities as well as fears.

The novel character of the challenges thrown up by digital technologies means that traditional institutions - whether science and technology funding agencies, government departments, universities or big firms - often struggle to adjust. Our experience at Nesta confirms that new kinds of institutions that can act more nimbly, work across boundaries and take risk are needed more than ever.

The dynamics of digital are very different from those of a more materially based economy. One aspect of their dynamics is that they change the rules about abundance and scarcity. The foundation of modern economics is scarcity. But information and knowledge can be replicated at low or zero cost. In many fields abundance is now the dominant fact and gives us apparently limitless access to information and choice. This creates its own problems, but they are very different to those of a previous era.

Thanks to these dynamics firms can achieve scale without mass – with firms like Google, Whatsapp or Weibo achieving phenomenal global scale at a very rapid pace and quickly becoming near monopolies. For governments of all kinds this poses major challenges – how to balance, constrain or contain the new patterns of power.

Another issue is that in a world covered with digital networks it becomes much more important to understand network behaviours and the many concepts of network science which better explain who has power, influence than the more traditional analysis of structures and hierarchies. Those with power may be bloggers rather than newspaper editors; insurgent political campaigners rather than traditional parties; start-ups rather than established firms. Leaders brought up on the concepts of a previous era find themselves constantly surprised.

Then there's the challenge that in a digital world feedback is much faster and richer. This makes it possible, and indeed necessary, to iterate and adapt. This is true in much of business where the dominant idea for start-ups is to quickly get to a 'minimum viable product' to test on consumers. But it also affects government. Policy becomes less like a one-off exercise, and more like continuous learning and adaptation.

Each of these is a challenge of mindset and approach as much as anything. Institutions and leaders of all kinds are having to learn how to 'think digital' – rather than just seeing the array of digital devices as just another group of technologies comparable to new materials or new production processes.

In the remainder of this piece I go into more detail to set out what this means, and how we can make sense of some of the challenges and tasks facing different areas of society, government and the economy.

Economy and business

Let me start with the economy. There are many estimates for the size of the digital economy, though its boundaries are increasingly hard to define. It's clearly affected every area of economic life, from manufacturing with the automation of factories, to logistics; retail; banking and every other field. Thanks to digital technologies every action in a factory or warehouse can be more precisely controlled and monitored. Feedback can be built in. Consumer demands can be linked more precisely to production schedules.

The result has been a revolution in everyday economic life. Automated factories became a commonplace in the 1990s and 2000s. Now Amazon employs over 30,000 robots in its warehouses. Japan's Softbank employs over 1000 Pepper robots to welcome clients to their stores. Every economic activity now generates a digital aura, traces of data, like the maps of mobile phone users' movements that now provide a better predictor of transport needs than any government.

It was often feared that these trends could only destroy jobs. Forecasters now warn of an escalation of jobs destruction with estimates ranging from nearly 50% in the US in the next two decades to more like 10%.

On the positive side studies of digital jobs show a steady advance, now as much in fields like food or hospitality as in software, and this is an era when the costs of starting a business have plummeted, giving us new phenomena like 'micro-multinationals', small multinational businesses run from bedrooms and kitchens.

It's impossible to predict with certainty what the labour market will look like in the future. But it seems likely that the jobs that will survive will be ones needing skills that are harder to replace with computing: ones with a higher proportion of creativity, social intelligence and dexterity (automation has been slow to handle some of the basic manual functions which humans find easy, from tying shoe-laces to walking over uneven ground).

As consumers we can gain much from the vast economies of scale and scope offered by digital technologies. These economies result from low to zero marginal cost industries. But precisely the same economies also lead to the rapid creation of quasi-monopolies, and the economies of scope that have allowed a firm like Amazon to branch into every area of retail, cloud computing and now the home. In the early days of the digital era the dominant firms were classic corporations, led by firms like IBM. But much of the digital economy has also been shaped by a very different confluence of factors. Silicon Valley grew up from the interaction of a strongly libertarian counterculture, huge public investment, primarily through the military; universities that encouraged spin offs; and a venture capital industry willing to lose a lot in the hope of a few gains. Together these encouraged a climate that's conducive to creating new compa-

nies and taking risks, helped by institutions that can help the best ones scale fast.

Although every attempt to replicate Silicon Valley too precisely has failed, there are now many hubs of digital dynamism around the world. New York increasingly challenges the west coast as do London, Berlin, Helsinki, Paris and Stockholm, Israel, Seoul and Singapore. Europe still lags behind in many ways – but it can increasingly point to large numbers of unicorns, clever business model design in firms like Rocket internet, and household names like Skype and Spotify. Cities and national governments have become increasingly adept at encouraging a dynamic start-up scene (helped by programmes like the Start Up Europe initiative), and providing incentives for venture capital to such an extent that access to capital is no longer the primary constraint. Governments have learned how to adjust rules; how to create hubs and incubators; and how to open up a dialogue between innovators and policy makers.

Part of the challenge has been to create new institutions. But as important is a mindset: a willingness to take risks, to iterate and adapt fast, and to learn by doing.

To maintain dynamism governments are then having to learn new tricks. One is how to reshape regulation to remove the barriers that stand in the way of very different business models. The idea of ‘anticipatory regulation’ means using regulation to help accelerate new organizational and business models. Traditional regulation aimed to be lawlike – rarely changing so as to provide predictability for business. But in the face of rapid changes in technology this model looks anachronistic. Instead what’s needed for emerging technologies like drones or machine learning is a more adaptive, iterative approach to rules, so that they can help nurture new models.

There are good examples of this from regulatory sandboxes in finance that allow new firms to test out how their ideas might work, and how they might interact with regulations, through government accelerators in the UAE that link innovators to policy makers, bringing in start-ups to work on reducing traffic congestion, road accidents or air pollution alongside with government officials. The Innovation Testbeds in Korea are another good example, using residential areas to speed up useful innovation in smart city and ‘Internet of Things’ tech-

nologies. There are also interesting examples of how many more people can be engaged in shaping regulations around emerging industries – like vTaiwan that used digital tools linked into the parliament to open up debate on decisions on issues like the regulation of Uber.

In a similar way public procurement can also be mobilized to aid newcomers with new ideas rather than privileging large incumbent firms – building on models like CitiMart which allows cities to purchaser outcomes rather than specified solutions. The key is to ensure that there aren't too many rules to block creative new entrants – like rules that prevent anyone without a five or ten year track record from bidding for contracts. Then there are the bolder moves which can change the whole economy but may also be introduced in an experimental way - like Sweden's commitment to switch off cash, and move to entirely digital monies; or the use of digital tools to raise taxes, for example through linking the payments systems of firms like Uber or Amazon directly into the tax authorities, as has happened in some cities and US states.

There are many unanswered questions. How should anticipatory regulation be organized or funded? How to ensure the right input from stakeholders? But this approach is a logical next step and part of a new armoury of tools for economic policy.

Some of the bigger challenges are then about how far to guide this economy. Should public policy care if people become addicted to clicks? If social media breed loneliness and depression? Different countries respond in very different ways. France, for example, has just announced a new programme to promote gender equality in start-ups – which may turn out to be a clever approach given the evidence on how much diversity fuels profitability.

In any event, what's certain is that economic policy will be much more data driven, and more empirical. It's now possible to map economic activity in real time thanks to combinations of public data, commercial data and web-scraping. Nesta's work on Tech Nation and Arloesiadur has shown how this can be done – and how it gives policy makers much sharper insights into emerging industries, jobs and clusters. The related trend is towards experimentalism. Just Amazon automatically tests out new service offerings with the use of control groups (A/B testing), so can governments test out methods for sup-

porting innovation and entrepreneurship, providing support to one group of businesses and using another group as a control: a much more rigorous way of finding out what really works. The Innovation Growth Lab which now brings together over a dozen countries is showing how this can be done, for example testing out the detailed design of science parks or the effectiveness of coaching support for small businesses.

Education for a digital era

What then do we need to learn to thrive in a digital era? Young people are avid users of digital technologies – from Snapchat and Instagram to Minecraft. But their risk is to be passive observers of a world being made elsewhere.

One drive in recent years was to invest in digital hardware, particularly in schools. In some countries huge amounts were spent on such things as electronic whiteboards. But without exception the results were disappointing. This was partly because, as in organisations, it's the combination of technology and new organisational models that has the impact not the technology alone. But it was also partly because digital hardware was being used as a patina of modernity, a symbol of being relevant to the future, rather than as a prompt for more fundamental rethinks.

In response to these mixed experiences some countries have put great effort into providing chances to learn and tinker, to promote different ways of learning rather than just expensive hardware. China has invested heavily in 'maker spaces' giving young people experience of making things, combining metal, wood and plastics with motors and processors of all kinds. Estonia has been investing in tech education since 1998, when all schools in the country went online, and has put a heavy emphasis on teaching coding skills to young children. This has helped to contribute to a dynamic digital economy, including firms like Skype now worth billions whose co-founder Taavet Hinrikus argues that one result is that school students now dream of being entrepreneurs rather than rock stars.

In the 2010s the UK put computer science in the national curriculum, and encouraged networks of clubs to give young people opportunities to be digital makers, helped by online resources and a big push from

the BBC. Nesta played a catalytic role in much of this – linking up big tech firms, government policy, and practical provision to make up for the relative weakness of schools, where teachers rarely had the digital experience and skills needed to help their pupils. More recently all around the world there has been a proliferation of new strategies to promote programming and coding.

But in many ways it's not the coding skills as such that matter (since these may soon be obsolescent and themselves be replaced by AI which can write and adapt code). Instead what matters is learning to think and act digitally. That's why the best of these educational models give young people experience of agency, making the world around them rather than just observing it. Project-based learning, entrepreneurship embedded into schooling – the sort of models promoted by HighTechHigh in the US, Lumiar in Brazil or Studio Schools in England – are a response to feelings of disempowerment. They are also aligned with what we know labour markets will be demanding in the future – with the likelihood of more demand for specialist digital skills but also more ability to work in teams, solve problems, and create (the subject of a major Nesta/Pearson project looking at future skills needs in the US and UK).

Germany has much stronger traditions of practical learning than almost any other country and so is in principle well placed to adapt these to digital era. The launch later this year of the Code University in Berlin is a promising move. But on a larger scale, for Germany as elsewhere, the challenge is to get the right mix of input from teachers and from practitioners in industry, the right mix of formal pedagogy and learning by doing.

While schools struggle to get the best from digital technologies, parallel challenges face universities. These are generally quite conservative institutions, and for some good reasons. Past predictions that the campus-based university would be wholly replaced by digital learning have not been borne out. The management guru Peter Drucker, for example, predicted that the traditional residential university would no longer exist by 2020. Instead investment in university buildings and campuses has soared.

But a flood of tools – MOOCs offering free courses, digital platforms allowing for assessment, measurement and adaptive learning, are

changing how universities work, and a large industry has grown up around edtech, with prominent companies like Coursera, Udacity and the Khan Academy. These are still finding their feet, have a mixed record (in terms of learning outcomes), and have made many mistakes (including many unnecessary ones that derived from a failure to learn from past initiatives in distance learning which had shown the importance of combining online and offline, self-directed learning and peer learning).

But it's a major problem that so few have come from Europe. Our universities have been observers and followers, rather than shapers. There are some exceptions – like the UK's Open University which has been a pioneer of distance learning at a very large scale for nearly half a century, and its offshoot Futurelearn which provides a platform for hundreds of universities and now has over 4m students. Many in Germany benefited from the courses provided by the Fern Universität Hagen, and more recently the attempt to create the i-versity. But Europe has invested very little in experimentation, and discovering which of the myriad new tools work best in improving learning.

Digital Health

Health is equally due for fundamental changes since digital technologies can transform diagnosis and prescription as well as management. The many projects Nesta has supported under the label 'people powered health' show what this can mean in practice: how to support self-management; peer to peer learning; and how digital technologies can amplify feelings of power over health, so that people with Parkinsons or Dementia can become more active in shaping not only their own treatments but also research and practice more generally.

There are now plausible alternative visions of future healthcare – with much less activity centred in large hospitals; much more care at home or at the workplace; much more use of technology, genomics; and much more mobilization of social resources to help. Within the next few years precise and rich information about patients will allow medical researchers to better understand how complex factors interact at an individual level. Sensors will be everywhere: air quality monitors, EEG brain sensors and molecular testing kit to find out whether an infection is bacterial or viral. This pervasive data collection already allows people to perform new kind of constant, mobile

health checks on themselves. It's akin to the dashboard, gauges and alarm signals in a car today, making it easier for patients and their doctors to track what is happening with their bodies.

Around that a stronger data infrastructure linking doctors and researchers will mean that genetic and other biological data, as well as day-to-day behavioural data, is part of decision-making in the clinic. Self-monitoring technology will be ubiquitous, and used by many to monitor their health. Digital patient portals will make healthcare truly personalised – offering people the chance to build their own interaction with the clinic.

Digitally supported public forums already allow people to debate health issues and challenge standard practices – encouraging them to generate and use their own data. But these have the potential to go far further.

The promise is that more pre-emptive or earlier treatment will reduce the burden of care, new kinds of treatment will respond to complex features of disease, the number of cycles of treatments will be hugely reduced, saving considerable time and money for each patient journey, improving quality of care at the same time. Meanwhile for many conditions it will be possible to identify subgroups of patients who all need a similar approach. Thanks to better sensors, acute care centre appointments should increasingly be made automatically, and when patients arrive at a clinic all of the detailed data about them will have been analysed ready to help diagnose them.

Much of this should be obvious. But the way healthcare is presented, and argued about in politics, often leaves the public as angry, disempowered observers watching on as hospitals are shut or services are changed, rather than as collaborators. The sharing of data is often seen through the prism of risk rather than opportunity. But the full benefits of digital in health will only be realised if anxieties about privacy can be addressed thanks to much stricter rules on misuse, so that data can flow more freely.

Denmark and the Netherlands provide instructive and very different examples. In Denmark, every citizen has had access to a health portal since 2003 – Sundhed. They can choose their services, participate in their own treatment choices and take part in 'chat rooms' where

patients and their relatives can meet others and consult health professionals. The portal provides the 150,000 Danish health professionals with information to make evidence-based decisions. At first 30 to 40 year olds used the service most. It is now used equally by 60–70 year olds. Although the two groups vary in the kinds of services they use. In comparison, after almost a decade and several hundred million euros, the Dutch parliament stopped the roll-out of digital health records in 2011 because of privacy concerns.

Digital Government

How should governments govern in a digital age? Many aspects of government are essentially about information and communication – assessing and then collecting taxes, planning cities, regulating industries. It's not surprising therefore that digital technologies have the potential radically to change how governments work day to day.

Most governments spend very large sums on their digital systems – providing secure communication, transactions with citizens and memory. But it's still the case that relatively few governments have used digital technologies to transform what they do. There are a few exceptions around the world. India's UID Aadhaar project has given a biometric ID to well over a billion people, and helped to transform financial services for poor people, reducing corruption and strengthening democracy. Estonia has innovated radically, giving people all over the world the right to become virtual e-citizens to start a business from Estonia. There are also stranger experiments like China's test of a 'social graph' that would record peoples' behaviours and give rewards and privileges to those whose behaviour is most pro-social.

But more often digital tools have been used to enhance the existing processes of government rather than to prompt radical rethinking of the kind that has seen business so transformed in sectors like retailing.

Governments sometimes aspire to be the brain of their societies. They put a head on coins, as a symbol of leadership and to remind people that they know more. They like to see and survey using any ways of mapping, observing, measuring and planning.

That was often an aspiration rather than a reality. But the state now has the capability to be something more like a true collective intelligence. In one direction it is being taken towards the panopticon – able to see, hear and analyse everything – a true Big Brother. These are the powers conferred by an internet that not only carries all communication between citizens, but also increasingly carries communication between things: registering where each car is, the temperature of each home. In this world the challenge for the state is how to keep track of the floods of data pouring into it, and how not to overstep the mark in its eagerness to know and become a monstrous Leviathan.

But there is also a very different kind of collective intelligence available to governments, a potential to collaborate with citizens to see, hear, analyse, remember and create. There are many good examples – for example of citizens generating data about air quality to help regulators; patients pooling data about their conditions; or members of the public helping to solve problems, like India's Smart India programme that encourages school children to help design solutions to problems facing government.

Today's continuing revolutions in digital technologies are changing the options for how government can make the most of these inputs, with new tools ranging from sensors and machine learning, to predictive algorithms and crowd-sourcing platforms. These technologies can amplify the intelligence of every aspect of government – from democratic deliberation to financial planning, disaster management to public health. They are contributing a denser informational aura around every activity – including traces, tracks and comments.

They certainly enable greater awareness, with floods of data pouring in from the public, from businesses and from the Internet and sensors. Many are experimenting with ways of tapping into more expertise and public ideas before policy is crystallised. In principle new inputs can help states be more empathic as well as efficient. This tends to be a blind spot for technologists and enthusiasts for new tools. But as Robert MacNamara – former head of Ford, the Pentagon and World Bank – pointed out, many of the worst mistakes states make derive from a lack of empathy.

Technologies can help to counter-act this risk. They can capture and survey feelings as well as material facts. They can provide space for

continuous feedback. Tools like Social Network Analysis can reveal the reality of relationships – for example who helps who in a local policing system.

To achieve these many shifts governments generally need to bring in new skills. The United States Digital Service for example brings in private-sector experts for “tours of duty” to redesign their federal products and services. They are trying to make this kind of consultancy into a patriotic act of citizenship. In a similar way the UK government digital service – GDS – tried to bring in private sector experts to design standardised tools for the public sector, saving millions in contracting costs. In every case, however, the biggest challenge is to encourage everyone at every level of government to think in a digital way.

Centres of governments

If governments are the brains, the central teams and units within national governments aspire to be the brains within the brain. Many include very clever people and their organisation has become ever more sophisticated – with Chancelleries, Cabinet Offices, executive offices, planning commissions and units. Some are tightly organised, while others are closer to the model favoured by leaders such as the US President Theodore Roosevelt, with competing agencies and power centres, blurred boundaries and often duplicate roles. None are as neat as the classic corporate organogram and there are important reasons why they shouldn't be.

It's become conventional wisdom that governments need to cope with more complexity, faster information flows and feedback and constant communication. But a close look at centres of governments shows that there has been relatively little serious innovation in recent years. There are many promising ideas, from Scotland to Singapore, Australia to Scandinavia, as well as pockets of innovation within big governments in London, Washington or Berlin. In Estonia the Cabinet has long met with screens instead of papers (part of a much broader programme of online government that makes it possible to complete tax returns in a day and set up a business in less than 20 minutes). The US federal government's challenge.gov site adapted the principles of open innovation to government and in the five years after its launch in 2010 was used by seventy agencies, vis-

ited 3.5m times and hosted 400 challenges. Nesta's challenges.org site works in a similar way, hosting challenges from the European Commission to private companies, and tapping into a far wider pool of ideas and creativity.

A fully digitised centre of government is still some way off – and will probably only come when a new generation of digital natives take over the top jobs. When it arrives it will pull in a much wider range of types of data; orchestrate collective intelligence; and structure tasks and projects across government in much more flexible ways, with temporary teams, horizontal structures and budgets alongside the traditional silos.

Such governments will be better at navigating the future. They may also be better at organising their own memory. Most governments are surprisingly poor at knowing what they know. But there are now many ways of greatly enhancing memory.

Part of the answer is to externalise their memory – publishing working papers, data, analyses so that these can be shared, or funding 'what works' centres that act as the memory for fields like schooling or policing. Within the system the answer is to make it a norm that all actions and policy work is done with shared documents that are easily searchable.

Digital Democracy

Our democracy remains mainly analogue. Indeed, seen in the long view it's amazing how little has changed. Democratic institutions today look much as they have done for decades, if not centuries. The Bundestag, Houses of Parliament, the US Congress, and some of the West's oldest parliaments have been largely untouched by successive waves of new technology. We still live in a world where debates require speakers to be physically present, there is little use of digital information and data sharing during parliamentary sessions, and, for example, UK MPs vote by walking through corridors in a building conspicuous for the absence of screens, good internet connectivity and the other IT infrastructure which would enable a 21st century working environment comparable to the offices of other modern organisations.

Almost every other sphere of life – finance, tourism, shopping, work and our social relationships – has been dramatically transformed by the rise of new information and communication tools, particularly social media, or by the opportunities opened through increased access to and use of data, or novel approaches to solving problems, such as via crowdsourcing or the rise of the sharing economy. But democracy has not.

Digital plays a big role in politics and campaigning; parties now target messages much more precisely, and invest heavily in social media campaigns alongside the traditional rallies and TV. But there has been much less use of digital tools in the everyday business of democracy. The lack of change wouldn't matter if democracy was clearly working well. But many argue that this gap between the way in which citizens go about their daily lives and the way in which politics and democracy are carried out has contributed to declining trust and confidence in democratic institutions. Large minorities in the US and Europe no longer see democracy as a good system of government, particularly young people.

So are digital technologies the answer, the way to get greater participation, better decisions, and more trust? Yes, and no. Over the last two decades, there have been thousands of experiments. In some areas, such as campaigning or monitoring the actions of MPs, there is a rich field of innovation, with myriad apps, platforms and websites gaining significant numbers of users. Petitions sites, for example, like Avaaz, can be found across much of the world in one form or another.

Other experiments have focused on areas such as participatory budgeting, opening up the problem-solving process for a range of social issues, to a focus on how digital can enhance the more traditional activities of parliamentary and democratic work, such as voting or case management. The reality has not lived up to early hopes and expectations. Although campaigning tools have mobilised hundreds of millions of people to influence parties and parliaments, the tools closer to everyday democracy have tended to involve fairly small and unrepresentative numbers of citizens and have been used for relatively marginal issues. Part of the reason is that the controllers of democracy effectively have a monopoly – it's up to them whether new methods can come in; a pattern very different to consumer markets.

The reformers have also made mistakes. Often they have been too linear and mechanistic in assuming that technology was the solution, rather than focusing on the combination of technology and new organisational models. They have failed to learn the lesson of the 1990s that democracy is a cluster of things, including media, civil society, and habits of compromise, as well as formal mechanisms of voting.

And many were insufficiently attuned to the very different ways in which different types of argument and debate take place, some framed by interests, others by very technical knowledge, others still very much framed by moral positions.

Some of the experiments have also run into the same problem as social media – a tendency to polarise opinions rather than bridge divides, as people gravitate towards others who share their political affiliations, as false information circulates, and dialogue hardens against opposing positions rather than helping people to understand different views. The current debate on filter bubbles has brought these issues to much greater prominence. Our recent report 'Digital Democracy: The Tools Transforming Political Engagement' shares lessons from Nesta's research into some of the pioneering innovations in digital democracy which are taking place across Europe and beyond, as well as our practical work in countries like Finland, Iceland and Spain, testing out new democratic tools.

Our aim was to address two main questions: How and to what extent are digital tools being used by parliaments, municipal governments and political parties to engage citizens to improve the quality and legitimacy of their decision-making? And, what can be learned from recent digital democracy initiatives about how to get the most from digital tools and create an effective platform for participation? The case studies from countries including Brazil and Taiwan, France and Canada, look at initiatives that aim to engage citizens in deliberations, proposals and decision-making. We've learned that most of the best examples combine online and offline; that they break democracy down into stages, so that understanding and diagnosis precede prescription; that they encourage people to engage with others who disagree with them rather than just expressing views; and that they tap into expertise as well as opinion.

These don't yet add up to a comprehensive blueprint for the future. But they do point very clearly to what should be part of the strategy of every democratic institution, from parliaments and municipalities to parties – conscious experiment and evolution of a digital strand in everything they do.

Data and the Internet

The management of data isn't yet at the top of the political agenda. But it's an issue that is bound to become more central – partly because data now plays such a big role in the economy and partly because it has become so central to the ways we live our lives.

The Internet and world wide web were born out of the hope that they could, in the words of Tim Berners Lee, be for everyone. An open, free and shared resource. Some of that original spirit survives but much of today's reality is very different.

Power has been consolidated in a very small number of commercial firms. Amazon intermediates our relationship to products; Facebook our friendships; Google our relationship to information. They've grown huge thanks to business models that rely substantially on how they use and sell your data, and network effects which mean that the ones that first became big then tended to become enormous, because the marginal cost of another user was so much lower for them than for their competitors. That's why we live in a world where the dominance of the big Silicon Valley firms is so much greater than their equivalents in previous industrial eras.

As consumers we've done well out of a deal that offered us free services in exchange for handing over our data. But such consolidation of power is problematic in all sorts of ways. Our most important infrastructures are now unaccountable, driven by incentives that are often against our interests (we're not their customers, but rather a commodity which they sell). We have very little control over our own data. Meanwhile, much of the potential value of the Internet is not being realised because it doesn't fit the dominant business models.

That's why the search for very different models of the internet is bound to become more prominent over the next few years, and will involve power. How can the citizen control more of the data that

matters to them? How can these great new infrastructures be more accountable? Part of the answer will lie in new structures to protect and share data – for example through various forms of data commons that can build public trust that their data is being appropriately used. The EU is developing plans that would young people to delete their internet history aged 18, saving them from the anxiety of a childhood in full public view, and broader rights to be forgotten and to inspect algorithms.

Here we come up against the bigger challenge of privacy in a networked era. A world in which it's much easier to gather, share and distribute data of all kinds can be a nightmare for privacy. Edward Snowden's NSA revelations fuelled a growing perception that the big social media firms are cavalier with personal data. Data breaches from government agencies and big firms are increasingly common, and often on a huge scale.

According to some this doesn't matter. Scott McNealy of Sun Microsystems famously dismissed the problem: 'you have zero privacy anyway. Get over it.' Mark Zuckerberg claims that young people no longer worry about making their lives transparent. We're willing to be digital chattels so long as it doesn't do us any visible harm, and most of the time it's worth getting free Internet services in exchange for providing our data.

But will this last? It seems unlikely as people become more aware of just how vulnerable they could be when not only their phones but also their homes and cars could be hacked. The head of the US National Security Agency, Keith Alexander, called cybercrime the biggest transfer of wealth in history. One attack on JP Morgan, for example, stole the records of nearly 80m households and 7m small firms.

In response we will almost certainly move into an era of stricter rules and enforcement, and much greater attention to both privacy and cybersecurity. There are close parallels to what happened to public health in the 19th century when the world became much more aware of the risks of infection, and introduced not just new laws and rules, new inspections of food and water, but also new habits of personal cleanliness and care washing hands.

We should expect ever stronger rights to privacy and control over data. But this route is likely to be ever harder to police and technological advance may make it ever easier to track people down and find identity. Another route will lead to stronger security by design, with software shaped so that it is entirely clear who has accessed, written or changed any item of data, through 'verified audit trails', and more stringent penalties for abuse. Again there is a parallel with public health in the 19th century when new rules developed in parallel with new technological solutions – sewers, water cleaning systems and so on.

The Fourth Industrial revolution reoriented to needs that matter

These questions over the future of data intersect with where our economies are heading strategically. One useful way of thinking about this is the idea of a fourth industrial revolution, which has been in play for 20 years, and was crystallised in the German governments' notion of Industrie 4.0. These terms usually refer to a convergence and interpenetration of digital technologies, bio, nano, info and things. It's a catch all for many different technological trends – from prosthetic devices to the Internet of Things and new models of advanced manufacturing.

On the present trajectory the 4IR promises great benefits. But it also risks leading to a widening divide between vanguards and the rest, accelerating job destruction ahead of job creation; and introducing potentially big threats to personal privacy and cybersecurity.

Most of the investment and inputs that are shaping the development of 4IR technologies are coming from the military and traditional industries, and some of the most visible ideas associated with the 4IR reflect the problem that so many resources are spent addressing trivial needs rather than fundamental ones (symbolized by fridges that tell you when you need to buy more milk and juice).

So how could this path be shifted? How could the benefits of extraordinary new technological possibilities be spread more widely? How could many more people have the opportunity to be makers and shapers, entrepreneurs and innovators, of this revolution rather than passive observers?

Some of the answers lie in using the powerful new platforms of the 21st century to use resources far more efficiently. The existing sharing economy models point the way: not just the commercial variants like Uber and AirBnB but also many more citizen owned ones like Peerby and Streetbank, or the cooperatives being promoted in Bologna. We've shown how similar ideas can be used in the public sector – for example to mobilise volunteer emergency services to enhance the health service (as in GoodSam, the app supported by Nesta that is now in use all over the world to mobilise skilled medic volunteers to reach patients faster than ambulances can).

In principle platforms of this kind can greatly increase utilisation rates across society and the economy – mobilizing not just things (such as land, buildings or vehicles) but also people in more efficient ways. But to get there requires fresh thinking about regulation, about supply chains, taxation and law. It takes us to new ideas like Sweden's recently introduced tax breaks for maintenance of goods – an attempt to shift the economy away from waste, while also creating jobs; and to some of the technological possibilities around blockchain. But the promise is an economy that can create value, and opportunities, for many more people than before.

Collaboration and connection

A final conclusion is that a digital world of multiplying connections is also one where the ability to collaborate and connect well becomes increasingly critical. This seems to be one of the keys to thriving: the ability to foster patterns of connectedness – whether for universities and business, investors and start-ups. Nesta's research on innovation and entrepreneurship in the world's great cities – published as *citie.org* – showed that a key attribute of the most successful cities is the quality and extent of these connections that then allow flows of money, information and people.

There are many instructive examples to point to. The long-term success of Silicon Valley relative to Boston is sometimes attributed to the greater flows of people between firms that helped ideas to circulate more rapidly. Israel – which achieved a remarkable resurgence of digital industries in the 2000s, largely fuelled by military spending, is another example, and has more recently pioneered a collaborative approach between businesses, investors and venture capitalists, uni-

versities and the military to keep them secure from cyberattacks, a good example of using the positive power of connections to protect against the negative power of connectedness. Across Europe's leading cities for the digital economy key factors include the strength of links between innovators and policy makers and regulators which make it more likely that the latter will be willing to adapt rules to support newcomers as well as incumbents.

A more general conclusion is that the ability to navigate openness, and manage a complex web of relationships, is an important attribute for children to learn; for institutions that wish to stay prepared for change; and for places. Indeed this ability to forge supportive relationships is probably the most important skill of a digital era: vital for a young person wanting to get on in the world, a refugee looking for work or for an older person wanting a circle of support around them. It's not the quantity of links that matters so much as the quality. You can have thousands of Facebook friends but no one to turn to in a crisis.

Understanding this, and shaping our policies to reap the best relationships, may be a key to the future economy as well as to a future society that is brought together by digital rather than pulled apart. After all, the future should not be something that is done to us, where we are passive observers on a journey that has already been determined by others.

Instead we should see the future as something that we can, and must, actively shape so that it gives us the best and not the worst.

THE AUTHOR

Since 2011, **Geoff Mulgan** has been CEO of the British innovation foundation Nesta (*National Endowment for Science, Technology and the Arts*). The politically independent, charitable foundation finances, tests and promotes new approaches that tackle the big challenges of our time and ensure that innovation benefits everyone. Nesta partners with other foundations, governments and corporates across the world on innovation training, impact investing, challenge prizes, trials and futures research.

Born in 1961, Geoff Mulgan holds a First Class degree from Balliol College, University of Oxford, a Ph.D. in telecommunications from the University of Westminster, and he was a Fellow at the Massachusetts Institute of Technology. Between 1992 and 1998, he was co-founder and director of the London-based think tank Demos. From 1997 to 2004, he occupied various positions within the British government: He directed the government's Strategy Unit and was also the chief of staff in the Prime Minister's office. He was chief adviser to Prime Minister Gordon Brown. Between 2004 and 2011, he was chairman of the Young Foundation, a leading independent center for social innovation.

He has been advising governments and organizations worldwide for many years. Since 2016, he has been presiding over a group that is engaged with innovation and entrepreneurship in the fourth industrial revolution at the World Economic Forum in Davos. A member of the board of directors of the French government's digital agency, Geoff Mulgan was also a Senior Visiting Fellow at Harvard University's Ash Center from 2015 to 2018. He has written several books and has trained as a Buddhist monk in Sri Lanka.



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