

JUNE 2017

POLICY CHOICES FOR A DIGITAL AGE

TAKING A WHOLE ECONOMY,
WHOLE SOCIETY APPROACH

DISCUSSION PAPER



This publication is part of Friends of Europe's work on digitalisation and the 4th Industrial Revolution, undertaken in the framework of our New Economic Models programme. It brings together the views of Friends of Europe's large network of policymakers, scholars, civil society and business representatives on digitalisation and the 4th Industrial Revolution. It closes a series of three high-level working group meetings that Friends of Europe organised in 2016 – 2017 to explore the impact of the 4th Industrial Revolution across policymaking, industry and society.

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FOREWORD



PUTTING EUROPE AT THE CUTTING EDGE OF TECHNOLOGICAL PROGRESS

Digitalisation is rapid and accelerating, with innovation changing the way that we design, produce and generate value from products and related services. We are moving towards a digital economy and society.

And since industry is the main driving force of the European economy, it will have to turn more digital to keep up with an increasingly digitised world.

Europe has all the elements needed to make the digitalisation of its industry a success - combining technologies such as artificial intelligence, robotics, big data, cloud computing and the 'internet of things' to develop the products and services of the future.

Many companies, especially those in the high-tech sector, are already taking advantage of these new digital opportunities. But many traditional sectors and small and medium-sized enterprises (SMEs) lag behind.

To make matters worse, there are large differences between EU countries and regions that risk creating a new 'digital divide'. This is something that we have to actively guard against, because it could be detrimental to the overall economic development of Europe.

The European Commission aims to make sure that every business in Europe - whichever the sector, wherever the location, whatever the size - can draw the full benefit from digital innovation.

This is the objective of the Digitising European Industry strategy, which complements and builds on national initiatives and is part of our broader plan for building a digital single market (DSM) in Europe.

This idea is to focus on adding European value – for instance by supporting digital innovation hubs, digital industrial platforms and digital skills, and by reducing regulatory barriers.

Better alignment of national strategies on digitising industry is an important aspect of Europe's future competitiveness. At the moment there are 15 national strategies on digitising industry, with six more expected before the end of this year.

Innovation hubs, for example, will help SMEs to adopt the newest and most suitable digital technologies. They connect businesses to the latest digital technologies and innovative suppliers; they provide expertise as well as access to state-of-the-art test and experimentation facilities.

Digital industrial platforms will act as glue between different technologies and applications. They can facilitate data exchanges, provide common or standard functions, and contain repositories of good practice.

With digital skills, there is a clear need to prepare society for digitalisation. People need to feel that they can cope with the challenges ahead. This is not only about filling existing jobs; it is about making sure Europe has enough digitally skilled workers to fill the many new jobs that the DSM will create.

We know that in the near future 90% of jobs are expected to require some level of digital skills since ICT is not confined to a specific sector and cuts across the entire economy. But in Europe today, one-third of all workers and employees have an insufficient level of digital skills.

Several EU schemes already help people to develop the right digital skills, along with re-skilling and up-skilling as needed.

The most recent of these is the Digital Skills and Jobs Coalition, designed to develop and expand the pool of European digital talent. It will help to provide people – young and old, employed and job-seekers – with the skills that they need to use digital technologies and be able to apply them in a working environment.

Going digital is a complex operation and almost every aspect of our lives is affected.

I am sure that digitalisation will be a huge success for European industry and European businesses.

This is our objective in the DSM strategy: to keep high-quality industrial activities in Europe and to maintain their relevance in the global economy and marketplace.

Our approach aims to give European industry the chance to be at the cutting edge of technological progress: to get ahead, to prepare for the future by removing the barriers of the past and present.

This report is a welcome contribution to the ongoing policy debate on digitalisation, and explores the many legal, economic, social, cultural and moral questions that need to be addressed as we move into the exciting era of the 4th Industrial Revolution.

Andrus Ansip

European Commission Vice-President for the Digital Single Market

OVERVIEW

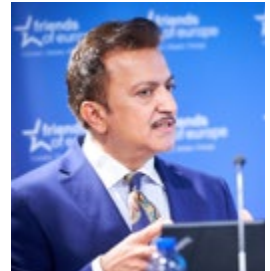
THE SUCCESS OF THE 4TH INDUSTRIAL REVOLUTION DEPENDS ON US ALL

Over the past year Friends of Europe has crowdsourced ideas, opinions, insights and experiences from policymakers, industry and civil society, to think deeply about the implications of the 4th Industrial Revolution. We convened three high-level working groups.

These groups were not static in membership and were very much open-source in nature, to ensure that we reached diverse, provocative and cutting-edge views. We posed questions that we felt would help us devise a set of policy choices that take a ‘whole economy, whole society’ approach to understanding how we prepare, plan for and take advantage of a digital age.

The future is arriving much faster than we thought it would. Ten years ago, the iPhone came onto the market. Now a whole generation is tablet-savvy even at the age of two, and billions of people across the globe communicate, socialise and trade online. Our consumption habits have dramatically changed, whether they relate to goods, services, information or political messages. Governments and public services are becoming increasingly digitalised. Hacking, cybersecurity and leaks are changing how we think about safety, privacy and security threats.

We have found ourselves unprepared for much of this. We have regulated on the hoof or allowed market forces to lead the way. These approaches reflect the inability of policymakers to pause, learn and think through the longer-term implications of a rapidly changing digital atmosphere. Friends of Europe wanted to create



space for deliberation on the consequences of digital age and the choices these present us with.

This Discussion Paper highlights key trends, developments and issues across all layers of the digital ecosystem. It aims to highlight public policies and private sector decision-making that affect our future. It is intended to crystallise feedback from all the discussions and conceptualise developments and trends over a select range of topics, providing context and analysis that will serve as a resource for actors seeking to learn more about existing solutions and approaches to some of the most pressing issues in the digital economy.

Each of the chapters captures in a concrete way the key challenges and recommendations related to one of the dimensions of the ecosystem. Drawing from national and EU-level dialogues on digital strategies, we highlight good practices to accelerate the benefits and manage the risks of the digital economy.

Some of the chapters include measures that effective countries and regions used to implement their agendas and discussion on the strategies, frameworks, stakeholders and resources needed to achieve the intended outcomes.

Others cover the expanding role of the private sector in developing national and regional digital strategies – including motivations, resources and operational parameters of the stakeholders. The paper highlights some of the existing European initiatives at the nexus of innovation and technology governance, cooperation and civic engagement.

Drawing on the broad community of policymakers, industry leaders, entrepreneurs and civil society representatives, we strive to offer analysis on a range of key questions, identify common themes, build on the key points and highlight emerging trends relevant for decision-makers.

The Paper serves as a forward-looking guide to critical questions on the state of the global and European digital economy, identifying key actors, opportunities and solutions to overcome implementation barriers. It should be viewed as a platform for identifying areas of interest and collaboration, a tool to strengthen strategic planning, and an instrument for robust understanding on how the digital technology is transforming politics, society and economy.

Primarily focused on Europe, many articles draw parallels between the United States and the European Union – as well as other parts of the world – with the aim of better understanding policymaking for public authorities and investment opportunities for the private sectors.

Throughout the chapters, we notice examples highlighting the economic gains driven by technology, paired with great enthusiasm about the social transformation it is bringing. Consider, for example, the two per cent of GDP that Estonia saves through its groundbreaking approach to digital signatures, or BlaBlaCar's framework for building trust among its users.

Aligning various trust vectors arguably has been the greatest success of the European integration story. All stakeholders need to realise that similar exercises now need to be applied to cyberspace. Governments' role in nurturing healthy digital ecosystems is hard to overstate, even if many entrepreneurs are put off by a different model of applying and reporting regimes that may distract them from solely focusing on the product or service they are working to launch. And with a growing abstraction of many of the skills necessary for the incoming workforce, educational institutions will come under stress.

Earlier industrial revolutions required new types of talent to be developed to succeed in the new environment. Human and technological progress always went hand-in-hand as long as academia responded by introducing new fields of studies that prepared us to collectively face challenges and opportunities offered by the emerging technologies.

At the moment, the traditional model of supply-driven knowledge provision, designed in a world where knowledge was scarce, is increasingly under stress in data-rich world, where information is abundant, attention spans short and young workers and employers prefer demand-based, real-time, continuously delivered skills-building modules.

Europe is the birthplace of universities. It now has a chance to become the birthplace of the new approach that is much more iterative, real-time and demand-driven. There are early signs of it as some of the top postgraduate degrees in the most interesting emerging technologies are being granted by European schools (such as postgraduate degrees in the digital currency, or the internet of things).

The traditional methods of economic value creation and consumption are being challenged by new technology-enabled business models and social interactions. All industries increasingly rely on digital channels for their internal operations, as well as interactions with their partners. Entities that have never been thought of as core technology players now have to deal with issues that lie outside of their areas of expertise or comfort.

Consumer behaviour caused by market hyper-segmentation and unprecedented levels of customisation has shifted towards more empowerment fuelled by information flows and an abundance of choices.

As a keen observer goes through the chapters, it becomes very clear that the key opportunity for the EU's Digital Single Market strategy is developing flawless interoperability that would drive transaction costs down. Here we are not just talking about economics. We speak about technical, institutional and individual interoperability that would allow productive flows of data, talent and resources across Europe.

At the moment, all our policies and regulations continue to be largely based on the notion that technological development will continue to be driven by human or human-controlled ecosystems.

With the advent of the artificial intelligence (AI) and the convergence of various technological platforms, we may increasingly need to deal with the situations of technology development that are less design-heavy and more evolution-inspired.

So of particular importance are chapters that touch upon algorithmic governance (governance by and of the algorithms) that explore critical issues around the role of algorithms in influencing our daily lives. The authors touch upon the differentiated roles and responsibilities of public authorities and private actors in building norms on privacy, surveillance, security and safety civil liberties online in the era of AI and blockchain-enabled solutions.

Overall the authors remain very upbeat about the potential of digital technology, preferring to talk of ‘enabling’ rather than ‘disruptive’ technologies. They encourage us to focus on outcomes rather than processes as this often helps to advance the notion of tech neutrality.

The contributions to this paper set out how Europe can lead the way on digital by taking a ‘whole economy, whole society’ approach. The policy choices offered in this paper provide a framework to enable governments, industry and civil society to reap the benefits and manage the risks of the ongoing digital transformation. We should not lose sight of the fact that digitalisation is a process.

The web has created a once-in-a-generation opportunity to change how we think about power and power-sharing. This has had a democratising effect at a number of levels and this discussion paper urges us to be thoughtful about the kind of society we want to live in and pass on to future generations. This is the outcome that we should be focusing on.

Dharmendra Kanani

Director of Strategy at Friends of Europe

PART 1

RETHINKING ECONOMIC MODELS – GDP OR DATA



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Moving **beyond** the balance-sheet economy



Economists typically treat the national, regional and global economies as one large balance-sheet. But digital is different

Michael Mandel, Chief Economic Strategist, Progressive Policy Institute

In 2016 the United States exported to Europe US\$598bn worth of goods and services, and imported \$698bn of goods and services. Minus some statistical discrepancies, European countries recorded the inverse flow of imports and exports.

For the past century, economists and policymakers have relied on this ‘balance-sheet’ approach to economics to guide their decisions. One country’s exports are reported as another country’s imports. One company’s production shows up elsewhere in the economy as consumption, or investment, or inventories. The output of the world is the sum of the outputs of the individual countries.

The balance-sheet approach to the economy is well-suited to the physical world. Go back 100 years, and the economies of industrialised countries were composed of physical objects that we could easily count: millions of cases of canned American corn; millions of hectolitres of French wine; millions of metric tonnes of German coal; thousands of long tonnes of British steel ingots. These were tangible and real economic outputs.

In the 1930s and 1940s policymakers needed to get a picture of the whole economy, including the growing service sector. Economists extended the balance-sheet approach by using flows of money—sales, purchases, income,

***Data is non-rival.
Unlike cars or homes, data can
be duplicated and shared
at a relatively low cost***

investment—as indicators of economic activity. These flows of money were added together to get gross national product, or GNP (which later became gross domestic product, or GDP). To simplify, the output of the economy was the sum of consumer spending, plus business investment, plus government spending on goods and services, plus net exports.

This adding-up process underlies the way that economists think about not just national economies, but the global economy as well. When Eurostat publishes its figures for the output of the European Union, or the International Monetary Fund calculates the output of the world economy, those organisations are adding together the output, calculated in monetary terms, of individual countries.

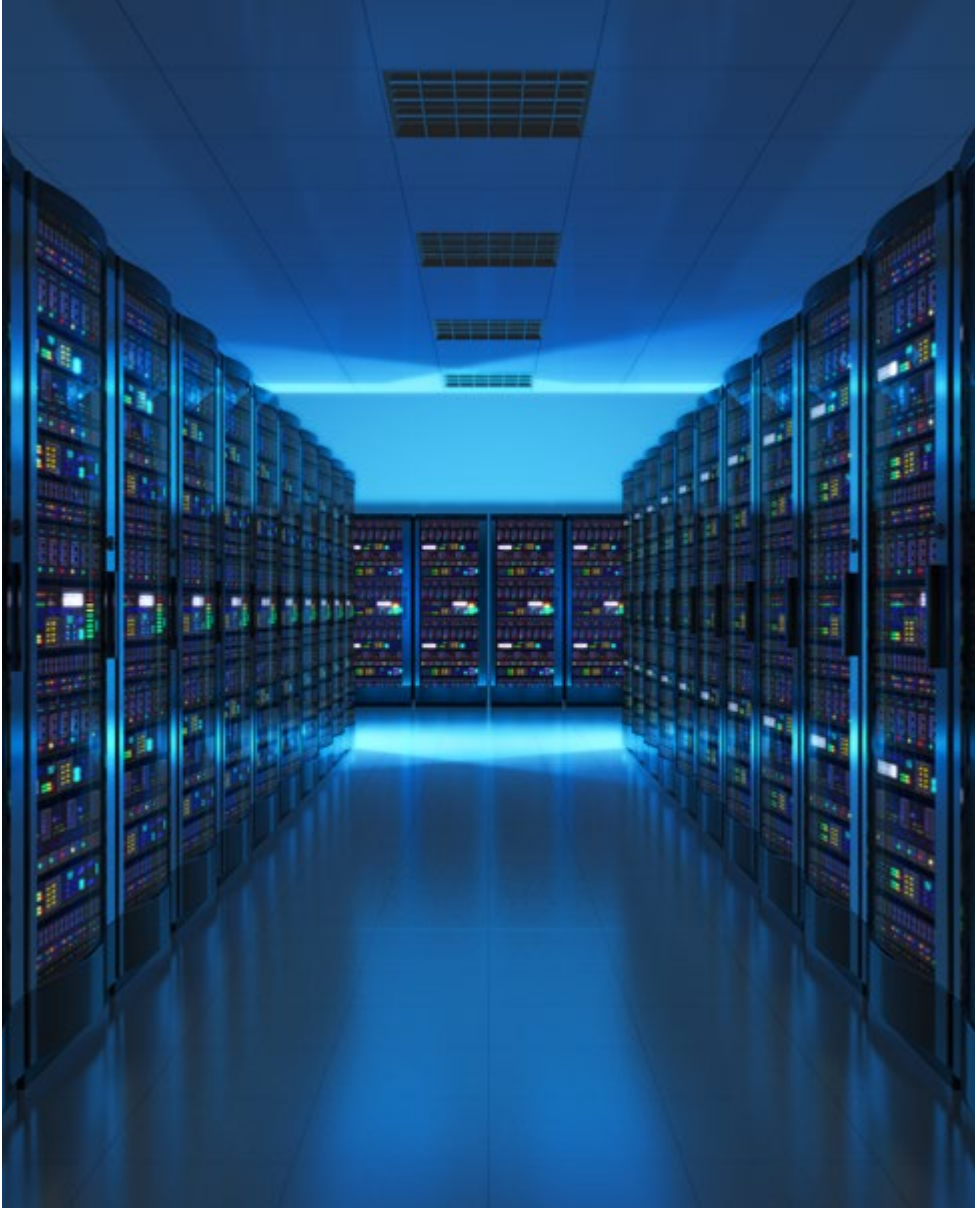
In an important sense, economists typically treat the national, regional and global economies as one large balance-sheet. By assumption, production of goods and services has to balance with the various uses of those goods and services in the public and private sectors.

But digital is different. As data becomes more important to the global economy, it increasingly bends (and perhaps breaks) the assumptions underlying the balance-sheet view of the economy. For one, many important services in the data-driven economy are not matched by a monetary transaction. Consumers don't pay to use Facebook or Google Search, for example. Wikipedia is free to use, as are many mobile applications. Erik Brynjolfsson and Andrew McAfee write that “the gap between what we measure and what we value grows every time we gain access to a new good or service that never existed before, or when existing goods become free as they so often do when they are digitized”.¹

Compare, for example, mailing a letter versus sending an email. If you send five identical letters to five recipients, each letter requires a stamp, physically attached to the envelope. But the transmission of an email from a sender to five recipients does not necessarily leave a monetary footprint at all. An email from Washington to Brussels may pass through several different internet service providers (ISPs) en route to its destination. Each of the ISPs has to decode the address to pass it on to the next stage of the email's journey. But often no money changes hands, since the largest ISPs – known as Tier 1 providers – typically exchange data traffic through ‘settlement-free peering’, which involve no payments.² As a result, we cannot use monetary transactions as a guide to economic activity.

1 Erik Brynjolfsson and Andrew McAfee. 2014. 'Beyond GDP: How Our Current Metrics Mismeasure the Digital Economy'

2 Accounting rules generally do not require telecom companies to report settlement-free peering as a paired income/expense barter item.



It is wrong to think of data like oil, where there is only a limited supply laid down millions of years ago. Instead, data proliferates at an exponential rate

But the increased importance of data poses an even more fundamental challenge to the balance-sheet view of the economy. Remember that data is non-rival. That means unlike cars or homes, data can be duplicated and shared at a relatively low cost, so the production of data does not have to be balanced with the uses of that data.

To give the simplest example, a program to teach coding can be developed once and duplicated and shared as many times as there are potential students. Similarly, information on how to produce a refrigerator or a computer can be summarised, duplicated and shared at a very low marginal cost. Google Maps, a resource which is costly to produce and maintain, can be used by multiple people across the world simultaneously.

In his widely-cited 2016 report on the UK statistical system, Sir Charles Bean writes:

“Once in digital form, data can be copied many times, often at essentially zero cost, while ownership rights might often not apply. Therefore, imputing the value of databases from their costs is likely to understate the true value of the data to all its users. Moreover, new and more valuable databases can often be created by merging or recombining existing data sources.”³

So it is wrong to think of data like oil, where there is only a limited supply laid down millions of years ago. Instead, data proliferates at an exponential rate. And data generated in one country can be duplicated and shared with other countries. What matters is not so much the access to the data, but whether a person or country has the capability of using it.

If we are to understand the global economy – and especially if we are to understand the fundamental connections between the United States and Europe – the balance-sheet concepts of production, consumption and trade need to be augmented. We measure output of goods and services, but we don’t measure the data created and how it is put to use. We measure how much consumers spend, but not how the value of their time changes. We measure the flows of goods and services between the two regions, but we don’t measure the duplication and sharing of intangibles, and how effectively they are used.

The issue of measuring the value of cross-border

³ Bean, Charles. 2016. 'Independent Review of UK Economic Statistics.' <https://www.gov.uk/government/publications/independent-review-of-uk-economic-statistics-final-report>

flows of data has received much attention in recent years. The United States International Trade Commission (USITC) undertook a comprehensive effort to measure and evaluate the economic impact of digital trade. The McKinsey Global Institute has explored the economic impact of cross-border data flows. The US Bureau of Economic Analysis (BEA) reports on trade in ICT services and potentially ICT-enabled services.

Yet many unanswered questions remain. First, an unknown but potentially large proportion of cross-border data flows do not show up in the export and import statistics because they do not leave a monetary footprint. In the US the BEA tracks service sector exports and imports by surveying companies. They are asked if they have paid money to or received money from foreign persons for services or use of intellectual property. If no money changes hands, the BEA does not record exports or imports, even if the data crosses national borders. For example, even if millions of people use a free game app (such as Pokemon Go) with a server in a different country, there is no trade recorded.

Even when money changes hands, cross-border data flows typically do not fit neatly into export-import national income categories. The fundamental (simplified) national income account identity is:

gross domestic purchases = gross domestic product – exports + imports

But since data can be duplicated at a relatively low cost, it's not clear whether the 'export' of data reduces the amount of output available to be used domestically.

We might consider the fundamental economic operations of cross-border data flows to be duplication and sharing rather than exports and imports. Then we would talk about 'global connections' rather than 'global trade'. This approach would also require rethinking the meaning of global GDP, since it would no longer be enough to simply add up the GDP of individual countries.

Indeed, the lack of good data on the economic value of cross-border data flows increases the odds of mistakes in trade policy, tax policy and macroeconomic policy. For example, trade negotiators are more likely to focus on better-measured industries, such as agriculture, because so many of the benefits of cross-border data flows are unmeasured. Tax policy changes to increase short-term revenues from cross-border data flows may do long-term damage that is not recognised because of a lack of measurement.

How does digital reframe the way we think about consumption and living standards? First, in the digital age we use online services – email, search, social media, apps – that are provided for free, while saving us time. Valuing those is difficult.

But that's only part of the story. In the US, our recent research shows that digital industries – such as online businesses, finance and professional services – make up only about 30%

The lack of good data on the economic value of cross-border data flows increases the odds of mistakes in trade policy, tax policy and macroeconomic policy

of the economy.⁴ Physical industries, such as manufacturing, transportation and healthcare, still make up 70% of the economy.

Yet increasingly the products being provided by the physical industries are taking on a digital dimension. Take e-commerce: it turns out that consumers don't simply want to order goods online – they want immediate or near-immediate delivery. Speed of response is essential.

That's why Amazon and other retailers are building hundreds of 'fulfillment centres' in the US and around the world, close enough to consumers to offer next-day delivery. In the US, the growth of e-commerce and 'fulfillment centres' has added roughly 400,000 jobs from December 2007 to May 2017, more than enough to balance out the 76,000 full-time-

equivalent jobs lost in brick-and-mortar retail.⁵

How can e-commerce be creating jobs? The key is that the ability to order online and have items delivered rapidly is saving consumers the time it takes to drive or walk to the store, shop and return. This time – which in the US roughly accounts for more than four hours per week per person – is not measured as part of GDP. But if it were measured, we'd see that the productivity gains from e-commerce are a win-win-win for consumers, workers and the environment: less time spent shopping for consumers, more and better-paid jobs for workers, and less impact on the environment, as the car parks full of cars at shopping malls, each with one or two packages, are replaced by a much smaller number of delivery trucks carrying many items.

More and more, the data-driven economy will place a great value on time, and the quality of time. That will inevitably lead us to treat leisure and life expectancy as an essential dimension of living standards. In the US this shift is starting to happen, as economists have realised that the rise in death rates for certain groups played a big role in the 2016 presidential election.⁶ Indicators such as life expectancy can be monetised and included as part of output, which would very much change how we compared different countries.

4 Michael Mandel and Bret Swanson. 2017. 'The Coming Productivity Boom.' <http://www.progressivepolicy.org/wp-content/uploads/2017/05/TCC-Productivity-Boom.pdf>

5 Michael Mandel, May 2017, 'Update on ecommerce and brick-and-mortar retail jobs,' <http://www.progressivepolicy.org/blog/update-ecommerce-brick-mortar-retail-jobs/>

6 Joel Achenbach and Dan Keating. 2017. 'New research identifies a 'sea of despair' among white, working-class Americans' - Washington Post, 23 March 2017

Despite the rise of the data-driven economy, both the US and Europe share the problem of slowing productivity growth. In 2015 the OECD published a massive analysis entitled ‘The Future of Productivity’.⁷ The study’s main finding was that “the main source of the productivity slowdown is not so much a slowing of innovation by the most globally advanced firms, but rather a slowing of the pace at which innovations spread throughout the economy: a breakdown of the diffusion machine.”

In other words, the data or information about how to boost productivity is available, but just not being used widely enough. What matters is not simply productivity, but absorption. Absorption is not a concept that is familiar in the traditional balance-sheet economy. In the conventional view, a national or regional economy has a certain amount of resources available, which are either being used or not used. Economies reach their potential when their resources are fully used.

In today’s world we have a near-limitless capacity to duplicate and share data. Factory plans can be easily reproduced, and cloud computing capacity can be easily accessed no matter where you are located. But it turns out that some countries are better than others at absorbing the information and making use of it. The OECD report enumerates several different ways a country or a region can improve its ability to make use of global data. These include:

- Extending global connections via trade, foreign direct investment, participation in global value chains, and the international mobility of skilled labour
- Experimenting with new technologies and business models
- Increasing flexibility and allowing labour, capital and skills to flow to the most productive firms
- Creating the capability to make the best use of new technologies by investing in R&D, education and skills, and organisational know-how

Duplication, sharing and absorption mean that Europe and the US could share in the production of knowledge, boosting growth rates on both sides of the Atlantic. One could specialise in creating new manufacturing techniques, and the other in creating new forms of biotech. By combining efforts, their ability to boost output could go up exponentially.

But we must also provide some somber historical context. The driving forces for developing the national income accounts were first the Great Depression, and then the Second World War. During the 1930s, economists had made progress in developing standards for GNP, wrote James Lacey, but “it took a policy requirement (the requirement for economic information during world war) to push the

⁷ OECD. 2015. ‘The Future of Productivity.’ <https://www.oecd.org/eco/growth/OECD-2015-The-future-of-productivity-book.pdf>



U.S. government to develop an authoritative, consensus-based statistical measurement.”⁸

Using the new methods of adding up the economy, economists were able to make two significant contributions to war planning in 1941. First, they told policymakers that the initial timetable for military production was far too optimistic. “They could concoct all the planes they liked for a 1943 invasion,” notes Lacey, “but the economists could have told them in 1941 that the forces they planned for would not be there.”

But the new-found economic science of adding up the economy also told policymakers that they could produce the planes and tanks needed

without forcing excessively high sacrifices on American families.

In the digital era, we must seriously consider whether our current GDP statistics will be equally useful for us in the case of an emergency. In the digital era, are we ready to mobilise economically for a major upheaval such as cyber war, military conflict, a major epidemic or a sudden impact from climate change? Do we accurately know the true capabilities and chokepoints of the national, regional and global economies in the digital era? Answering these questions will help us prepare better for our digital future. ●

8 Lacey, Jim. 2011. 'Keep from All Thoughtful Men: How U.S. Economists Won World War II,' Naval Institute Press.

Transatlantic cooperation and collaboration on the digital economy



If we fail to set an example of inclusive, transparent and people-centered governance of commerce for the digital age, command-and-control visions will diminish the promise of digital revolution

Daniel A. Sepulveda, former Deputy Assistant Secretary of State and U.S. Coordinator for International Communications and Information Policy Making

America and Europe are both embracing and trying to understand the 4th Industrial Revolution (also known by some as the 'Third Wave'). These are umbrella terms for understanding the transformation of our world from the industrial age to an information age built on a digital economy.

The challenge for policymakers includes differences between and within nation states on the proper role of government, law, and regulation in this space. Stakeholder groups often speak different languages rooted in varying knowledge, incentives, responsibilities

and value structures. And there are strong, well-financed actors on all sides of any given digital economy proposal that want to serve their own interests. All this creates a daunting environment.

But the European Union and the United States can and must take on this challenge if they are to lead and prosper. Transatlantic and global cooperation on the digital economy should allow for communication across divergent communities and help facilitate consensus. And we should aim to develop solutions to specific challenges while respecting and preserving

Fortunately, existing transatlantic collaboration and cooperation is strong due to Europe's and America's many shared values and their long history of cultural and economic interdependence

the integrity of the underlying platforms, tools and technology as forces for innovation and economic development.

Fortunately, existing transatlantic collaboration and cooperation is strong due to Europe's and America's many shared values and their long history of cultural and economic interdependence. We can build on existing mechanisms to ensure better-informed and more interoperable approaches to governance of the digital economy. The same is true globally, albeit less so.

If we successfully develop and modernise these mechanisms, we can engage in policy experimentation in different jurisdictions on the basis of agreed principles. Hopefully that means preserving the global nature of the digital economy, therefore requiring technical and legal interoperability, and ensuring transparency and

the use of stakeholder expertise in evaluating changes to laws and regulations. That experimentation should allow us to compare outcomes that would in turn lead to better law and regulation everywhere.

Americans and Europeans are not willing to cede to government command and control authority over the digital economy's development and use. But parents, labour market analysts, law enforcement officials, consumers, policymakers and civil society activists are simultaneously unwilling to cede the development of the digital economy and its use to purely commercial forces. In the face of tension in values, mission and views across stakeholders, how do we make transatlantic and global cooperation on the digital economy work?

The most recent comprehensive effort to develop a strategy for transatlantic digital economy cooperation was produced last year by the Atlantic Council's Task Force on Advancing a Transatlantic Digital Agenda. Two giants in the field led the work: Sweden's former prime minister and Friends of Europe's trustee Carl Bildt, and former US ambassador to the EU William E. Kennard.¹

They called for a transatlantic digital single market "stretching from Silicon Valley to Tallinn" and identified 20 steps to make that happen, beginning with the creation of a new high-level US-EU Digital Council tasked with constructing mechanisms for work on interoperable rules

¹ <http://www.atlanticcouncil.org/publications/reports/building-a-transatlantic-digital-marketplace-twenty-steps-toward-2020>



for the digital economy across the Atlantic and ensuring their implementation through inclusion in the Transatlantic Trade and Investment Partnership (TTIP).

The report presents a strong path forward if we are able to restore or win the trust of citizens in large multilateral agreements. With the stakes of TTIP negotiations rising with the growth of the digital economy, regulators in the US and Europe must settle on the right balance of ambition and feasibility.

Unfortunately, the views of Donald Trump's US administration and the current global political

climate make the completion of TTIP unlikely. The recommendation to create a new position within the White House to manage these issues is also unlikely to be taken up. As a result, in the short to medium term the most effective path forward transatlantic digital collaboration should focus on improving existing mechanisms for cooperation.

The newest example of collaboration translated into new practices is the work that the US Department of Commerce led with EU officials at the end of the Obama administration to build a new structural solution to the most obvious divergence in our practices in law –

Government and industry stakeholders in the EU and the US are excessively risk-averse

the Privacy Shield.² That solution was built on an existing system for transatlantic data flow legal compliance known as the US-EU Safe Harbor. Evolution works.

The outcome of the Privacy Shield process was substantively strong, but it was not a transparent or inclusive process in its construction. Its maintenance, monitoring and evolution over time must be transparent and inclusive of non-government stakeholders if it is to win over those who remain cynical about the Privacy Shield's ability to achieve adequate privacy protection.

So what should happen next? First, we should make the Privacy Shield process 'multistakeholder' and transparent. We should welcome participation from non-governmental stakeholders on all but the most sensitive

national security discussions and produce a commitment to interim steps for communication with the public on the Shield's implementation and development.

Second, use the Privacy Shield Annual Review as a springboard for annual transatlantic digital summits. We can build on the Privacy Shield Annual Review by adding days for other agencies outside of the Department of Commerce and the European Commission's Directorate-General for Justice to lead workshops on other issue areas of mutual interest – including competition, intellectual property protection, transport and labour. Both sides should name a high-level coordinator to manage these annual digital economy dialogues and ensure that conversations involve all stakeholders. The State Department, through the Under Secretary of State for Economic Growth, Energy and the Environment and in partnership with the office I used to lead in the Economic Bureau, could serve that coordinating function with the EU.

Third, give multilateral institutions and gatherings a chance to work. The G7 and G20 have constructed digital ministerial gatherings, and the United Nations, the OECD and others have worked to enable dialogue on broad principles to which we can all agree. The US and the EU can and should build on these mechanisms, send increasingly higher level representation to the gatherings, and establish joint positions where possible.

² <https://www.privacyshield.gov/welcome>

Fourth, EU and US policymakers should engage stakeholders on their own turf, thinking about how best to engage other stakeholders to discuss public-private and co-regulatory solutions. The Mobile World Congress in Barcelona, the Internet Governance Forum, the Freedom Online Coalition gatherings, the Consumer Electronics Show and other non-governmental gatherings create useful spaces and opportunities for high-level engagement among industry and civil society leaders and policymakers.

Fifth, EU and US officials need to engage the global South in the global South. The digital economy is a global platform that requires global support and acceptance. The EU and the US should welcome, encourage, and help finance new actors in the dialogue, including the Economic Commission for Latin America and the Caribbean (ECLAC), the Organization of American States (OAS), the World Economic Forum, Asia-Pacific Economic Cooperation (APEC), the Association of Southeast Asian Nations (ASEAN) and the African Union. All provide opportunities and infrastructure for dialogue.

Sixth, US policymakers need to reengage the International Telecommunications Union (ITU). American and European industry (and to some degree governments) have largely disengaged from the ITU's work and proceedings due to concern that it seeks an excessively regulatory agenda. That is true, but the solution is not to disengage, but to participate and advocate respectfully for alternative views and increased dialogue.

***The margin of difference
between the EU and US on
digital economy governance is
narrow compared with in China
and Russia***

Seventh, risk failure in the pursuit of consensus. Government and industry stakeholders in the EU and the US are excessively risk-averse, and should instead look at the NetMundial multi-stakeholder event that Brazil hosted in 2013, using it as a model for a transatlantic event on cooperation on the digital economy and a transatlantic declaration of principles. It may fail to achieve consensus, but honest and open dialogue will help us to learn and even avoid failure over initiatives that carry a much bigger international footprint. Dialogue could feed into an annual or biannual exercise that would eventually help narrow differences.

Efforts at enhanced cooperative governance of the digital economy should start with America and Europe because we are, as they say in the diplomatic jargon, 'like-minded'. But without increased collaboration, even our like-minded approaches to digital economy governance could become dangerously divergent.

There is some degree of suspicion on both sides of the 'pond' that the other's policymakers are acting as defenders and advocates of their national firms and industries rather than as

collaborators in pursuit of a common goal - a fair, open, and inclusive digital economy. We can only overcome that skepticism through stronger, deeper relationships between leaders.

The margin of difference between the EU and US on digital economy governance is narrow compared with the rigid command-and-control views for management of commercial development of the networks that we see in its extreme forms in China and Russia, and in less extreme but still concerning degrees in other parts of the world. China and Russia demand central control and authority over the use of information services and have no qualms about using law and regulation to favour state-owned enterprises or home-state industries.

Europe and America have to lead in the effort to fit law and regulation to purpose to solve specific public policy challenges. This is essential because generalised or national calls to broad and restrictive regulation

challenge the democratising effects of the network on commerce and citizenry. Those uses of the network are core to our joint vision for progress, and new law and regulation, whether they call for data localisation or state-mandated technical standards, can do more harm than good.

If we fail to come together and set an example of inclusive, transparent, responsible, and people-centered governance of commerce for the digital age, then alternative visions of command-and-control imposed over the global communications system will diminish the promise of digital revolution for people and for the enjoyment of the internationally-recognised human rights we hold dear. ●

Digital as a trust maker



The trust-building potential of digital platforms is already transforming our economy and societies, and everyone should have the opportunity to join in

Frédéric Mazzella, Founder and President, BlaBlaCar & European Young Leader (EYL40)

Trust is the keystone of our society and its absence has serious consequences. Take, for example, the uproar in recent months as we question the integrity of election results and the reliability of news sources shared widely on social media. From an economic standpoint, the trust we place in governments, institutions and companies allows us to carry out day-to-day transactions, comfortable in the knowledge that we can rely on a favourite brand to provide a certain product, or our bank to allow us to authorise a payment, or national regulations to assure safety and quality of services.

This kind of trust has become second-nature, but with the sharing economy, and peer-to-peer interactions arranged through an online marketplace, it is individuals in whom we must place our trust, and we are more conscious of actively taking the decision to do so. The level of interpersonal trust needed for a successful interaction can vary; in some situations, such as when buying or selling low-value goods online, there is little risk involved. But what is required for an individual to place enough trust in a stranger to let them stay in their home, or ride in their car? Are digital platforms able to

quickly create a level of trust between people that otherwise would take months to build? And if we succeed in creating a society where trust is easily developed and shared online, how can this help shape the economy of the future?

BlaBlaCar is a perfect example of how creating trust is an integral part of online sharing platforms. For ride-sharing to take place, users must trust their chosen driver; and for this to happen they must both trust the platform and its processes of moderation and verification, and trust other users to provide honest and accurate reviews. From an early stage we incorporated elements to help users feel more secure, providing the option of female-only trips,

and the capacity for users to report drivers for unacceptable behaviour.

We also listened to our members, who told us they wanted drivers to provide more information - for example photos and links to social media profiles – and us to take a more active moderator role, verifying phone numbers, email addresses and bank account numbers. From these suggestions we created our D.R.E.A.M.S. framework, consisting of our six pillars of trust, which together provide sufficient evidence of identity and trustworthiness to encourage a user to feel comfortable to engage in an offline interaction.



With the traditional method of trust-building via person-to-person contact, we have been limited by our locations and existing networks; moreover it is a time-consuming process. While traditional trust-building between two people was based on repeated interactions between them, these can now be replaced by viewing the aggregated data of the other person's previous interactions with multiple people. In this way, trust can be 'transferred' between users. By recording and displaying information from these interactions, the digital platform allows two users to immediately jump forward to a point of trust with each other previously only reached after several interactions.

A digital platform therefore can provide a means of building trust quickly with people outside our network to share resources in a convenient way. But the benefits of digital trust-building are not limited to a single platform; our survey shows that using BlaBlaCar is more likely lead to engaging in the collaborative economy in other ways, using a variety of different platforms. Our survey of over 18,000 BlaBlaCar members assessed whether carpooling has made them more open to using other collaborative services; our results showed that it can increase participation in other aspects of the sharing economy by 1.3 to 3.1 times. This suggests that by increasing the positive social and economic interactions through our digital network, we are growing the overall willingness to trust others in different situations. Raising overall levels of trust in society means that we are more likely to engage in further social and economic interactions, and so the upward cycle of collaboration continues.

A digital platform can provide a means of building trust quickly with people outside our network to share resources in a convenient way

While BlaBlaCar did benefit from certain favourable conditions, its success is in part due to the fact that we acknowledged the importance of building trust within our model and have built upon this throughout the development process.

The idea for BlaBlaCar arose from seeing a clear gap in the market: train and bus seats between major destinations were too few and too expensive for many customers, but there was an abundance of empty seats in cars making the same journeys. While it seemed likely that many drivers would be willing to carry passengers in return for offsetting fuel costs, no large-scale online ride-sharing service existed to put potential passengers and drivers in touch with each other. The challenge was therefore to develop a platform that would attract users on a sufficiently large scale to make the project viable and sustainable.

Like any digital start-up we encountered technological and economic hurdles, such as making the platform accessible from mobile

To build trust between passengers and drivers, selecting the right payment system turned out to be crucial

phones, and building a business model that could withstand market fluctuation. But as a sharing platform, building trust within our online community was equally necessary. One factor for an individual deciding whether to place trust in an online platform is seeing if other people trust it; because of this it is difficult for a new platform to gain users until it reaches a tipping point in user numbers. To help reach this point we highlighted the level of traffic to the site, such as by publicising the numbers of rides or users in the past month.

To build trust between passengers and drivers, selecting the right payment system turned out to be crucial. The initial setup, whereby passengers paid by cash at the beginning of the ride, gave the passengers no financial incentive to turn up for the rides they had booked. This led to drivers overbooking their seats, and passengers likewise booking multiple rides: there was no trust between drivers and passengers to honour their commitment, and this threatened the entire platform. By requiring passengers to pay in advance, we increased passengers' level of commitment, and this fostered trust between users.

In building this community of trust, we benefitted greatly from the willingness of drivers and customers to share information, both about themselves and about others, through providing reviews of those they have encountered through the platform.

In the development stages we also benefitted from the involvement of business angels. BlaBlaCar's journey to put trust at the centre of our business model took around five years, and multiple rounds of investment over this period gave us the chance to develop and hone our platform before achieving success. Government start-up schemes have the potential to be very valuable in stimulating entrepreneurship, but these must balance a responsible approach to managing public money with allowing sufficient freedom to encourage innovation: often, public funding offered to start-ups comes with so many conditions attached that entrepreneurs are forced to spend more time trying to meet the conditions and report back on their work rather than getting on with the work itself.

A way to avoid this is for government to lever private finance and create a co-investment model in which private sector money can operate as risk capital while public funding operates as patient capital. This works best when public funders and private investors are able to play to their respective strengths. For instance, public funders can establish criteria for businesses' eligibility for funding, while private sector expertise is brought in to assess start-ups' viability. Decisions can then be left up to the investors' expertise and first-hand experience.

In addition to public funding the availability of risk capital is important, to allow for more risky development with less certainty of success. This helps to contribute to an environment that nurtures innovation, and the state can play an additional useful role by offering tax incentives for investment. This will, if done properly, enable a coherent funding pipeline from seed capital to scale-up finance.

Regulation can hamper innovation. As things currently stand we do not have a fully functioning single market in Europe, let alone a digital single market. Blablacar has had to adapt its operating model according to the different regulations in place in Member States across Europe. It is clear and regulation cannot keep up with the pace of technological change, but we can find solutions. Regulation can be designed to be adaptive to digital advances.

But the first priority for policymakers looking to encourage innovation should, without a doubt, be providing citizens with high-quality digital education. With the rapid pace of digital development, early life education is no longer

sufficient preparation for a career during which technology has the potential to change beyond recognition. Life-long learning opportunities must be made available to provide people with the skills needed to become, and remain, employable, and to provide companies with employees who possess relevant and up-to-date skills. With an increasing amount of research and innovation taking place in privately funded enterprises, rather than universities and public institutions, there is a danger of educational establishments being left behind; therefore a greater level of information-sharing is needed between the public and private sector, to ensure that everyone has the skills needed to take advantage of the digital era. The trust-building potential of digital platforms is already transforming our economy and societies, and everyone should have the opportunity to join in creating this positive cycle of trust and economic development. Digital can be a trust-maker, but for it to be truly transformative for society we need everyone to trust in trust. ●

PART 2

INDUSTRY 4.0 – AUTOMATION, AI AND NEW BUSINESS MODELS



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If the **EU** were a **startup** . . .



European institutions are acting as if innovation will come only from individuals, academics and private enterprise

Sébastien Deletaille, Chief Executive Officer, Real Impact Analytics

I was 16 years old in ‘Y2K’. At the turn of the century, the internet was still in the starting blocks. As a teenager, I was among the early adopters, using Napster to download MP3s. Since 2000, internet users have grown from seven per cent to roughly 50% of the world population. Like previous industrial revolutions, a few visionaries predicted its impact correctly. Like previous industrial revolutions, a few innovators dreamt and changed the fundamentals of our society.

In the digital industry, the United States has set the pace as global leaders. They are now

being caught by the ambition and investments of Asian behemoths. Alongside the US goliaths – Google, Amazon, Facebook and Apple (GAFA, collectively) appear Asian Davids – Baidu, Alibaba, Tencent and Xiaomi (or BATX).

As a technology entrepreneur, I’m eager to dream big. And so my dream for Europe is that we breed our own champions.

Although Europe started late, technology entrepreneurship has constantly been on the rise: the number of tech start-ups, the size of the tech workforce, the number of tech hubs and

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capital invested have all increased by around 25% a year since 2010.

This new culture of tech is extremely promising. But European start-ups need more than founders, seed capital, talent and entrepreneurial spirit to grow into global champions. They need clients: consumers, corporates, private and public; and they need to acquire these clients before American and Asian tech start-ups understand how to function in Europe.

Does Europe have the luxury to wait for our home-market clients to adopt digital habits at the current pace? Can the European Union institutions play a change-making role? Can they accelerate the digital adoption process for consumers and corporates? For a minute, let's imagine the EU institutions turned into a start-up called Europa. How differently would it behave?

Europa has a clear mission: convert Europeans to digital. Quite a mission. No wonder Nick Z took over Europa. He's a digital champion, he's young, he uses digital in his everyday life. Contrary to his predecessors, Nick doesn't need someone else to explain how Amazon works, and doesn't need his assistant to write

a Twitter post for him; he simply uses his mobile phone to fulfill his needs in a digital manner.

Nick is multicultural and speaks several languages. He knows that different age groups, people from different backgrounds (urban versus rural) and countries will require tailored approaches – personalised approaches, even – to light up their digital minds.

How can Europa act? Designing the Digital Single Market policies was such a painful experience: the time it took, the never-ending debates, theoretical principles winning over facts, lobbies winning over political courage, too few experiments... there must be a better way.

Nick decides to change the way of working at Europa. It's not about spending years at the drawing board, it's about creating a culture of continuous experimentation. Nick lets 28 squads emerge with the brightest and most motivated minds of the continent. Each squad gets to design its own unique solution with a simple target metric: convert as many Europeans as possible to digital. Each squad will collect and share its data openly. Although the squads are competing to find the best solution, we're all united in the aim of fulfilling Europa's mission. Using data and being analytical are critical habits of digital startups.

It's amazing how much you learn from an experiment. About half of the squads threw their first idea away within two weeks of launch. The other half have already iterated and improved their solutions over two-week sprints. The numbers are coming in. Digital adoption has

doubled in the first 12 months. Nick is delighted – different solutions are performing differently among end-user groups. This means that he was right to avoid mass solutions. Segmentation has already paid off. Imagine how much more impact Europa would have with personalised solutions.

Within a year, Europa has not only shown quantitative results on digital adoption but European citizens are promoting Europa's work. Instead of the inefficient, distant and outdated institution, its citizens are constantly interacting with Europa's squads, suggesting new objectives and providing feedback on its solutions. The UK has even asked to rejoin the team from fear of missing out.

I am aware that there is little value in building a fiction describing more agile European institutions. But with fiction I hope to challenge our current underlying assumptions. European institutions are acting as if innovation will come only from individuals, academics and private enterprise. How much innovation do EU institutions produce themselves? I wish Europe would adopt some entrepreneurial traits and give a new experience to European citizens.

I wish the European Commission could shift from a technology laggard to a technology innovator. I wish it would create a culture of experiments, of data, of personalisation. And measure its spread to EU citizens.

I'm part of a community of innovators and the great news is that Europe has many, many more innovators (see, for example, the MIT Innovators

under 35 Europe list). None of these innovators accept the status quo. They are at the edge of legality, the edge of regulation, the edge of tradition and they all pursue a simple objective: spread to the mass adopters. Europe should enable them to make their dream come true. And should even, as an institution, pursue the same objective.

I like ambition. I seek ambitious friends. I seek ambitious organisations. If the EU was to set an ambitious target around its own modernisation, I would volunteer and participate in the change. I would not be alone. But beyond the promise of wanting to change, there is nothing like a 'proof of love' (also referred by techies as a 'proof of concept').

To shift from ambition to action, I would give a simple recommendation to Europe's institutions: set-up your digital sandbox. The principle is simple: create a context where digital habits can emerge and spread across the EU house. How? By using four ingredients: identify your internal digital champions; provide a physical space where the champions can meet up; have a governing goal, like increasing digital adoption at the European Commission; and set constraints – one experiment per team, a maximum of ten people per team, with a limited budget to help teams focus on a minimum viable product.

What would it take for Europe to run 5,000 experiments and demonstrate its digital innovation? Only the ambition and courage to act. ●

How **data, algorithms and AI** are shaping the digital economy – and our lives



Automation and personalisation can be beneficial, but only if we trust that their purpose is to empower us

Elena Alfaro Martínez, CEO, BBVA Data & Analytics, & European Young Leader (EYL40)

A lot has already been said about data as one of the fundamental ingredients for the digital future of our economy and society. Data and the intelligence based on them not only allow us to make existing processes more efficient or to make better decisions. They also create new services, products and solutions that improve people's lives by making them more comfortable, convenient, secure, and even more interesting and enjoyable.

Last year I wrote for Europe's World on how all successful digital businesses are based on how they are able to capture, analyse and create services around data. Their offerings are based

on data engines that, surrounded by a great customer experience, provide personalised and simple services – some that we even see as essential, despite having been with us only for a short time. I also provided ideas on how Europe could foster and promote a more data-driven approach to innovation that eventually would allow us to be more successful on the development of the digital economy.

Now it's time to go deeper. What is the impact of the use of data, algorithms and artificial intelligence on our society? What opportunities do they generate, and what are the risks?

Artificial intelligence – or AI – is a broad term that inspires different and hotly-debated definitions, and which is even just used as a buzzword.

On the one hand there is confusion between form and substance. Public opinion tends to mix up machine intelligence and external expression – an image of powerful, human-like and even threatening robots when the key aspect is really the ability of machines to reason, to decide, and to learn at a much higher scale than humans can.

On the other hand there is AI as something that will come in the future, that is unknown, and that provokes fear. This is because when AI has a practical application, we then change its name: to ‘translation’, ‘recommendation’, ‘logistics’, ‘image recognition’, or ‘spam filter’. Once we find a use, we don’t call it AI anymore.

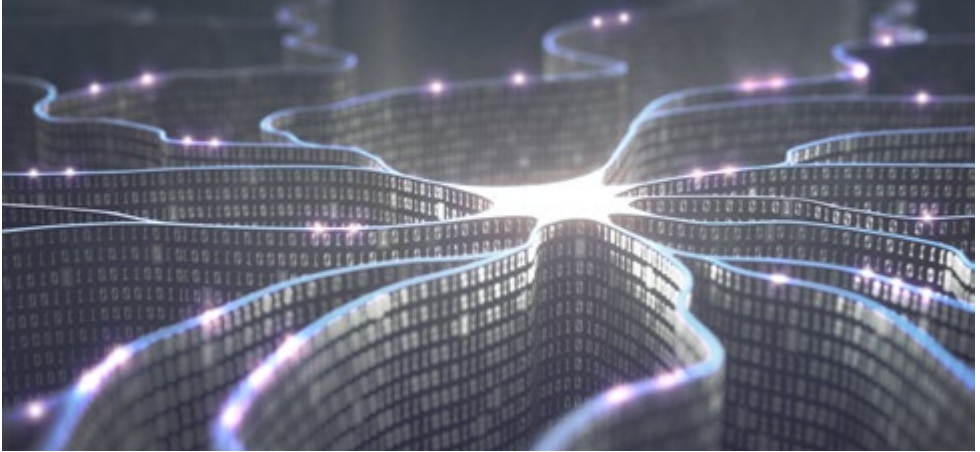
A good way to understand AI is to learn how it is developed. There have been different approaches in the past to the generation of ‘thinking machines’ – mainly by programming pre-established rules to a computer that then applies them to different situations as they happen. For instance, this was the way the first chess-playing machine was developed, as well as the first translation systems.

But the most successful way to create AIs today relates to machine learning. This approach is based on the capacity of computers to extract patterns from large volumes of data, so without the need for a person to program them on how to solve a problem or answer a question; instead, they infer the solution from the analysis

of large datasets, ‘learning’ it from the data. We talk about ‘training’ an image recognition system – for example, by showing it many photos of cars until the machine learns ‘what it takes’ to be a car. A machine that learns a pattern from data creates a model, or an algorithm, that can then be used to make prediction, a recommendation, a decision or an optimisation, or which can be used to perform tasks previously attributed only to humans (such as perception, communication, linguistics, complex reasoning, inference and deduction).

Here’s an example of how this works. Imagine that we want to predict the water level of a dam: we have access to historical data of different variables that might affect it (date, location, weather, humidity, porosity, water demand, water composition and so on) and data on the water level, as observed over the same historical period. Imagine that the number of variables that we have access to is 1,000, and we have daily observations of the past 20 years (so more than 7,000 observations). With this data, a computer can create a model so that we know which variables and combinations of variables really affect the water level (and which do not), and can predict the water level when there are changes in those variables. We can also use the results to determine the best place to build the next dam, and in the future, the model might even learn that there are new significant variables and fine-tune itself for improved predictions.

The number of models and the problems solved by AIs have increased dramatically of late, mainly due to the growing availability of



data (mostly a result of increased usage of digital devices and services) and because of the appearance of technologies to process and analyse large amounts of data (also known as 'big data' technologies).

Although this might still look like something that is not directly related to our daily lives, a quick look at how we use our mobile phones and other electronic devices shows the extent to which the intelligence provided by algorithms has an impact.

The algorithms and AI that are generated with them have the ability to shape our lives by supporting decision-making or by eliminating it

From the moment we wake with the vibration of a smart watch that monitors our sleep and knows the right moment to get you up, a lot of things happen that are either suggested or directly decided by algorithms. The best route to work, by using the maps app on your mobile; the relevant posts to read on your favorite social network; the new music discovery via your online music app while you drive (and soon, the driver of your car); the product that you buy in your favorite online store; the cost of the loan or insurance that you are about to buy; the film that you will enjoy most before going back to bed; and once there, the next e-book you will read.

The algorithms and AI that are generated with them have the ability to shape our lives by supporting decision-making or by eliminating it. This implies that these decision systems act as guardians of opportunities (ranging from apparently banal aspects to key decisions): for

that reason, it is important that when developing them we consider scientific and technology quality criteria as well as the ethical aspects of their potential usages. Technology can respond to whether something is possible or not, but it cannot tell whether the result is positive or negative for society. This is where we need to consider regulation (to some extent) but more importantly a true ethical evaluation of the goals we are pursuing through autonomous systems.

In my view, and taking into consideration that it is going to be difficult to control all the growing possibilities and methods to develop AI, legislation should not determine how technology is developed, but what it is used for (or, more precisely, what it should not be used for). Efforts to restrain the use of algorithms by limiting their technical capacities might be an excuse to exempt AI creators and exploiters from ethical responsibilities.

As institutions and companies, we need to work harder on self-regulation, transparency on data usage and the functioning of algorithms, data literacy, and designing people-centred data products and services. This is not only because we have to be ethical or comply with the law: it is because this will be the only way for us to be trusted by users and customers of the automated systems. Automation and personalisation can be beneficial, but only if we trust that their purpose is to empower us.

As a starting point, here is a non-exhaustive checklist that that we could use to ensure these systems are developed and used correctly:

- Who are we empowering? Who is getting the benefit of the resulting recommendation or prediction? (Note that it doesn't have to be just one party.)
- What is the worst thing we could do with the model/system? What could go wrong?
- Have we challenged our own maths, or did we stop with the first result that met our aims?
- Are we replicating human biases?
- Are the variables used by the algorithm actionable for the subject?
- Can we be transparent on those variables?

AI has also opened a lively debate on automation of the workforce. We are facing a period of transition between the work done by humans and machines, and it is still to be seen whether this transition will be different from what is has been going on for the past two centuries. We need to study the development and consequences of this phenomenon, and not blame technology for deeper problems, such as the distribution of wealth.

Europe has historically been at world's forefront in facing similar situations, and it has done so through the creation of welfare estates. Perhaps it is time to take a step further, and explore new ways to ensure that the economic benefit of a more automated and efficient society does not reach only the few. ○

How automation is upending economics



Technology is affecting not just work and its future, but some fundamental tenets of economics. We may have to reset our intuition

Jacques Bughin, Director of the McKinsey Global Institute

Ever since Gutenberg's invention of the printing press more than 500 years ago—and perhaps even before—technology has challenged incumbents and old jobs, even as it has enabled the creation of new ones. Today, with the rise of digitalisation and automation, a wide-ranging debate about digital disruption and the future of work has broken out, and the key question is whether the impact of this latest technological revolution will be similar to previous ones, or much larger.

Certainly, the nature and scale of the changes that digital technologies are bringing about

can seem sizeable: in just a few short years, digital has opened the door to a bevy of new entrants, from Netflix to Airbnb, who are using disruptive business models of platforms to take on incumbents in a range of sectors.

Recent research shows that digital entrants now own about 17% of total company revenue worldwide, a huge proportion in such a short time. A 2016 study by the McKinsey Global Institute (MGI) showed that cross-border data flows have grown 45 times larger since just 2005, and today, they exert a larger impact on global economic growth than traditional flows of goods,

which developed over centuries. The arrival of this digital wave has created intense economic pressure: globally, digital disruption is cutting incumbents' revenue growth by 45%, and their earnings before interest and taxes by 35%.

I will leave it to the growing multitudes of techno-optimists and -pessimists to argue over whether, this time, anything is truly different about this cycle of creative destruction. Instead, I want to highlight one of the less-noticed consequences of digitalisation and automation: the way they are upending conventional wisdom in fundamental economic constructs such as supply, demand and productivity.

In developed economies, several orthodoxies underpin labour supply. They include the idea that the best jobs are salaried ones in companies, that labour supply is both time-inelastic and rarely mobile, and that in terms of value exchange, people work for a salary. Each of these orthodoxies is being upended in this digital era.

First, non-salaried forms of employment are on the rise. MGI estimates that as much as 25% to 30% of the working-age population in Europe and the United States is engaged in some form of independent work. Digitalisation technologies make it easier to switch to self-employment by providing essential tools for businesses that include not just websites to create a retail presence, but also global distribution platforms such as Amazon and Alibaba that enable tiny businesses to acquire a global reach and become 'micro-multinationals'.

Cloud technologies enable the outsourcing of back-office solutions, and artificial intelligence tools can support sales, customer care and more. Online digital platforms such as TaskRabbit and Uber allow people to engage in freelance work even without having to acquire special tools, or to do so for only a few tasks. MGI estimates that four per cent of employment is already driven by a labour- and capital-based sharing economy, and this share will increase materially in years to come.

Second, a common assumption in the past has been that labour supply is relatively time-inelastic. Attempts to introduce more flexible or longer working hours can be the undoing of governments in Europe. But a European survey published by MGI in 2015 showed people are willing to work about 1.8 hours more per week to secure and enhance their revenue. Digitalisation enables such aspirations to become reality. A large share of workers on digital work platforms already perform more than one job, often freelancing to supplement their primary jobs as salaried employees. A 2016 study by Lawrence F. Katz and Alan B. Krueger shows that the majority of Uber drivers in the United States use the platform to earn supplemental income, and many are students or are retired.

Third, digitalisation is already upending notions of individual labour mobility. This has traditionally been relatively low: less than five per cent of the labour force worldwide lives and works abroad, and only a small percentage of people work more than 50km from their homes. With the rise of digital global job platforms, jobs may go to people, rather than people to jobs.



A typical example of this change is Amazon's Mechanical Turk—which characterises itself as 'an online marketplace that gives businesses and developers access to an on-demand, scalable workforce'. Although four per cent of information and communication technologies (ICT) workers in the US are Indian-born, 20% of ICT tasks sent out for completion in the US are performed by Indian 'turkers'. These platforms can be controversial because they raise concerns about downward pressure on wages, but they can also create opportunities for skilled workers including in developed countries, and potentially reduce costs to companies; these reductions could be passed on to consumers.

Fourth is the engrained notion that for the most part, people work in a company in exchange

for a salary. Digitalisation is changing the nature of the value exchange, with many workers using digital platforms as a way to participate and contribute for non-monetary value. Non-financial motivation or 'free work' has been an important motor for the growth of the internet – think of sites such as Wikipedia that depend almost entirely on volunteers. On YouTube many users post for peer recognition, the chance to become famous by attracting a large crowd to view their creations, or just for the fun of it. In the corporate world, 35% of new products introduced at Procter & Gamble came from co-creation on its 'Connect + Develop' platform—and the largest number of contributors were retired former P&G employees eager to spend a few hours contributing to their former employer without remuneration.¹

¹ Larry Huston and Nabil Sakkab, 'Connect and develop: Inside Procter & Gamble's new model for innovation,' *Harvard Business Review*, March 2006.

Economic models of production often assume that companies are effective enough to work at the frontier where substitution between capital and labour operates as a rule. But with digitalisation only a few companies – those that are able to operate with offensive strategies and adequate agile culture – can operate at the frontier. As they strive to move to the frontier, companies creating the most jobs are also those investing heavily in digital capital. The skills most in demand on LinkedIn tend to be in areas of cloud and distributed computing, big data, data marketing analytics, cybersecurity or user interface design. These talents in turn tend to be complementary to new forms of digital capital deployed.

But this complementarity is far from being fulfilled today. MGI estimates that the US alone could face a shortage in 2018 of between 140,000 and 190,000 people with deep analytical skills. There is also a lack of 1.5 million managers and analysts with the know-how to use big data analysis to make effective decisions. A European Commission report from 2014 suggests that roughly half of Europe's workforce has insufficient digital literacy—if true, this creates a major dilemma for companies seeking to invest in new forms of digital capital.

At the same time, there are some intriguing shifts in the ratios between capital and labour. With the increasing adoption of digitalisation and automation, one might expect the capital

***Non-financial motivation
or 'free work' has been an
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to labour ratio to increase. In many advanced economies it has done so. But that growth has been slowing quite sharply in several countries. In Germany, for example, the growth in fixed capital stock relative to employed persons dropped to an average annual 1% in 2000-2015 after growth of 2.2% from 1990 to 2000. In Sweden, it fell to 1.8% in 2000-2015, from 2.5% in 1990-2000. And in Japan, it has plunged from 3.5% in 1990-2000 to just 1.1% in 2000-2015.²

In the 1980s, the US economist Robert Solow famously said that, "you can see the computer age everywhere but in the productivity statistics". Today we could be experiencing the second round of Solow's Paradox as technological innovations like smartphones, artificial intelligence, big data, and the 'internet of things' seem to be everywhere but in the productivity numbers. Labour productivity growth has dropped sharply in advanced economies in the past few years. In the US, it has fallen from a long-term average of 2.1% annually to 0.6%, and quarter-to-quarter

² IPUMS database; US Bureau of Labor Statistics.

productivity growth was even negative for three quarters between the end of 2015 and the first half of 2016.

Several explanations are possible. The best known of these, promulgated notably by Lawrence Summers, is that we have entered a new era of “secular stagnation” in which the economy is out of balance because of an excess propensity to save relative to a lower propensity of business, households, and the public sector to invest. Other explanations owe more to the rise of technology. For example, digital technologies lead to a redistribution between digital attackers and incumbent natives, but that redistribution takes time—and pushes down average productivity because digital natives who boost productivity are still the minority of revenue generated.

Another aspect could simply be mismeasuring productivity, because we have not found ways to capture how technology is changing its fundamentals. In particular, new consumer services such as mobile GPS systems, smartphone-based applications and cloud-based services from WhatsApp to Google Translate are provided free of charge. Skype, for example, saved consumers around the world US\$150bn in international phone charges from 2005 to 2013.³ All these savings amount to a sizeable consumer surplus that we simply are not taking into account. Correctly assessing the value of capital goods is another challenge, particularly for ICT equipment and software capital that have become an increasingly important factor of production.

A final explanation is closer to the explanation for the original Solow paradox. Back in the 1980s and 1990s, it turned out that IT-enabled gains in productivity were not automatic and did not occur in all industries that made heavy IT investments, but required significant changes to business processes and operational practices. Could the same thing be happening again? This is an area that requires more research—and in that sense quite typical for the bigger issue of how technology is affecting not just work and its future, but some fundamental tenets of economics. We may have to reset our intuition—and review a lot of what we learned. ●

FURTHER READING

This article draws from several recent reports published by the McKinsey Global Institute, which are available for download at mckinsey.com/mgi. They include:

- Independent work: Choice, necessity and the gig economy (October 2016)
- Digital globalization: The new era of global flows (March 2016)
- A labor market that works: Connecting talent with opportunity in the digital age (June 2015).

SEE ALSO:

Jacques Bughin, Laura LaBerge, and Anette Mellbye, ‘The case for digital reinvention’, McKinsey Quarterly, February 2017

³ *Playing to win: The new global competition for corporate profits*, McKinsey Global Institute, September 2015.

Forging transatlantic cooperation on the next wave of innovation



4.0 innovation is something both sides of the Atlantic should not only welcome, but do everything possible to accelerate

Robert D. Atkinson, President, Information Technology and Innovation Foundation

There is considerable buzz about the imminent '4th Industrial Revolution' that purportedly is set to transform the American and European economies and labour markets. New technologies, such as machine learning, robotics and autonomous machines are undoubtedly improving and being more widely adopted. But as I write in my book 'The Past and Future of America's Economy: Long Waves of Innovation that Power Cycles of Growth', such technologically-based transformations have been a regular part of American and European economic history, to the point where the next wave will not be the fourth, but rather the sixth.

While a new wave of technologically-powered innovation, whatever number we give it, is coming, it's not here yet. And it won't likely be for at least another decade. If it were here now, one would expect global labour productivity growth to be at much higher levels. Instead, since the end of the Great Recession, productivity growth has been at near all-time lows. This is because the '4.0' technologies are not yet cheap enough or good enough to replace existing technology systems en masse.

Take the case of autonomous vehicles (AVs), the source of much consternation in terms of the

threat to jobs. AVs are neither cheap enough nor good enough now. And while they might eventually get good enough, it will probably be a while before someone would be willing to ride in a driverless taxi, particularly in a complicated urban setting in bad weather.

But the fact that this next wave of technology is not ready for prime time has not stopped a groundswell of techno-utopianism and dystopianism from sweeping both sides of the Atlantic. You cannot attend Davos, a G20 summit, or a TED talk without being told that the pace of technological change is accelerating and the days of ‘work’ as we know it are numbered. Yet these alarmist claims are either inconsequential (as when Klaus Schwab, head of the World Economic Forum, warned that robotics and artificial intelligence will destroy five million jobs by 2020, a loss of just 0.25% of jobs) or simply wrong – as when Oxford researchers Carl Benedikt Frey and Michael Osborne warn that new technology will destroy 47% of American jobs in 20 years, including fashion models, manicurists, carpet installers, barbers, and school bus drivers. (Even if we could produce school buses that didn’t need a driver, no parent would let their primary school child ride to and from school unaccompanied by an adult.)

The reality is more along the lines of what the McKinsey Global Institute and the Information Technology and Innovation Foundation (ITIF) have independently found: only between five and ten per cent of jobs are at risk of elimination from these technologies. But poor research and even poorer media coverage fans the flames

of technology-based job destruction, leading to calls to slow down automation, including by taxing and regulating robots.

So, one place where the United States and Europe could cooperate is to actively work to reject this new Ludditism and instead work together to share information on how our firms and governments are working to advance the next wave of innovation and automation. It’s important, because both regions will need productivity growth to cope with looming demographic challenges. For example, the number of working people in the EU for every old person drops from 3.5 to 2.2 by 2040. Unless we want lower per capita incomes, speeding up productivity will be crucial. This means, first and foremost, avoiding a rush to regulate.

Unfortunately, the European Parliament has already jumped the gun, passing legislation to regulate robots, including establishing a code of ethics. (Does this mean Roomba vacuum cleaners will no longer be able to have cats ride on them anymore?) It is way too early in the evolution of these 4.0 technologies for policymakers to fully understand all the implications, and while there is almost no risk from waiting to intervene, if that is even necessary, there is considerable risk of regulating prematurely before we see how the technologies and business models emerge.

But one place policymakers can and should act now is with regard to labour market disruptions. Notwithstanding the fact that this next wave will take a while to come upon us – and when

it does, it will likely be more gradual than most pundits and ‘futurists’ would have us believe – these technologies will produce some labour market disruption. Working now to ensure that workers are prepared will be important.

Even if the technological changes will be more gradual than most predict, some occupations will be negatively affected, as they have been throughout European and American history. And so both Europe and the United States can and should do a better job at helping dislocated workers make transitions to new work. One

The fact that this next wave of technology is not ready for prime time has not stopped a groundswell of techno-utopianism and dystopianism from sweeping both sides of the Atlantic



Scandinavian nations understand that it is the role of government to provide their citizens with ‘skills security’ not ‘job security’

place to look is to the Scandinavian nations with their well-developed programs of ‘flexicurity’. These nations understand that it is the role of government to provide their citizens with ‘skills security’ not ‘job security’.

There are other key areas where cooperation is needed between the United States and Europe. One area is standards. Companies using these new technologies, including the industrial internet (such as ‘Industry 4.0’) will be interacting with customers and suppliers across the Atlantic. We will be moving to a world where machines will need to be able to talk to one another seamlessly. This means that having different standards in Europe and the United States would significantly limit the spread and benefits of Industry 4.0.

Imagine if there were two internet standards and email in Europe didn’t work with email in the United States. That’s what is at risk with Industry 4.0 if policymakers on both sides of the Atlantic do not commit to embracing voluntary, industry-led standards for 4.0. Yet the European Commission’s Digital Single Market

plan includes ambiguous language regarding technology standards when it warns that “industry stakeholders decide ‘bottom-up’ in which areas to develop standards and this is increasingly taking place outside of Europe, undermining our long-term competitiveness”. Does this mean Europe wants its own 4.0 standards? If it means developing European-based standards for European-based products, it would mean fragmented rather than integrated markets. This would hurt, not help, European machine builders, who could no longer easily sell their products in North America.

A second and related key factor will be to enable the free flow of data across the Atlantic. As more devices are enabled by data and machine learning, the importance of data flows increases. For example, the Swedish truck producer Scania offers a service called ‘ecolution’ that monitors a driver’s habits behind the wheel, analyses that information, and sells it back to the driver or to their employer. This service is designed to help coach the driver to better operate the vehicle in a more efficient, environmentally-friendly and safer manner. Ecolution is operated out of Sweden and involves cross-border data flows if the driver is operating his or her vehicle outside of Sweden.

Finally, progress in this next wave will depend on companies making risky investments in innovation, whether it is German robot manufacturers, American software firms or French sensor companies. If these companies cannot make an adequate return they will invest less. Adequate returns depend on two

key factors: the ability to protect intellectual property; and markets based on private-sector competition, not government-subsidised champions. Why invest in risky innovation if a competitor can easily copy it? Likewise, why invest in innovation if you have to compete against companies subsidised by their national governments and who are able to consistently price below costs to gain market share?

In this sense, a major challenge for the development of 4.0 in Europe and America is Chinese ‘innovation-mercantilist’ policies, including forced transfer of technology and intellectual property theft, development of China-only technology standards, subsidies to domestic Chinese 4.0 companies and acquisition of European and U.S. 4.0 firms by Chinese firms relying on government funds. Chinese IP theft and massive subsidies have already harmed global innovation in the solar panel industry because China has been a copier, not an innovator, and its policies have either bankrupted or driven down margins of European and American solar innovators. As China doubles down on its ‘Made in China’ 2025 plan, the risks to 4.0 innovation are equally as great.

As ITIF has written, it will be critical for the United States and Europe to work closely

and resolutely to roll back Chinese innovation mercantilism. Failure to do so will not only cede leadership in the industries critical to the next wave (such as artificial intelligence, robotics and the ‘internet of things’), it will slow the overall pace of global innovation in these areas.

In summary, 4.0 innovation is something both sides of the Atlantic should not only welcome, but do everything possible to accelerate.

Rather than focus on regulating or slowing down the spread of robotics, Europe should put the pedal to the metal and accelerate the rate of progress, in part so that they can dominate the global robotics industry. One key way to do that is for the European Commission’s Directorate-General for Research and Innovation to establish a new directorate focused on supporting research and development in robotics and artificial intelligence. This would bring not only needed increased resources but also focus for the Commission in this critical emerging technology area.

More widely, close cooperation, coupled with an embrace of the innovation principle rather than the precautionary principle, and stronger efforts to help workers make needed labour market transitions, will help ensure that 4.0 comes sooner and helps more people. ●

Privacy in the age of data:

Regulation for human rights and for the economy



***Organisations must design products for privacy
and with privacy in mind***

Jules Polonetsky, CEO, Future of Privacy Forum

Just about every day we learn about a new use of data that has the potential to enhance efficiency and improve our quality of life. Healthcare, transport, environmental protection, education, city services, entertainment and other areas are being revolutionised by the development of new technologies that use data to make smarter decisions.

In sector after sector new uses of data provide great value to individuals, organisations and society at large. Location information is used to improve traffic flows, reduce waiting times in shops, help the blind navigate airports and provide drivers with essential real-time

navigation information. Wearable devices give us granular information about ourselves beyond what anyone could have imagined just a few years ago, helping us make informed decisions about our eating, sleep and exercise habits. The rapid spread of low-cost sensors is transforming everything from living rooms to workplaces to entire cities, helping them to become 'smart' environments.

Scientists use data collected by search engines to find cures for diseases or to identify harmful drug interactions. Financial providers perfect algorithms that identify suspicious account activity, helping prevent fraud and protect our

accounts. Content providers tailor their offerings to our tastes, serving us with the movies, TV shows, music, books and articles that we like.

Governments provide services seamlessly, cutting nerve-wrecking wait times and simplifying bureaucracies to better serve populations, including elderly people or individuals living in remote places. In the near future autonomous vehicles will roam our streets, minimising road casualties and streamlining traffic in busy urban arteries and highways. Drones will deliver products straight to our door.

These new technologies and business models, ranging from big data and artificial intelligence to the ‘internet of things’, use data as a critical input. Often the data is personal, including sensitive or intimate details about individuals’ behaviour, personality traits, preferences, demography, social networks, health, financial situation and even genetics.

As one former European consumer protection commissioner put it, personal information has become not just “the new oil of the economy” but also “a new currency for the digital age”. But much like the use of oil or currency requires rules and regulations, so too does the data economy. It needs an ethical and legal framework to prevent excess and ensure responsible use of individuals’ information.

The explosion of data triggers privacy issues that governments and responsible businesses need to confront head-on. The same technologies that are used to market, entertain, transport and educate can be misused for discrimination,

profiling, stigmatising and targeting based on sensitive criteria that can risk embarrassment and exposure as well as financial or even physical harm.

Born in an age of mainframe computers, before the advent of the commercial internet, not to mention mobile, cloud and the internet of things, the long-standing Fair Information Practice Principles, which for decades have governed how organisations around the world handle personal information, are increasingly strained. Principles that focus on minimising data collection and specifying in each case exactly how information will be used are challenged by a world awash in data. More problematic, providing individuals with transparency and seeking their consent for data collection and use has largely evolved into a practice of drafting endless privacy notices that no one reads or understands, and presenting consumers with rote tick boxes that are viewed as a nuisance (and are ignored).

In a world of drones, smart lighting, and embedded medical devices, the goals of traditional privacy regulations remain true, but the means of execution need to be updated. This can include interactive privacy tools and dashboards, and more generally recognition that beyond legal compliance, organisations must design products for privacy and with privacy in mind.

The United States and Europe are often viewed as having different approaches to data privacy. European data protection laws view privacy as a fundamental human right.

Consequently, in Europe companies cannot process personal data without a clear reason, such as consent or a legal obligation. In the US, where privacy is primarily considered part of consumer protection, the default is different; organisations can use data unless doing so would be deceptive or unfair, or if there is a restrictive sector-specific regulation.

Fortunately for individuals in the US, a plethora of federal and state rules, many of them similar to European data protection regulations, govern the use of sensitive data in sectors such as healthcare, financial, credit reporting and insurance, as well as data about employees and children, and biometric and genetic information. Moreover, anti-discrimination laws in employment, housing, credit and insurance prevent abuse of data to discriminate by race, age, religion, gender and other protected categories. State laws increasingly go further, with emerging provisions addressing innovations in facial recognition, drones, education technologies, biometrics and more. But at a fundamental level, the US and EU privacy frameworks are alike. The two major allies and trading partners share a deep-seated recognition of the importance of privacy as a fundamental normative, social and ethical value, and seek to protect individuals' privacy from governments and businesses in various ways.

One of the major policy developments in the personal data space is the arrival of the European General Data Protection Regulation, which will come into force in May 2018. While born in Europe, the GDPR reaches well beyond European borders, applying to companies all

over the world that target their services at consumers in Europe. The new law builds on the 1995 Data Protection Directive and on member state legislation, intending to harmonise the framework across Europe. The GDPR introduces new individual rights, such as the right to be forgotten and data portability, and empowers regulators with significant penalties, which will grab the attention of corporate boards.

Will the new law create an uneven playing-field, where companies that collect massive amounts of data to train algorithms and develop a new generation of services powered by artificial intelligence establish well-staffed and budgeted compliance departments, while newer more nimble players feel stifled by regulatory risk? Or will the law create an environment of trust that nurtures European innovation and supports a techno-entrepreneurial surge?

Furthermore, while much of the global policy discussion has focused on the EU and US, technological innovation is surging in other parts of the world. For example, China-based e-commerce company Alibaba has experienced explosive growth, with its CEO predicting the adoption of artificial intelligence, big data and cloud computing that would revolutionise online retail. Will technological advances that rely on access to data shift to countries where access to data is easier and where privacy regulation is nascent?

To a great degree, the answers to these questions depend on the ability of European regulators to provide certainty with regard to the



interpretation and application of the new law, as well as its companion e-privacy regulation, which, when finalised, will govern some of the same data covered by the GDPR. To the extent that political consensus has determined that certain data processing activities must be deterred, there is little room for further debate. The results of these policy determinations have established a respect for privacy as a leading fundamental right.

But the GDPR leaves open many interpretative questions, and although efforts by data regulators are underway to provide guidance, privacy professionals continue to struggle to provide clear operating instructions to senior executives who face the risk of stiff penalties in less than a year. For organisations planning to implement the GDPR, even more concerning than the spectre of penalties is the inability to know today whether data-dependent products

and services already (or about to be) deployed will be on the right side of an evolving body of law.

Policymakers on both sides of the Atlantic have a firm interest in helping support a digital ecosystem that protects individuals while enabling data-driven advances. But the path to compliance with the GDPR's strict set of limits may be rocky. The risk is that when coupled with uncertainty over its interpretation the GDPR, with its steep penalties and conflicts over its interpretation, could widen the EU-US divide. These days, global companies are deploying teams of technologists, lawyers and privacy experts to address these new challenges. Hopefully, their efforts to do so will enhance trust in the digital economy while also strengthening the deep mutual values that citizens and consumers so cherish in both Europe and the US. ●

PART 3

DIGITAL SOCIETY – EDUCATION, INCLUSION, AND JOBS



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Preparing Europe for the workplace of the future: **Is education learning from digitalisation?**



Europe's potential to lead will be determined by its ability to bridge creativity and innovation in education

Eva Maydell, Member of the European Parliament & European Young Leader (EYL40)

While experts, policymakers and communities puzzle over whether technologies are 'good' or 'bad' for society, digitalisation has made its impact on every aspect of our lives.

Away from heated debate, Emiliyan Kadiyski, a young social entrepreneur in north-western Bulgaria, struggles to transform his hometown of Vratsa from a decayed manufacturing centre to a leading software development hub. The region has the lowest GDP per capita in the European Union and the highest rates of youth unemployment and student drop-outs. But Emiliyan is convinced that for Vratsa, the digital revolution is an opportunity for prosperity.

He is a co-founder of the Vratsa Software social enterprise that equips young people with the necessary e-skills and knowledge to prepare them for the 21st-century digital economy. From a weekend computer science club a few years ago, Vratsa Software has matured into a dedicated IT centre, training young people to pursue and sustain careers in coding.

Such initiatives raise a question: what are the ingredients of 21st-century education, to make it relevant to a business environment defined by flexibility and change?

What are the ingredients of 21st-century education, to make it relevant to a business environment defined by flexibility and change?

Every day we hear stories like Emilyyan's – of innovation, entrepreneurship and success. But it is clear that our well-being within the digital economy is essentially dependant on our capability to rebuild education and the way we sustainably develop human capacity for the requirements of the new labour market.

The 4th Industrial Revolution, riding the wave of big data, nanotechnology, the internet of things and artificial intelligence, may also bring about changes in social structures. We can expect changes in the structure of employment: automating routine tasks and creating new jobs. But fears of a difficult transition employees should not be met with 'tech-averseness', but rather by tech-savviness. E-skills will become an ever more demanding a condition for employment: the European Commission estimates that in a few years 90% of all jobs will require at least basic digital skills, and that in 2020 Europe will face 500,000 vacancies in ICT.

Education systems seem to lag behind the disruptive business models and technology of the present. The skills and qualifications mismatch

has been recognised as a critical challenge for employers, individuals and governments. The International Labour Organization estimates that in the EU between ten per cent and one-third of employed people are overeducated and about 20% are undereducated. As a result, the mismatch affects between 30% and 50% of all workers in the EU. At the same time, East Asian countries outperform the majority of EU members, with the largest share of top-performing students. Should those alarming tendencies endure and deepen, Europe faces the unwelcome prospect of falling further behind in the global race for economic growth and will jeopardise its credentials as a healthy and flourishing society with high standards of living for all.

As we struggle to prepare people for the requirements of the 21st-century market economy, it seems that national and international stakeholders have reached a consensus: education is decisive for Europe's future, and public-private cooperation is pivotal in making education outcomes relevant for the potential growth and change in our economy and society.

Today's social and economic challenges, the skills mismatch, the demands for highly-qualified employees and high unemployment rates are indicative that the education model of the 20th century is not only irrelevant but harmful for the human potential of the future. If the buzzword of past industrialisation has been mass production and standardisation, the mantra of the 4th Industrial Revolution needs to be mass customisation and personalisation.

Education needs to match those developments. Whereas 30 years ago a quality education system put at its centre subject knowledge, assessed by standardised tests, and memorising and regurgitating information, today's model of success requires skills and character to be the agents of human creativity and entrepreneurial spirit.

The digital workplace of tomorrow, with its new approach to work, technology, time and data, needs people to be equipped with the technical, cognitive and socio-emotional skills for success. As the World Economic Forum has identified, critical thinking, complex problem-solving, creativity, coordinating with others, emotional intelligence, cognitive flexibility and decision making should be the core of the 21st-century approach to education. Digital, entrepreneurial, financial, global and STEM (science, technology, engineering and mathematics) competencies are critical for both individual achievement and a vibrant economy.

Apart from technical and cognitive skills, virtue and character development, promoted by education, are essential in defining and shaping generations of growth-mindset-learners, risk-takers, dreamers, innovators and conscious community-engaged members of society. Classrooms should become an open space for exploration, active learning and community-building, with real-life experience and the right to fail becoming learning tools for young people.

If the buzzword of past industrialisation has been mass production and standardisation, the mantra of the 4th Industrial Revolution needs to be mass customisation and personalisation

Under this new definition of education in the digital economy, experts recognise educators as agents of change. The way we recruit, train, support and empower teachers through their professional journey will determine the progress of our society in this digital era.

In the global digital economy marathon race, Europe's potential to lead will be determined by its ability to bridge creativity and innovation in education. We must, therefore, re-design and redefine quality education. Ensuring that education mirrors technological innovation and business versatility means creating an educational ecosystem ready for regular updates – and teaching how to constantly learn is a central part of it. ●

The digital revolution should serve a **new humanism**



Businesses that will succeed in the new industrial revolution will be those that recognise that technologies are at the service of the individual, rather than its substitute.

Brando Benifei, Member of the European Parliament

Our European Union faces remarkable political instability, and great challenges are upon us. Our core values, as enshrined in the treaties that we celebrated on 25 March 2017 in Rome, are under pressure and are being attacked by populist movements that offer ‘solutions’ to social and economic problems that promote isolationism and threats to our rights.

As a socialist and a European federalist, my personal view is that any realistic answer to these problems rests on the EU’s to renew and relaunch its original integration process. We need to stand unite and firm to promote fairer and more inclusive communities and be credible actors at the global level, capable of setting the

scene for a peaceful and prosperous future.

The core of the European values set out 60 years ago is the very concrete idea of common management of the revenues of key industrial sectors of the economy, under joint political supervision, to eradicate the risk of conflict between nation states and ensure peaceful collaboration.

The creation of the common market came from this very idea, and became a driver for individual well-being, giving shape and meaning to a new European citizenship and encouraging the creation of cohesive communities. This market benefits 500 million

European consumers and has strengthened European competitiveness, facilitating the rise of a specific European social model.

The Single Market is not a goal in itself but it a major tool to boost our social model. It is therefore of fundamental importance that policymakers at every institutional level address the two major challenges that the single market, and more broadly our society, are facing nowadays: globalisation and digitalisation.

It is no surprise that the European Commission made the Digital Single Market one of its top priorities for 2015 to 2018. The Commission's complementary but quite unassertive reflection paper on harnessing globalisation, published on 10 May 2017 as a follow-up to the White Paper on the Future of Europe, does finally complete the framework for the new challenges ahead of us. But much work still needs to be done to reach this goal.

Take a closer look at the labour market, for instance. Globalisation and the digital revolution do provide new opportunities: flexibility, mobility, a variety of working arrangements and a more personalised concept of working time and space – all of which can attract hyper-connected and highly skilled millennials. But both digitalisation and globalisation also carry a disruptive and dangerous potential, where uncertainty and insecurity may hinder social cohesion and economic growth and create even more social exclusion.

Some new forms of employment are leading to prolonged economic insecurity, polarisation

Large segments of society are worried about the new industrial revolution

of incomes, bad working conditions, lack of proper social and health insurance schemes and difficulties in reconciling on-demand work with private and family life. And there is no scientific consensus on the effects of robotisation and automation in terms of loss of jobs and a rebalance through the creation of new jobs.

Large segments of society are worried about the new industrial revolution. They see the changes as synonymous with job losses, social injustice and lowered living standards. And their worries are understandable.

So the EU must respond - visibly - to increasing frustration. Digitalisation should respect our fundamental values and in particular the protection of freedom, justice, self-determination, pluralism, accessibility and solidarity. We must develop digitalisation in ways that will help communities prosper and promote human dignity, self-determination, the rule of law, privacy, ethnic and cultural diversity, free speech and democracy.

What we are looking for is a new humanism. Businesses that will succeed in the new industrial revolution will be those that recognise that technologies are at the service of the individual, rather than its substitute. Human capital must remain the first thought of both business leaders and policymakers, who will have to exercise more responsible leadership. We must be able to seize every opportunity to shape the digital revolution in Europe into a global, socially fair and sustainable strategy. A strong digital Europe has to focus on people, leaving no one behind.

A few key points of our vision: we must promote universal access to an open, borderless internet based on net neutrality and fair rules for content

creators; we must ensure effective mobile and broadband coverage and bandwidth throughout the whole continent (focusing in particular on rural areas).

We also must look to create a European data cloud to ensure data privacy and European leadership on global digitalisation, with a strong EU regulations on personal data privacy and effective free-flowing data management. Finally, Europe must strengthen its efforts to take the lead on 5G research and development, and more broadly focus on research, innovation, cultural policy and youth policy, which can boost European digital content creation and new businesses development.



One of the pivotal challenges that we need to address is the up-skilling and re-skilling of the workforce and the promotion of the digital literacy for the future. This topic is a key priority, especially if we look at the most vulnerable groups, the ones that risk being excluded from the benefits of the digital revolution and from the labour market of the future: women, the long-term unemployed and the elderly, people with disabilities, and young people. On the one hand, we need to mainstream digital skills throughout formal education; on the other, we must encourage women to look for employment in the digital sector, supported by effective regulation to address work-life balance.

For people with disabilities and the over-60s (the latter being one-third of the EU population in an increasingly ageing society), the 4th Industrial Revolution can have a concrete impact on their everyday lives and foster social participation and independent living. People with disabilities use information and communication technologies and assistive technologies to a greater extent than their peers in overcoming some of the barriers they find in everyday life. Technology must be made available, affordable and accessible, and a universal approach towards accessibility should be included in every piece of legislation.

We are already starting to see benefits connected to the digital revolution in terms of reduced costs for the welfare systems thanks to ICTs (telemedicine, e-health, m-health and mobile apps). We should do more to broaden the ‘payback’ of the new era in terms of social

We should do more to broaden the ‘payback’ of the new era in terms of social inclusion

inclusion. In particular, there is still much room for improvement with regards to the accessibility of websites (less than a third are accessible), equal access and choice in telecommunications products and services (there are huge variations across the EU) and the accessibility of audiovisual content, products and services. The three themes are currently a topic for regulatory discussions within the EU institutions.

Unfortunately, there is some resistance to the implementation of a model of fully universal design for accessible products. Current negotiations on the three topics lack courage. Too many would prefer to stand behind the old argument that too much regulation hinders innovation.

I firmly believe that only an approach based on the promotion of human rights will be able to secure real innovation – innovation that serves the people. The digital revolution needs new ethical standards if we want European society as a whole to benefit - especially the most vulnerable groups in society. ●

The path to genderless digitalisation



Technology and automation need not be our enemies. With the right tools and direction, they may have a positive impact on women's rights and empowerment

Marta Ochoa, Coordinator UNI Equal Opportunities, UNI Global Union

In many parts of the world, technological innovations such as artificial intelligence (AI), robotics and machine learning are already having an impact on many aspects of society. They allow us to communicate faster, to share information, to feel closer to one another. They have become an essential part of our everyday lives, providing us with unprecedented opportunities for advancement in areas ranging from education to political participation.

Their mundaneness and expanded use makes us believe that they are genderless. But nothing is further from the truth, at least not when it

comes to their impact. Just as technological innovations can help us advance, they can also further deepen existing inequalities and biases.

These inequalities can be seen in access to (and use of) information and communications technologies (ICT) - the offline population is disproportionately poor, rural and female. They can also be seen in areas such as the lack of digital skills, the absence of relevant content for women and the rise of negative stereotypes. All of these elements increase what is known as the 'gender digital divide'.

To these existing inequalities, a new and emerging issue needs to be added: the rise of sexism and discrimination imbedded in algorithms or the use of algorithms and machines, including robots and AI.

Machine learning and AI rely first and foremost on the information humans give them, including inherent discriminatory behaviour and bias analyses. At the moment, machines are not equipped like human beings to consciously counteract these taught biases. Machine learning and AI cannot distinguish causation from correlation, nor can they independently assess when it is necessary to gather more data to check for, and provide, a sounder, more balanced conclusion.

In other words, through our language and interpretations, we are transmitting our own conscious and unconscious biases to machines and algorithms. As a result, some studies indicate that as the use of AI systems becomes more widespread, groups already facing inequalities, such as women, may be negatively impacted even further.

Added to this unconscious algorithmic bias is a clear conscious discrimination towards women who work on these fields. Such is the case of women coders. According to a study published by the World Economic Forum, code written anonymously by women had a 78.6% approval rate while code written anonymously by men had 74.6%. However, when the gender of the coder was specified, the approval rate for women fell to just 62.5%.

Machine learning and AI rely first and foremost on the information humans give them, including inherent discriminatory behaviour and bias analyses

We already know that the technology-driven and automated world of work will be characterised by the constant need to educate, train and build digital skills. This puts millions of women workers at a disadvantage. Women are already facing the challenge of balancing their professional and private life responsibilities, and women already have a gap in their digital skills relative to men.

This disadvantage is further accentuated when we look at the types of jobs that are predicted to be displaced by AI, automation and digital innovations. Studies show that 47% of employees are in job categories that are amenable to computerisation (particularly those that require routine measurements, operation, pattern recognition or manipulation). As Erik Brynjolfsson and Andrew McAfee put it in their 2014 book, 'The Second Machine Age', "... there's never been a worse time to be a worker with only "ordinary" skills and abilities to offer, because computers, robots, and other digital technologies are acquiring these skills and abilities at an extraordinary rate".

Women represent 50% of the total workforce but their issues are not included at the negotiating table

The World Economic Forum says that this trend could lead to a net employment impact of more than 5.1 million jobs lost to disruptive labour market changes in white collar office functions such as administrative and office work – areas where there is a high concentration of women workers – and a total gain of two million new jobs in computer-, mathematical-, architecture- and engineering-related fields, where women are vastly underrepresented.

Unfortunately, we are still generations away from empowering women in the occupations that will grow in demand. According to the OECD, by the age of 15 fewer than five per cent of girls consider careers in engineering and technology, compared with 18% of boys. In Europe only nine per cent of developers are women, only 19% of bosses in the ICT and communications sectors are female (compared with 45% in other service sectors) and women represent just 19% of entrepreneurs in this sector (compared with 54% in other service sectors).¹

In other words, women face more than one challenge. On the one hand, the unequal distribution of household responsibilities,

a result of pre-existing social and cultural stereotypes, translates into less available time to re-train and educate themselves. This is on top of a lack of economic resources for equal access to available technologies, and the lack of encouragement to join those careers and workplaces that will provide job opportunities in the future, making it harder than ever for women to be ready for what lies ahead.

But not all is lost. Technology and automation need not be our enemies. With the right tools and direction, they may have a positive impact on women's rights and empowerment. By providing new opportunities to solve societal problems and imbalances, the gender digital divide can be bridged.

For example, ICT can help to improve women's working conditions by creating spaces where women workers can be active in claiming their labour rights; where they can organise and lobby to improve laws, wages and working conditions, and report abuses. Take the case of violence against women, where ICT tools help create a virtual space where women can acquire information on violence, and where victims and survivors can find a safe place to discuss their experiences and seek help.

To be able to take advantage of these tools and use them for social inclusion, we first need to understand the digital advantages and limitations.

¹ European Parliament Report on gender equality and empowering women in the digital age (2015/2007(INI)). 8 April 2016; and Opinion of the Advisory Committee on Equal Opportunities for Women and Men.

UNI Women, the women's section of the European services workers union, believes that technological innovation needs to be addressed from a human rights perspective, focusing on freedom from discrimination, the right to freedom of opinion and expression, freedom of peaceful assembly and association, the right to work and to the enjoyment of just and favourable conditions of work, the right to education and to participate in cultural life; and the rights of women.

By embedding a human rights approach in the design and use of technologies and automation, we can create safe and equal environments where all groups, particularly those facing inequalities, can participate in fairer conditions. This requires governments and states to develop and implement relevant policies and programmes aimed at promoting accountability, equality and non-discrimination, participation, transparency, empowerment and sustainability; to include gender advocates and experts in the policy development process; and to allocate sufficient resources. Business must also be involved, with proper training and education for managers and CEOs on gender biases, which will help create more collaborative work environments.

Women represent 50% of the total workforce but their issues are not included at the negotiating table, they have limited access to leadership positions and are subject to many forms of discrimination. Their lack of participation in decision-making processes, in the development of technologies, and in union work, also means that their issues are not being

This new world of work does not need to be terrifying

discussed and catered for. Women workers are at a disadvantage, and one that can be augmented by a growing gender digital gap and biases in technological innovation.

As part of our goal to create more inclusive and equal workplaces, where technology can be used as a tool for growth, UNI Women's work agenda includes the expansion and implementation of our ongoing campaigns such as 'Break the Circle!', to end all forms of gender based violence; 'Equal Pay'; and '40for40', to increase women's representation in decision-making positions.

We are also building discussion groups and workshops in which women and affiliated unions can provide information, share tools and resources on how technology is impacting their lives to better understand the challenges ahead.

We have designed programmes, including a mentoring programme where a young woman is trained by a woman leader in her union, helping her to not only develop the necessary skills to grow in her union work (with skills such as leadership, communications and organisation), but to build support networks that will allow her to stay in their career and follow her work path. This programme will be launched for women in



sectors where the biggest growth is expected as a result of technology and where women have the lowest representation, such as IT.

As actors in civil society, we are also aware that governments, the private sector and civil society need to work together to invest in digital skills training for women and girls, making sure

Now, more than ever, human skills such as awareness, perception, complex problem-solving and decision-making, all of which are typically labelled 'female' skills, will be essential

that education starts early and that educational opportunities are available at all levels, from basic training to more advanced programming.

This new world of work does not need to be terrifying. With proper policies and education, with proper tools, with a human rights approach where freedom from discrimination is embedded in all our work, we can build the capacity to adapt and learn to work with machines.

Now, more than ever, human skills such as awareness, perception, complex problem-solving and decision-making, all of which are typically labelled 'female' skills, will be essential. The future world of work is about partnerships. It is about having the capacity to adapt and learn to work with machines. We can use technology as our ally to amplify our cognitive abilities, to liberate ourselves from burdensome tasks, and to create more inclusive environments. ●

Consumers or citizens?

How the 4th Industrial Revolution can help people change law and policy



Thanks to the information revolution, lobbying is no longer the prerogative of well-funded groups

Alberto Alemanno, Jean Monnet Professor of EU Law, HEC Paris and NYU School of Law & European Young Leader (EYL40)

Digital technology has already created more opportunities for more people than any technological change since the printing press. Google, Facebook, Twitter, Snapchat, Instagram and Tumblr are radically changing how ideas spread, how they influence others, and how they create networks and communities of change. As a result, today businesses and governments have ever more data about us, and know how to use it. But we citizens know next to nothing about what they are doing with it.¹ This imbalance of information control and

use is not only an issue of power, but also one of rights and dignity.

What these apps and platforms offer is the product of an accurately engineered algorithm. This is a mathematically-powered application that optimises the outcomes chosen by its programmers. After processing a bunch of data, an algorithm identifies patterns among the various data points it owns about you and then determines the probability that, for instance, you will pay back your mortgage, be an excellent

¹ David Sarokin and Jay Schulkin, *Missed Information: Better Information for Building a Wealthier, More Sustainable Future*, The MIT Press, 2016.

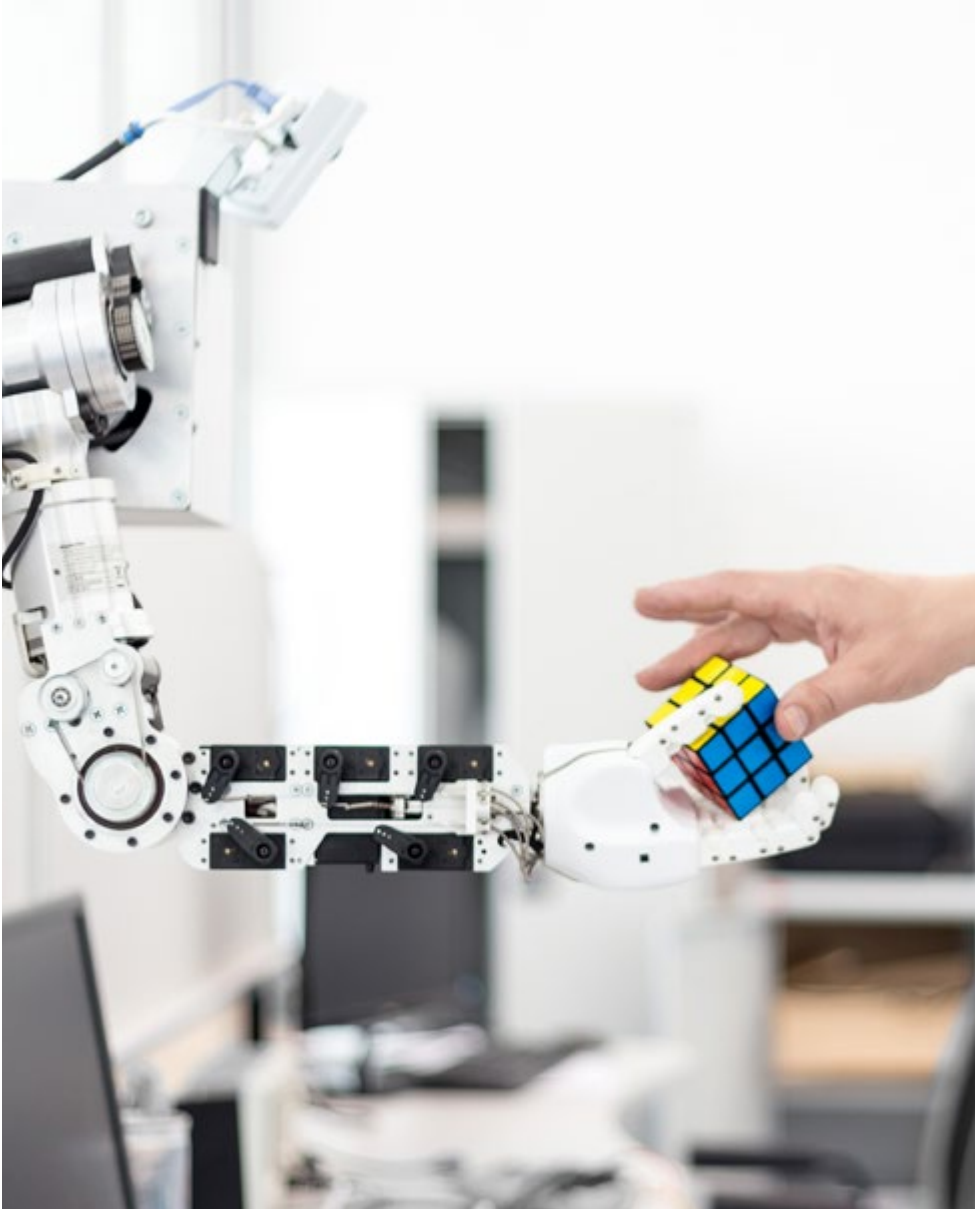
The ability to control individuals through the use of technology risks deepening our unprecedented social inequalities

employee, or are interested in buying a particular car, song or book. In the case of Facebook – and specifically its Newsfeed – the goal is to maximise the amount of engagement you have with the site, and hence with advertisers. You are therefore selectively exposed to the posts you have the greatest propensity to ‘like’. Every click generates revenue. This is the pay-per-click internet advertising model that defines your internet ‘user experience’. You can find it on all major platforms, including Google.

Algorithms need data just as cars need fuel. There are thousands of bodies that collect and sell personal information from website cookies, loyalty card programmes, pharmacy records and some of the ten million public data and registries sets available. While each individual data point carries little meaning and value by itself, taken together they may allow the brokers to draw some powerful conclusions about you, and to create a profile which they sell to businesses who want to target their product or political advertisements. Facebook, for instance, acts both as a data buyer and data broker.

Algorithms are anything but objective. Being the products of human imagination, they embed a series of assumptions about how the world works and how it ought to work. They approximate the world in a way that suits the purposes of their architect. So for instance, they typically rely on your credit score as a proxy to determine whether you will be a good employee. Similarly, a programmer may decide that people who read the Guardian are feminine and people who read tech blogs are masculine. These algorithms are unscientific, based on assumptions, but they increasingly shape your life.

As such, algorithms do not just encode biases, but perpetuate them. By relying on historical data, such as the fact that women and people from ethnic minorities earn less, they reflect and magnify those biases in society. A Washington Post investigation by Jennifer Stark and Nicholas Diakopoulos found that in the US capital waiting times for Uber cabs are, in general, shorter in the centre of the District and longer in the periphery, where more non-whites live. This is due to Uber’s surge-pricing algorithm, which influences car availability by dynamically adjusting prices. When surge is in effect, and prices are higher, the idea is that the supply of drivers is increased while at the same time demand is decreased. Rather than increase the absolute supply of drivers by getting more cars on the road, existing driver supply is instead redistributed geographically to places with more demand. If drivers are relocating to areas with surge-pricing, those areas will experience reduced wait times for cars (better service), whereas the areas the



drivers are moving away from will experience longer wait times (poorer service). So who gains, and who loses? Which neighbourhoods get consistently better or worse service? As a result of the algorithm, people living in predominantly non-white areas of the US have to wait longer for Uber cabs.

Given how pervasive these mechanisms have become in our lives, and their potential to turn our lives upside down, you might expect to be able to appeal their decisions. But there is no way to challenge their results or even question their operation. Unfortunately, algorithms are black boxes, with their workings invisible to almost everyone except their programmers. This opacity is made possible by a complex web of proprietary rights; for instance, Google algorithms are a secret as closely-guarded as the Coca-Cola recipe. We don't know the data that goes into them, how that data is processed through the algorithm, or the outcome – the value that emerges, be it a score, price or prediction. In short, algorithms remain largely untested, unquestioned and unregulated – which, troublingly, prevents users from contesting the quality of their underlying data, how it is obtained and the results.

Injustices have always existed. But the ability to control individuals through the use of technology risks deepening our unprecedented social inequalities. Based on a combination of preferences, habits, postcodes and status updates, predatory algorithms enable marketers to target people in great need to identify where they suffer the most – what is called the 'pain point' – and to sell them false or overpriced

promises. For years, online retailers like Amazon and travel companies like Expedia have priced items according to who they think we are, where we live, our incomes and our previous purchases. Often, paradoxically, the rich pay less. Yet there are signs that the rich as well as the poor are being targeted – because the low-information voters targeted by fake news exist at the top as well as the bottom of the income scale. As we increasingly feel that our voices don't matter, we – as citizens – lack the bravery to stand up. We continuously trade off our fundamental rights to privacy and data protection with the convenience provided by multiple apps, social media channels and other technological platforms.

What can we do about it? As I set out in my new book, 'Lobbying for Change: Find Your Voice to Create a Better Society', if you are worried about this state of affairs and want to have a say, turn yourself into a citizen lobbyist.

Thanks to the information revolution, lobbying is no longer the prerogative of well-funded groups with hundreds of thousands of members and myriad political connections. You, the individual, can just as easily write to officials, film and upload a hard-hitting video, or mobilise your fellow citizens to protest or apply civic pressure in different ways.

That's exactly what Max Schrems, an Austrian law student, did when he stood up to Facebook in 2013. After a short stay in California as an exchange student, he discovered that the company had circumvented the EU data protection regime when transferring his data

(and those of millions of other Europeans) to the United States. After crowdfunding his campaign, he succeeded in challenging Facebook through the Irish authorities and eventually the European Court of Justice. Max epitomises citizen lobbying. He occupied the space left vacant by regulators, enforcers and civil society organisations. We need more Max Schrems in the world, and I hope he will inspire others.

Lobbying enables anyone to engage with the policy process directly, by influencing elected representatives to initiate – or block – a given policy, whether it is data protection, fracking, LGBT rights or reforming the pension system. It involves writing to policymakers to influence them, or arranging meetings with politicians or pressuring them to take a particular course of action. It involves mobilising other citizens, building alliances and conveying information to decision-makers and the public. Paradoxically, thanks to the digital revolution and myriad new channels of participation, lobbying has never been so easy. Contrary to conventional wisdom, lobbying is not only legitimate but also necessary – provided that everyone (including you) has the chance to get involved – which hasn't always been the case. It ensures citizens and interest groups are directly represented in the policy process by circumventing the traditional, often insidious and oligarchic, channels of political representation. Lobbying

empowers you and your community. You may end up being surprised and delighted by how much difference you can make.

Data protection and algorithms accountability are two major areas that require a large number of actions from citizens. In the space of just six years, privacy has become a core issue that attracts substantial financial backing – shown, for example, not just by the recent surge of mainstream privacy start-ups such as Sirin Labs (which had raised US\$72m by May 2016), but also by the \$250m bankrolling of The Intercept magazine, which aims to hold governments and businesses to account, while doggedly protecting the security and anonymity of its sources. Activist groups, non-profits and NGOs have never experienced such a boost in popularity and funds. These campaigners are building a new framework of strategic activism that aims to create reputational damage by destabilising public confidence in targeted companies.

That's how you can stop being only a consumer and feel a citizen as well, both online and offline. ●

FURTHER READING

Albert Alemanno: 'Lobbying for Change: Find Your Voice to Create a Better Society' (London, Iconbooks, 2017)

CASE STUDY



ESTONIA: A digital pathfinder in Europe

Taavi Rõivas, Vice-President, National Parliament, Estonia

Estonia is often mentioned as a frontrunner in e-government solutions – and rightfully so. International comparisons like the European Commission's Digital Economy and Society Index (DESI) give Estonia the highest rankings in digital public services.

Many of these services could be easily scalable and used in other countries or even across national borders. As there are

obvious benefits in using digital solutions for government services (speed, effectiveness, transparency), it is well worth looking into the practice in Estonia.

It all started with a pursuit for less bureaucracy and more effective public services in a country eager to make up for the lost decades of Soviet occupation. We have consciously taken risks and experimented on the way,

and it has paid off. Estonia has adopted a start-up-like way of doing things – pushing at the boundaries while understanding what is at stake.

All services have to be properly designed to keep security, data privacy and - most importantly - data integrity intact. In some cases, such as voting over internet (often called i-voting, probably the most sensitive digital service there is) there are also physical security measures, including the possibility to cancel an electronic vote completely and invite people to come to the traditional polling booths on election day. Preparing for different kinds of risks (such as cyber-attacks and technology failures) is the best way to stop them happening.

The Estonian digital society or ‘e-Estonia’ was founded on four principles and two key infrastructure ingredients. The four principles are decentralisation, interconnectivity, open platforms and open-ended processes. The two key infrastructure ingredients are X-road and e-Identity (or e-ID) - a nationally standardised system for verifying a person’s identity in an online environment, with the highest level of security and trust.

Our secret weapons are a few clear and straight-forward principles:

- the internet is considered a social right;
- all public organisations follow the once-only and digital-by-default principles; and
- no legacy systems.

To better understand the phenomenon of e-Estonia, there are couple of important cornerstones to get acquainted with:

1. DIGITAL IDENTITY

To offer public services over internet, people and businesses using the services have to be securely identified. A traditional username-password combination is not considered secure enough for this purpose, so Estonia opted for a two-way-identification using either a plastic card with a chip (a smartcard) or a SIM-card with additional functionality of a personal PIN-code and an encrypted key.

In other words, anyone with a smartcard ID (a default document in Estonia) and a computer, or anyone with a smartphone and special SIM-card, can identify themselves over the internet in a way that is legally binding - equal to showing your document to a civil servant. This secure and legally-binding two-way identification gives people and businesses access and ownership to

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their data - from health records to taxable income to property information. The key is in knowing that it is really you who is asking for the information.

In Estonia citizens and businesses own their data. They are not simply given an opportunity to view it but also to change it or give permission to other relevant authorities to view it. By using the first PIN code for identification and the second for digital signatures (legally completely equal to a handwritten signature) data can also be changed - registered a new home address or beneficiary of childcare benefits, for example.

Needless to say, the technology behind digital identity has to be constantly upgraded to meet the highest security standards. A verified electronic signature is in many ways more secure than a conventional handwritten one (where in most cases we just seem to assume that the signature has been given by the right person). Electronic signatures also have a time-stamp that means the moment of signature is fixed automatically. This makes all the difference in cases where it is important to know exactly when the signature was given.

2. DIGITAL SERVICES WORKING TOGETHER SEAMLESSLY

In Estonia all public organisations follow the once-only and digital-by-default principles, leading to much fewer forms and much more accurate information. Estonia is thinking in terms of becoming an invisible government. We are moving towards proactive services and gradually away from services that are available on request. Public services must be there when people or businesses need them. Government and local municipalities need to work in the background. Any life events can and should be serviced proactively thanks to smarter governments that rely on data and analytics.

As 99% of state services (more than 2,000 of them altogether) are online in Estonia, it is critical that services work together where necessary. For example, when you have registered your home address once in the population registry, there is no real need for a tax authority or hospital to ask you where you live - they can simply be given the right to ping for that information in the respective registry. In the same way it is absurd for a social security board to ask a citizen information that the tax board already has - it is much quicker and more secure to ping for the information directly.

For this interoperability to function properly, Estonia created a base layer for e-services called the X-road. Instead of building thousands of individual connections between databases you connect them all to the X-road through which they can (if given the legal right) communicate with each other. X-road has more than 900 organisations and databases connected to it, many of which are private (banks and telecoms companies, for instance). In addition to sharing information it also creates an opportunity to design digital services that are tailored to specific needs and be event-based instead of following the institutional silos. Events like establishing a company or registering the birth of a child can be handled in a single encounter instead of reporting (or filling forms asking the same questions) to six or eight different institutions.

Some say that the X-road is the busiest highway in Estonia, with more than half a billion transactions every year.

Just as a single credit card can give you access to any form of internet shopping, the electronic ID is the single means to identify one electronically for all services, whether they be public or private. No need for separate and less-secure PIN-calculators for internet banking, or usernames and passwords for self-service.

There are many countries in EU and beyond (most recently Japan, with 'MyNumber') that have similar digital identity systems in place. The main difference is that most people have never used it and so there is no demand for services. We are often asked how all our digital development has been possible: what has been the policy? I have always said that first you need the political will. There needs to be leadership to do things differently and take risks by trying out new solutions. Technology is only an instrument; it is the transformation of government with technology what matters - to redesign processes around technology and across agencies.

There were a few years, right after adopting the digital-ID in Estonia, when most people used the smartcard only for the purposes of a physical ID - as if it were any traditional paper or plastic document. But around 2005 to 2006 the private sector realised that using the state-developed and very secure identification systems enabled them to scale up and save money: there was no need to develop their own secure user-identification systems; instead they were invited to use the existing system.

In cooperation with the banks it was decided that any online transactions exceeding the sum of 200 Estonian crowns (now equal

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€20) had to be conducted using the most secure identification available - the e-ID. That led to a much wider usage and obviously unlimited internet banking. As of 2017 there has been more than 500 million electronic identifications and more than 376 million digital signatures given by the 1.3 million citizens of Estonia. The growth in use has clearly been exponential.

THE MOST IMPORTANT QUESTIONS: SECURITY AND PRIVACY

In the digital age cyber-threats have become a general concern. Societies become increasingly dependent on information systems and so are more vulnerable to the threats in cyber domain. Estonia was the first country to experience a full-scale cyber-attack against the whole of society – including government, banks and media – in 2007. That provided an immensely valuable lesson and became a driving force to establish the NATO Cyber Centre of Excellence in Tallinn. This centre not only practices how to counter cyber-attacks but has also taken the lead in establishing a common understanding of when a sovereign country is under attack in cyber domain, and how to react properly.

‘Cyber-hygiene’ is an integral part of any digital interaction. Continuity of the most important services (both public and private) has to be guaranteed, as without them the society could become paralyzed. As clusters and off-site backups are the most common ways to keep services running, the next level could very well be services running from different geographical locations (and also from different countries). Estonia has decided to establish data embassies in several countries around the world; this way, we can be sure that the most important e-services are safe from both cyber- and physical threats.

As trust is vital for successful government, the same applies for government e-services as well. People must not only be convinced that systems are designed in a way that government does not become a Big Brother; they must feel that they really are the owners of their data, which in most cases can include the right to block data from others (as is the case for health information) and ensure that no government official can ever access or see it (as is the case for i-voting). Another way to grow trust is to give people the opportunity to monitor the log in a simple and convenient way, thereby ensuring that no government

official looks at their data without a real need or authority (which should be made illegal as it violates privacy). A digital system with proper log can be argued to be much safer and much more privacy-granting than any paper file in a drawer or cellar, where there is no control of who can gain access to it and look at it.

DIGITAL EUROPE - MISSION POSSIBLE

Estonia is the most integrated Nordic country and also the world's first country to function as a digital service. Almost anything can be done digitally – you can register a company online, digitally sign and exchange encrypted documents, conduct secure online bank transfers, and make tax declarations electronically. Doing things digitally has become an integral part of our everyday lives - only marriage, divorce and selling your house cannot be done online. Yet.

It has been calculated that in a country of 1.3 million people around two per cent of

GDP is saved in work hours by signing files digitally. We can only imagine the scope of savings for the whole of EU: as physical distances are considerably greater, so is the time saved.

Many public services can and should be made available across borders. We are getting used to using the same app to get a ride in Tallinn, Brussels or London (Uber, Taxify) or book a hotel room or apartment in Vienna, Berlin or Paris (Booking.com, Airbnb). In public services this could be paralleled, with digital prescriptions working at any EU pharmacy, despite borders; tax authorities exchanging information about income of the same citizen in different countries; booking a doctor's visit using an app similar to one used for booking a hotel room.

As transferring goods requires quite a bit of physical effort, digital services only need legal enablers to be scaled across borders. Technology-wise it is not rocket science: the only limits are laws and political will. ●



A FORWARD VIEW

AN OFFENSIVE DIGITAL STRATEGY FOR EUROPE

The digital revolution is rapidly reshaping the world in which we live. What a few years ago appeared to be mere science fiction is now entering our homes, our streets, our workplaces, our personal lives: refrigerators automatically ordering new stock; thermostats autonomously regulating your heating based on your lifestyle; smart cars finding their own parking spot. These digital innovations make our daily lives easier, but they also bring profound change in other areas.



Businesses and economies are fastening their seatbelts for the deep disruption of the 4th Industrial Revolution, pushed by three important megatrends with an unseen transformative impact: the internet-of-everything, big data and extreme automation.

Disruptive, technology-driven transformations have always been part of history. We have to avoid falling into the trap of extreme views, whether a naive techno-optimism or an ultra-conservative techno-pessimism. Although we are going through a major societal and economic transformation, it is not the first fundamental disruption humans have faced. As these debates are not new, we should learn from the past.

One of the most important lessons is that technological revolutions allow core questions to surface regarding education, employment and societal organisation. This is because technology is part of our human nature. A human being is a technological being. We have always used tools to supplement our own physical abilities.

If Europe wants to take the lead in the 4th Industrial Revolution, it will have to decide on an offensive strategy to deal with these new digital megatrends. The European mindset has too often been

one of suspicion and mistrust. Europe has been playing defence: partly because it was confronted with global technology leaders from outside Europe, but also because new technologies provoke negative emotions among parts of the general public.

This is not new. Technological revolutions have always generated anger and fear because disruption means that some people feel they are losing or risk losing. But behavioural economics has shown that acting on negative emotions such as anger and fear leads to bad decisions, both individual and collective.

Legislators faced with disruptive evolutions have the very delicate task of seizing these new opportunities while mitigating the risks. Let me focus on two fields that are ready for a bold, European offensive strategy.

The first is (big) data. The digital revolution is a data revolution. Between 2000 and 2012 the global production of data grew 2,000-fold and the amount of all available data is expected to double every two years. In the years to come, this data will increasingly drive our economy. The OECD identified big data as one of the most important sources of growth and innovation. In Germany, studies have shown that the use of big data can enable companies to boost their productivity by up to 30%.

A data-driven economy is a stronger economy; therefore the European Union has to bolster data-driven innovation and growth. The strategy on big data, launched in 2014 by the European Commission Vice President for the Digital Agenda, already charted the key steps for the European Union to seize the opportunities of the data revolution and to be able to compete in a global data economy. Three years later, the Commission has outlined the next steps towards a European data economy.

For a strong data-driven economy, it is crucial to have a free flow of data between countries. A strong European data-driven economy

relies on cross-border transactions including collection, processing and use around the world. Unjustified data localisation requirements are barriers that have an adverse impact on innovation. Uncertainty about the legality of international transfers of personal data has the same negative effect. Strong data protection agreements and rules on international data transfers are therefore the foundations for the free flow of data across borders. If we want the Digital Single Market to prosper, we have to avoid the EU becoming an isolated island that relies only on its own rules of protection and prefers data to be stored on its own territory.

The second field is digital skills, an area where Europe has to step up. The digital revolution will be a net job creator, but the nature of jobs is going to change. By 2020, nine out of ten jobs will require basic digital skills. At the same time, there will be 825,000 unfilled positions for digital jobs. Our start-ups, small companies and large players will need thousands of front-end and back-end developers, data analysts and web marketers. Leadership in the 4th Industrial Revolution will require a massive upgrade of Europe's current workforce. Every European citizen, regardless of age and background, should be able to take advantage of all the digital opportunities that lie ahead.

The EU should take a leading role in making sure that all citizens are schooled in digital skills so that the potential of the digital economy and the knowledge society can be fully exploited. It is time to take action. We need massive investment in digital skills and education, while at the same time strengthening those other qualities – creativity, critical thinking and emotional intelligence – that make us humans different from machines.

Alexander De Croo

Belgian Deputy Prime Minister and Minister for the Digital Agenda

POLICY CHOICES FOR A DIGITAL AGE

These recommendations draw on the viewpoints and ideas presented by the authors of the articles in this Discussion Paper and the conversations at a series of high-level working groups organised by Friends of Europe in autumn 2016 and spring 2017. Underpinning the recommendations are principles of multi-stakeholder collaboration; taking a global outlook; and focusing on impact rather than just process.



EDUCATION:

PRIORITISE ONGOING DIGITAL EDUCATION

It is only by equipping citizens to thrive in a digital society that we can make a success of the 4th Industrial Revolution. That digital skills must be mainstreamed into formal education is clear: however, our systems for and expectations of education also need a rethink if the next generation is to be adequately prepared for their future.

Education cannot focus only on the technical skills that citizens need but must also seek to foster the innovative thinking and creativity that will enable them to be the next change-makers. Education must likewise prepare citizens for an economy where flexibility and openness to lifelong learning will be key survival skills. This will require new models of provision that integrate learning opportunities along the full length of individuals' career pathways.

To facilitate this, greater cooperation between the public sector and industry is needed now to co-design the curriculum and provision of education. We need to ensure we learn from the past and overcome the old adage from industry that schools do not prepare young people for the world of work. We cannot say that we need to train people for jobs that don't yet exist. We need real-time heat maps of types of skills required in certain geographies to enable education consumer and providers

match this demand. This will also require an urgent and open conversation on the future concept of education for a digital age – its infrastructure, content, modality and overall purpose. But ultimate responsibility lies surely with policymakers to ensure a future-focused approach, based on preparedness, coherence and accessibility.

REGULATION:

DESIGN REGULATION TO BE ADAPTIVE TO DIGITAL ADVANCES

Legislative processes are slow. Regulation can never fully keep up with the pace of change. But this does not mean that laws must always lag behind.

In the 4th Industrial Revolution the pace of change is unprecedented, and if regulation is to stand a chance of being fit for purpose it must be designed to be adaptive to digital advances. Approaches to regulation based on principles of co-production can pay dividends. Policymakers could usefully ensure that all relevant stakeholders – including citizens, entrepreneurs and industry – are engaged in the process of developing regulation early on. Rather than viewing this as overly bureaucratic and of no value, it should be regarded as an 'invest to save' bid and lead to better, more efficient regulation-making.

The EU has the potential to lead the way in this space, by building the capability for 'test drive' thinking. Applied through models such as the regulatory sandbox, this will prove more efficient in a context where regulation increasingly needs to cope with rapid change and boundary-pushing innovation.

INVESTMENT:

DEVISE AND PROMOTE EFFECTIVE AND COLLABORATIVE MODELS OF INVESTMENT IN ENTREPRENEURSHIP

Fostering entrepreneurship is a winner all-round, benefiting governments, citizens and investors alike. It is therefore fitting that the public and private sectors work together to give the best business ideas the best chance to thrive. But good intentions must be reinforced by good practices. The models we establish should play to the respective strengths of the different parties involved.

Governments must recognise both the importance and the limitations of their role. Combining their capacity for long-term investment and putting public interest at the heart of decision-making with more openness to private sector expertise and better strategies for cooperation with private investors, they can create mechanisms to buffer against risks

inherent in innovation and offer more flexible selection and eligibility criteria for public funding of investment programmes.

Finance and access to it across Europe does not operate horizontally, let alone have an integrated market to support digital. Developing a fund of funds across Europe, supported by the European Investment Bank and in partnership with private finance, may prove a useful innovation and policy choice that can provide an investment pipeline to cater for the needs of ideas development through scaling-up and access to markets. There are number of social finance models and entities across Europe that can be drawn from to learn from experience. We should also think through the development of a special purpose vehicle, at arm's length from government, whose role would be to nurture, grow and scale digital innovation.

The EU's next Multiannual Financial Framework presents an opportunity to significant advantage of digitalisation, by proofing it digitally and increasing both its research and development in robotics and artificial intelligence and digital enterprise support. This will require political management and commitment, but the benefits will be significant and enable the EU to improve its digital potential, which currently sits at 12% (compared to 18% in the US) and to increase its GDP growth, adding €375bn to €415bn each year.

Furthermore, at European level there is a clear demand for a coordinated tech hub, offering a fertile environment to nurture new ideas and coordinated access to opportunities to grow them to scale. In a logical response to market

forces, the private sector will sooner or later take this forward. Policymakers should recognise the opportunity that they still have to take a meaningful role in and be a catalyst for this by providing infrastructure now that will ultimately play a huge role in supporting more effective policymaking on digital for the future.

CITIZENS:

CONSIDER THE CITIZEN, NOT JUST THE CONSUMER

For all the opportunities they present, algorithms risk reducing citizens to consumers and consumers to the sum of their digital footprint. Algorithms have become the mainstay of the private sector and in many ways the new infrastructure for our lives. But the pace of their development far outstrips citizens' awareness and skills base to understand their own role as data units, and the implications of this shift.

Policymakers need to design enabling regulation that creates greater transparency around data ownership and greater accountability in the development and use of algorithms, as well as granting agency to citizens to manage their data and digital footprint, with access to the right tools for the job. The levers and approaches currently in place are often post hoc and remedial in nature. What is required is a more collaborative approach with citizens and industry based on a set of agreed principles. For example, we could foresee a 'Data/Digital Ombudsman' for Europe.

ECONOMIC MODELS:

RETHINK THE ECONOMIC MODELS THAT INFORM POLICY CHOICES

The 4th Industrial Revolution is upending economics. Metrics such as GDP can no longer be the mainstay of the model that informs our policy choices. More thought must be given to how indices for growth and economic wellbeing and supply and demand are understood and applied, as the impact of digital takes globalisation to a new level and creates an increasingly borderless economy.

The world of work will change for all sections of society. Governments need to think long and hard, and ahead of time, about how tax will continue to provide revenue for public services and welfare, as well as how to fix what will be a huge pensions deficit given our current demographics and an increasingly digital labour market.

Policymakers must find mechanisms to better engage with the latest thinking from both academia and the private sector. They must be willing to take new and emerging models of digital economics into account and to be informed by them when making and evaluating policy choices for the digital age.

GOVERNANCE:

ENSURE THAT INTERNATIONAL AND REGIONAL GOVERNANCE STRUCTURES ARE FIT FOR THE DIGITAL AGE

The current framework of multilateral treaties institutions underpinning international cooperation on issues like trade, security and fundamental rights were not built for the digital age. Europe has an opportunity and the clout (both economically and politically) to lead the way: it can craft the strategies and structures needed for effective international cooperation and find effective ways to balance market demands and citizens' interests and safety.

The policy choice is to reconfigure existing institutions and the underpinning treaties to adapt to the consequences of a digital age or to establish new structures, operating agreements and multilateral alliances, focussed on the implications of digital trade, cybersecurity and international relations in the data-driven and tech-enabled world. We need to recognise that policies and regulations at the moment lag behind social norms that in turn lag behind technological development. Understanding of this three-speed dynamic will help us to debate, deliberate, and compare and contrast public policy in multiple jurisdictions, engaging stakeholders in their own domain including the global south on these issues together.

EQUALITY:

LET THE 4TH INDUSTRIAL REVOLUTION BE A REVOLUTION FOR INCLUSION

Inequality and discrimination are markers of market failure and may be particularly exacerbated by the network effect. Artificial Intelligence and algorithms are not inherently neutral, fair or unbiased. The data used will always transmit our biases and often perpetuate them. The digital transformation presents so many opportunities to combat inequality and discrimination, whether through flexible working practices, tools to support disabled people in the workplace, wide and affordable access to precious information, or new educational opportunities online.

Yet it also has the potential, if we do not pay attention and take action, to entrench the inequalities that exist. Customisations that algorithms offer may easily stray into choice limitation by demographic, race and gender, reinforcing discrimination and exclusion. The tech industry still struggles to attract and retain enough women, and both the funding and practical measures to make beneficial technologies available to those who need them remains inadequate. The digital divide exists not only between global North and South but also within Europe and across generations, professions and urban/rural areas. We cannot afford to let current failings be written into the new model through nothing more than oversight: policymakers must actively and consistently

apply a lens of equality and inclusion to the policies they are developing that will shape our digital future.

SOCIAL PLANNING:

PLAN NOW FOR THE LONG-TERM SOCIAL IMPLICATIONS OF THE 4TH INDUSTRIAL REVOLUTION

Tech giants and online platforms for good and services have already significantly changed our habits and experiences of consumption. While the transactions may take place online, the wider long-term implications will be felt most powerfully in the physical world, in our cities and local communities, as our patterns of daily social interaction are altered and urban spaces are reshaped to accommodate the logistics of the digital economy.

Combined with the advent of both the new world of work that AI and robotics are ushering in, the wide-scale implementation of e-government models moving much public service delivery online, and the growing prevalence of virtual and augmented reality in recreational activity, the shift in how we consume goods and services can radically alter our notions and experiences of society and community. To promote wellbeing and secure the maintenance of shared values among citizens, governments must be proactive in planning for the social consequences of the

4th Industrial Revolution. Policy choices for the digital age extend well beyond managing privacy or removing barriers to digital trade.

The policy choices in this regard are many, but there are two which present both current and future opportunity. The EU has a plethora of funding at its disposal stretching from R&D through to the European Social Fund and beyond. A quick win could be to ensure that the policy objectives of these funds incorporate the emerging and future needs of digitalisation in the relevant fields.

A mid-term option is the current discussions on the 2017 White Paper on the Future of Europe. These present an ideal opportunity for Europe to be a thought leader and a pathfinder in planning for a digital age. The choices presented by and consequences of the digital age, which have a 'whole society' and 'whole economy' impact, should be one the cornerstones of how the EU thinks about its future role in designing and developing a policy framework; one that helps member states to engage in effective and long-term social planning for a digital age.

This is more than a focus on jobs and growth: it is also about building citizens' trust, increasing social cohesion, and fostering transition planning for all stakeholders to reap the benefits of the 4th Industrial Revolution. The European Commission would be well advised to introduce this dimension as a horizontal theme into the discussions on the White Paper.

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