Defying Gravity: Europe in the Digital Transformation

Mario Voigt

"Because there is a law such as gravity, the universe can and will create itself from nothing."

- Stephen Hawking

Introduction: State of Play

The world is witnessing a New Moon Race. Looking at the digital economy, today's world is organised around two centres of gravity: the United States (US) and China. They are home to nine of the top 10, and 18 of the top 20 internet companies as measured by market capitalisation. All the leading companies in online search, social media, and e-commerce are based in these two countries.[1] But as the digital transformation continues, it is now shifting toward other economic sectors like transportation (Lyft and Uber) and hospitality (Airbnb). Other industries like automotive, manufacturing, financial services or healthcare will be swift to follow, and new technological developments in Artificial Intelligence (AI), the Internet of Things (IoT) and Big Data will spark even faster and more widespread disruption.

In the age of a growing digital economy, Europe's prosperity is being created, not inherited. The future of Europe depends on a competitive mindset and a willingness to gain an edge over the world's best competitors in the US and China. Hence, Europe's competitiveness depends on the capacity of its society, politics and economy to innovate and upgrade. As European companies and governments consider their own stakes in the game, a critical question remains: Are Europeans defying the two centres of gravity and if yes, how?

---

[1] Candelon, François, Reeves, Martin, and Daniel Wu. 2018. "18 of the Top 20 Tech Companies Are in the Western US and Eastern China. Can Anywhere Else Catch Up?". Harvard Business Review, 3 May 2018.

This article discusses the role of Europe in a digitally transforming world. Therefore, in the first part, it examines the landscape of the digital world, where advanced technologies like AI, digital start-up ecosystems, e-commerce and platforms are dominated by the US and China. Most of the tech giants by market capitalisation are based in these two countries and Europe is being left behind. Hence, in the second section, the article seeks for necessary steps Europeans must take to become competitive. It explores the need for a better digital infrastructure, a strengthened Digital Single Market and a European digital mindset. Finally, it proposes a more competitive and particular European approach.

Europe between Two Centres of Gravity: Uncle Sam versus The Dragon

We are in the midst of a technological revolution: digitalisation. For some, the revolution looks full of promises. Self-driving cars will bring us safely to our destination, communication networks connect continents and 3-D printers meet all customer-specific requirements. However, others suggest a different scenario in which the US, Europe and China are engaged in a race for digital supremacy. The one who loses it, they say, loses the future. With half of the world's population online, demonstrating competitiveness and market potential for further digital economic growth is key for success.
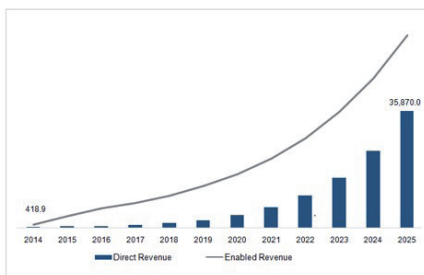
Technology advances quickly and the digital landscape is mainly driven by an imbalance in the platform economy. In order to measure future potential, one has to look at innovation and start-up ecosystems, investment in new technologies and market capitalisation in the digital economies of the US, China and Europe.

Advanced Technology: Putting a Stamp on Artificial Intelligence

Developments in Artificial Intelligence and robotics are generally recognised as the main driver of future growth, competitiveness and job creation by increasing productivity and efficiency, and lowering costs. But AI also triggers far-reaching societal and economic changes, which will transform all aspects of life from employment, the social contract to warfare. The impact of AI leadership has been summed up by

Russia's President Vladimir Putin: "whoever becomes the leader in this sphere will become the ruler of the world".[2]

In Artificial Intelligence, the US and China are in an arms race for global leadership. Rapid improvements in information storage capacity, high computing power, and considerable advancements in Artificial Intelligence technology in end-use industries are driving economic growth. The global Artificial Intelligence market size was valued at 641.9 million USD in 2017 on the basis of its direct revenue sources and at 5,970 million USD in 2017 on the basis of AI-based gross value addition (GVA) prognoses. The market is projected to reach 35,870 million USD by 2025 in direct revenue sources, growing at a compound annual growth rate (CAGR) of 57.2% from 2018 to 2025.[3]

Source: Artificial Intelligence Market Analysis. 2017.

While taking an either more state-driven (China) or a more private-sector-driven (US) approach, in their entrepreneurial frenzy, China and the US are outshining other countries. In 2017, China's Artificial Intelligence start-ups took 48% of all dollars going to AI start-ups globally, more than that by US start-ups (38%). Both combined made up almost 90 percent.[4]
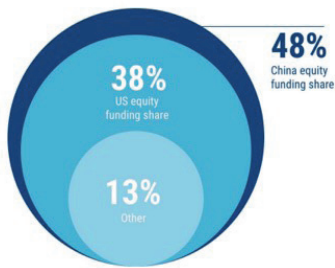
---

[2] Gigova, Radina. 2017. "Who Vladimir Putin thinks will rule the world". https://edition.cnn.com/2017/09/01/world/putin-artificial-intelligence-will-rule-world/index.html. Accessed 18 December 2018.

[3] Grand View Research. 2017. "Artificial Intelligence Market Analysis By Solution (Hardware, Software, Services), by Technology (Deep Learning, Machine Learning, Natural Language Processing, Machine Vision), by End-use, By Region, and Segment Forecasts, 2018 – 2025". https://www.grandviewresearch.com/industry-analysis/artificial-intelligence-ai-market/methodology. Accessed 18 December 2018.

[4] CB Insights. 2018. "Artificial Intelligence Trends To Watch In 2018". https://www.cbinsights.com/research/report/artificial-intelligence-trends-2018/". Accessed 18 December 2018.

China dominates global AI funding
US vs. China total equity funding to startups in 2017

48%
China equity
funding share

38%
US equity
funding share

13%
Other

Source: CB Insights. 2018.

In July 2017, China outlined a bold multi-billion national strategic plan to catch up in global AI research by 2020 and to deliver major breakthroughs and become the world leader by 2030. On the other side, however, the US still leads in both the total number of AI start-ups and total funding overall. Both countries can draw from a wealth of data and opportunities for companies to scale quickly.

For some, Europe's role in this arms race is defined as that of a colony in the American tech empire.[5] Indeed, Europe still lacks a comparable AI ecosystem. Even the European Commission admits that Europe is lagging behind in private investments in AI: "2.4-3.2 billion EUR in 2016, compared to 6.5-9.7 billion EUR in Asia and 12.1-18.6 billion EUR in North America".[6] A lack of a strategic plan at the European Union (EU) level, a low level of public and external investment, a cautious approach to adoption from companies and the general public and no EU-wide liability rules on AI and robotics are credited for the underperformance.[7] This has led European countries to lay down AI-specific and comprehensive AI strategies (e.g., the UK, France), integrate AI technologies within national technology or digital roadmaps (e.g., Denmark) or develop a national AI Research and Development (R&D) or Work strategy (e.g., Finland). In April 2018, 25 EU countries signed a declaration to join forces and to engage in a collective "European approach" to AI. This push includes

[5] Lee, Kai-Fu. 2018. *AI Superpowers: China, Silicon Valley and the New World Order*.

[6] European Commission. 2018. "Factsheet: Artificial intelligence for Europe". https://ec.europa.eu/digital-single-market/en/news/factsheet-artificial-intelligence-europe. Accessed 18 December 2018.

[7] European Commission. 2018. "Digital Transformation Monitor. USA-China-EU plans for AI: where do we stand?". https://ec.europa.eu/growth/tools-databases/dem/monitor/sites/default/files/DTM_AI%20USA-China-EU%20plans%20for%20AI%20v5.pdf. Accessed 18 December 2018.

funding for research to harvest the potential of Artificial Intelligence.[8] Under the research programme "Horizon 2020" public funding will be 1.5 billion EUR for the period 2018-2020 and adds up to a combined public and private investment in the same period of 20 billion EUR.[9] Germany's Minister for Economy, Peter Altmaier, has called for a "European Airbus for AI" as an "Important Project of Common Interest" (IPCI), which fits Germany's AI Strategy to create a joint French-German AI research centre.[10] In such an endeavour, European institutions will play a key role in coordinating, "filling in policy gaps that cannot be addressed solely at the national level and support the widespread development of competitive AI ecosystems throughout Europe" as well as aim for "a common, internationally recognised ethical and legal framework for the design, production and use of AI, robotics, and their increasingly autonomous systems".[11] Prioritising the protection of the user's privacy would be a distinctly different approach compared with the commercial quest for data and analytics of the American and Chinese companies. It seems that Europe will seize the opportunity by fostering a continent-wide collaboration to put its distinct stamp on AI by taking a different path from that of the US and China. Or in the words of Emmanuel Macron: "to be an acting part of this AI revolution".[12]

Innovation: Flourishing a Digital Start-Up Ecosystem

Such an aggressive competition for innovation and new technologies spills over to the venture capital market and start-up ecosystem. The US and China have the most active digital-investment ecosystems in the world. In fact, the members of the so-called "Global Unicorn Club", private companies in the tech sector whose value exceeds 1 billion USD each, speak predominantly American-English or Chinese-Mandarin. For the 274 companies founded in 2003 or later that have

---

[8] European Commission, 2018. "EU Member States sign up to cooperate on Artificial Intelligence". https://ec.europa.eu/digital-single-market/en/news/eu-member-states-sign-cooperate-artificial-intelligence. Accessed 18 December 2018.

[9] European Commission. 2018. "Factsheet: Artificial intelligence for Europe". https://ec.europa.eu/digital-single-market/en/news/factsheet-artificial-intelligence-europe. Accessed 18 December 2018.

[10] Peter Altmaier at the Digitalgipfel, 4 December 2018.

[11] Delponte, Laura. 2018. "European Artificial Intelligence (AI) leadership, the path for an integrated vision". http://www.europarl.europa.eu/RegData/etudes/STUD/2018/626074/IPOL_STU(2018)626074_EN.pdf. Accessed 18 December 2018.

[12] Thompson, Nicholas. 2018. "Emmanuel Macron talks to wired about france's ai strategy", 31 March 2018. https://www.wired.com/story/emmanuel-macron-talks-to-wired-about-frances-ai-strategy/. Accessed 18 December 2018.

reached unicorn status, half are in the US and China, which with its 69 has more than twice as many unicorns as Europe with 33.[13] More strikingly, American companies in Silicon Valley tend to scoop up the promising digital start-ups from Europe. From 2011 to 2017, the GAFAM companies[14] acquired more than 65 leading-edge European technology companies like Skype and AI pioneer DeepMind. And it is no wonder that in most cases the size of the respective European operations shrank after their acquisition.[15]

In China, the "Great Firewall" of legislative actions and technologies hinders competition and helps the three Internet giants to nurture a homegrown digital ecosystem that is now spreading beyond China. Baidu, Alibaba, and Tencent[16] have been developing a multi-industry digital ecosystem that touches almost every aspect of consumers' lives. How important Chinese digital companies are for the venture capital market becomes obvious by looking at the numbers. In 2016, Baidu, Alibaba, and Tencent (BAT) provided 42 percent of all venture-capital investment in China. They have a far more prominent role than Amazon, Facebook, Google, and Netflix, which together contributed only 5 percent to the US venture-capital investment in that same year.[17]

In contrast, European companies make up about 11% of the total number in the "Global Unicorn Club", that is, only 30 companies. These European start-ups have an aggregate valuation of about 64 billion USD, and operate across a range of industries, including fintech, e-commerce, or healthcare.[18] Europe's tech community seems to be still "Balkanised" along national borders, while connections between local venture capitalists and start-up founders across the continent are needed if Europe ever wants to play in the big leagues.[19] The lack of a competitive venture capital market is described by the most recent numbers of 2017. From the 57 start-

---

[13] CB Insights. 2018. "The Global Unicorn Club". https://www.cbinsights.com/research-unicorn-companies. Accessed 18 December 2018.

[14] GAFAM stands for Google/Alphabet, Apple, Facebook, Amazon, Microsoft.

[15] Candelon. 2018.

[16] Collectively known as BAT.

[17] Woetzel, Jonathan et al. 2017. "China's digital economy. A leading global force". https://www.mckinsey.com/featured-insights/china/chinas-digital-economy-a-leading-global-force. Accessed August 2018.

[18] CB Insights. 2018b.

[19] Scott, Mark. 2018. "Goodbye internet: How regional divides upended the world wide web". 28 January 2018, Politico. https://www.politico.eu/article/internet-governance-facebook-google-splinternet-europe-net-neutrality-data-protection-privacy-united-states-u-s/. Accessed 18 December 2018.

ups which became unicorns in 2017, 32 are from the US, 18 from China and just four from Europe; interestingly all four were from the UK.[20] The lack of appropriate and swift funding of new ideas to make them products or a company is a major weakness of Europe.

Market Share: Competing in the Platform Economy and E-Commerce

Even in a digital world, size matters. In a digital economy, Napoleon Bonaparte's old saying becomes reality: "China is a sleeping lion. Let her sleep, for when she wakes she will shake the world." In e-commerce, China is the world's largest market and accounts already for more than 40 percent of the value of worldwide transactions compared to less than 1 percent only about a decade ago. The current value of China's e-commerce transactions is estimated to be larger than that of France, Germany, Japan, the United Kingdom, and the United States combined. One explanation for China's dominance is the explosion in use of mobile payments, which grew from just 25 percent in 2013 to 68 percent in 2016. In 2016, the value of mobile payments related to individuals' consumption was 790 billion USD, 11 times that of the United States.[21]

Two factors drive this quick digital transformation of the Chinese Dragon. Firstly, China is benefiting from its large domestic market to achieve scale and to surround itself with rich ecosystems of start-ups, suppliers and customers. In 2016, 731 million of China's 1.4 billion citizens used the internet, more users than in the European Union and the United States combined. Beyond scale, it is the enthusiasm for digital tools among China's much younger consumer base which accelerates growth and quick adoption.

Such an imbalance can also be found in the platform economy. According to the Center for Global Enterprise, the Asia-Pacific has seen the creation of 82 digital platforms with close to 350,000 employees and a combined market capitalisation of 930 billion USD. Europe is trailing behind both the United States and the Asia-Pacific region in encouraging successful platform enterprises. Only 27 digital platforms were created in Europe, with 109,000 employees and a combined market capitalisation of 181 billion USD. However, Europe and China do not come close to

20 Desjardins, Jeff. 2017. "The 57 Startups That Became Unicorns in 2017". https://www. visualcapitalist.com/57-startups-unicorns-in-2017/. Accessed 18 December 2018.

21 McKinsey. 2018.

the combined market capitalisation of US-based digital platforms – about 3 trillion USD.[22]

Market Capitalisation: Financial Strength in Tech

From 2010 to 2017, the market capitalisation of the GAFAM companies (Google/Alphabet, Amazon, Facebook, Apple, and Microsoft) increased by 2.6 trillion USD. In contrast, the value of the 28 non-GAFAM companies that make up the Dow Jones Industrial Average rose by 2.1 trillion USD. In China, Alibaba and Tencent are among the 10 most valuable companies in the world and, along with Baidu, are collectively worth more than 1 trillion USD.[23] In today's digital economy the US and China are the two centres of gravity, where their tech giants dominate the markets. Out of the top 10 companies by market capitalisation nine are based in these two countries.

There is another aspect aside from the duality between the US and China driven by the winner-takes-all mentality of digital companies in the US and China. Looking at the world's 20 largest tech giants, there is a divide between the top-tier companies and those further down the ladder. The top companies on the list like Apple, Alibaba, Alphabet, Amazon, Microsoft and Tencent are all above the 450 billion USD mark and account for over 80% of the total value of the Top 20 tech companies. Not a single company hovers between 200 and 450 billion USD. This underpins the divide. First of all, digitalisation is driven by American or Chinese companies, and secondly, for tech newcomers it is pretty hard to vault into the upper echelon of the market. The only European company in the Top 20 ranks is German based SAP.

In conclusion, Europe is facing two major risks. First, European companies are struggling to keep pace with their US and Chinese competitors in core areas of technological change. In particular, platform economies and digital ecosystems are heavily imbalanced from the European point of view. Second, the digital arms race between the US and China in the area of Artificial Intelligence draws tech-talents away from the European market. It has a strong base of homegrown engineering talent and a good start-up creation rate, but the availability of venture capital in Europe is sparse compared to the financial El Dorado in the US or the Chinese-style government approach to sheltering and nurturing its tech industry.

[22] Evans, Peter, and Gawer, Annabelle. 2016. "The Rise of the Platform Enterprise: A Global Survey", Center for Global Enterprise.

[23] Candelon. 2018.

A Third Way? Europe's Role in a Digital Age

The EU is prosperous, technologically advanced and has a well-educated but aging workforce. Europe is the second largest economy after China, coming in ahead of the US, and its domestic market is providing a powerful launching pad for world-changing technologies and companies. However, the digital world seems to gravitate towards either the Chinese or the American pole, whereas Europe is stuck in the middle. On the one hand, big US companies like Google, Apple, Facebook, Amazon, or Microsoft dominate in Europe. On the other hand, China is challenging Europe's industrial strength and innovative industries. Europe could potentially be the biggest loser of a successful "China 2025" strategy, when its leadership in research and development of high technology is challenged.[24] Accordingly, a competitive Europe has to address how prosperity for both citizens and companies can be produced to an extent that companies operating in the EU are able to compete successfully in the global digital economy while supporting high living standards for the average European: a global digital player and a better place to work and live in.
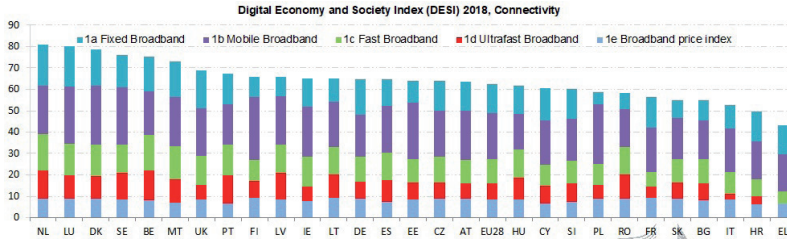
What are necessary steps to becoming competitive? Three major issues which hinder European excellence have to be addressed: digital infrastructure, a Digital Single Market and a digitally educated mindset.

Improving the Backbone: Investing in Digital Infrastructure

A big bottleneck towards achieving a more competitive Europe is the slow expansion of digital infrastructure in the EU. There was a political target to achieve fast broadband coverage (more than 30 mega-bits per second) for all Europeans by 2020. But this seems to be out of reach, because in 2017, only 79% of all households had access to such connections (up from 55.8% in 2013).

---

[24] For different scenarios, see Bertelsmann Stiftung. 2016. China 2030. Szenarien und Strategien für Deutschland. However, in a Bruegel study, Alicia Garcia Herrero sees a paradigm shift in terms of US-China economic relations which could potentially benefit the European Union. http://bruegel.org/2018/08/us-china-trade-war-whats-in-it-for-europe/. See also: Alicia Garcia Herrero and Jianwei Xu, "How Big Is China's Digital Economy?". Working Paper, 2018.

Digital Economy and Society Index (DESI) 2018, Connectivity

Source: European Commission, DESI. 2018.

In the EU, 4G mobile coverage is almost universal at 98%. However, rural areas remain challenging, as 8% of homes are not covered by any fixed network, and 53% are not covered by any NGA technology (VDSL, Cable Docsis 3.0 and FTTP).[25] Upgrading the digital infrastructure is an expensive endeavour and depending on the time horizon and the planned investments, their costs often reach several billion. The European Commission estimated that 515 billion EUR would need to be invested over ten years to achieve a European Gigabit Society by 2025.[26]

Increasing data volumes, more cloud storage capacities and a demand for real-time communication between physical and virtual "things" as a precondition for Industry 4.0 amplify the need for an improved digital infrastructure. Today's European capacities are insufficient to meet increasing demand by European industries, innovators and scientists who process their data outside the EU because their needs are not matched by the computation time or computer performance available in the EU. Tim Hoettges, CEO of Telekom, recently stated that only five percent of German data are hosted by SAP or Telekom. The other 95 percent are with the hyperscaler Amazon, Microsoft or Google.[27] If data is a prerequisite for machine learning and AI, the EU must find better ways to reduce this disproportion. However, the EU has none of the 10 most powerful supercomputers worldwide and only 4 of the top 20 supercomputers. This situation has constantly deteriorated since 2012, when the EU possessed 4 of the top 10 supercomputers. Moreover, the best supercomputers in Europe are supplied by non-EU vendors and are based on

---

[25] European Commission. 2018. "Broadband Coverage in Europe 2017". https://ec.europa.eu/digital-single-market/en/connectivity. Accessed 18 December 2018.

[26] European Commission. Commission Staff Working Document SWD (2016) 300 final. For yearly improvements the EU's Digital Economy and Society Index (DESI) indexes relevant indicators on Europe's digital performance and tracks the evolution of EU member states in digital competitiveness, see: https://ec.europa.eu/digital-single-market/en/desi. Accessed 18 December 2018.

[27] Tim Höttges at the Digital Summit of the German Federal Government 2018, Nuremberg on 4 December 2018.

non-EU technology. At the moment, EU industry provides about 5% of supercomputing resources worldwide, but consumes one third of them.[28]

Digital infrastructure is critical to achieving the goal of a Gigabit Society in 2025.[29] Europe has to improve significantly in order to keep up with China and the US.

A Union: Smart Regulation for a Digital Single Market

Market fragmentation and regulatory barriers in Europe are major hurdles to building a vibrant digital economy. Hence, Europe has set out an ambitious agenda and the European Commission wants to make the EU's single market fit for the digital age – moving from 28 national digital markets to a single one. The EU's Digital Single Market (DSM) strategy was launched in May 2015 and is one of the European Commission's ten political priorities. It aims to create an area where businesses and consumers have unrestricted access to digital goods and services all over Europe, with free flow of data and an environment that allows for both competition and innovation.[30] Expectations for the DSM are high, and the European Commission suggests that creating a fully functioning DSM could add about 515 billion EUR per year to the EU GDP and help to create several hundred thousand new jobs. As Alphabet chairman Eric Schmidt rightly observed: "A digital single market will give European entrepreneurs, who have all the right building blocks, the incentive to invest and the ability to achieve global scale at greater speed".[31]

The DSM strategy rests on three main policy pillars:

---

[28] European Parliamentary Research Service. 2017. Developing supercomputers in Europe. Brussels.

[29] In 2016, the European Commission updated and extended its digital infrastructure goals:
- By 2025, all major socio-economic drivers (such as schools, transport hubs, the main providers of public services or highly digitalised companies) should have access to connectivity of at least 1 gigabit/second.
- all urban areas and all major terrestrial transport paths should have uninterrupted 5G coverage by 2025.
- all European households should have access to internet connectivity of at least 100 Mbit/s, which is upgradeable to gigabit speed, see: European Commission (2016). Connectivity for a Competitive Digital Single Market – Towards a European Gigabit Society. Brussels.

[30] For a complete overview: Erixon, Fredrik and Lamprecht, Philipp. 2018. "The Next Steps for the Digital Single Market. From Where do We Start?". http://ecipe.org/publications/the-next-steps-for-the-digital-single-market-from-where-do-we-start/. Accessed October 2018.

[31] Schmidt, Eric. 2014. "Why Europe needs a digital single market". https://www.weforum.org/agenda/2014/09/new-digital-era-europe/. Accessed 18 December 2018.

- Access: better access for consumers and businesses to digital goods and services across Europe by removing barriers to cross-border e-commerce and access to online content while increasing consumer protection.

- Environment: creating the right conditions by providing high-speed, secure and trustworthy infrastructures and services supported by the right regulatory conditions.Economy and Society: maximising the growth potential of the digital economy and enhancing digital skills, which are essential for an inclusive digital society.[32]

Overall, this has impacted different policy areas. They stretch from data and data security, copyright issues, mobile and broadband infrastructure, online cross-border trade, to e-government. Furthermore, with the strategy the EU has established a set of support mechanisms such as the "Building a European Data Economy" Communication. Different policy groups and workshops, e.g. the EU Blockchain Observatory and Forum, or working groups on 5G networks, have been created.

Financially, the Digital Single Market strategy has pushed, along with Horizon 2020, for more funding of R&D, e.g., for Digital Innovation Hubs, or the Future and Emerging Technologies Fund. The EU Commission proposes an overall budget of 9.2 billion EUR to shape and support the digital transformation of Europe's society and economy. Through this targeted financial support, the future long-term budget of the EU should help bridge the digital investment gap.

Initial successes of the DSM strategy can be witnessed. Achievements on roaming and cross-border portability of digital content, or the infrastructure push to pave the way for the roll-out of 5G in 2020, were well received by consumers and businesses alike and enabled them to make the transition to Industry 4.0 models. For the public sectors, the DSM's objective is to promote the digitalisation of public administrations of member states, and the E-government Action Plan sets standards and will improve their level of digital cooperation. On the other hand, the Directive on Security of Network and Information Systems (NIS Directive) has been criticised for not sufficiently promoting cybersecurity in the EU. And the geo-blocking regulation falls short of ending the legislative fragmentation that prevents the emergence of a single market for businesses and consumers using e-commerce. Furthermore, international initiatives already address tax base erosion:

[32] The complete Digital Single Market strategy can be found at: https://ec.europa.eu/digital-single-market/en/news/digital-single-market-strategy-europe-com2015-192-final.

profit shifting and countries like France introducing legislation regarding taxation in a borderless digital world.[33]

One initiative has gained particular prominence. The General Data Protection Regulation (GDPR) aims for a more harmonised data protection regime across the EU. It has been received with mixed reactions. Some praise it as a new global standard for data protection and privacy in a digital world. Others criticise its demanding administrative costs from businesses and the difficulties it causes to develop and provide market-driven services for data on an individual level.

The GDPR is symptomatic of the overall approach of the current commission. It puts more emphasis on regulation than liberalisation.[34] The "Balkanisation" of the European digital market is still strong as they remain all too segmented along national lines. Hence, a new competitive digital market is not advancing fast enough to address the disruptive change occurring and some European regulations even harden the digital barriers to non-EU countries.[35]

---

[33] European Commission. 2018. "Fair Taxation of the Digital Economy". https://ec.europa.eu/taxation_customs/business/company-tax/fair-taxation-digital-economy_en. Accessed 18 December 2018. And European Commission. 2018. "Shaping the Digital Single Market". https://ec.europa.eu/digital-single-market/en/policies/shaping-digital-single-market. Accessed 18 December 2018. See also: See OECD, Tax Challenges Arising from Digitalisation.

[34] Erixon. 2018.

[35] Clearly, the EU as an institution and their member states often follow different paths and strategies. For a differentiated look at the European member states, see: Erixon, Fredrik, and Lamprecht, Philipp. 2017. "New Coalitions for Europe's Digital Future – Building Capacity, Improving Performance", Brussels, which divides the member states based on their openness towards a digital transformation in digital managerialists, digital frontrunners, and digital convergers.

Remaining initiatives	Impact	Status
Data and Cybersecurity		
European cybersecurity agency[5]	Establishes an EU agency to undertake EU responses to cyber-threats.	Proposed in September 2017, awaiting co-legislature.
EU cybersecurity certification framework[6]	Establishes a framework to promote cybersecurity via appropriate certification of digital goods and services.	Proposed in September 2017, awaiting co-legislature.
E-commerce		
Modernize e-commerce contract rules[7]	Switches majority of rules from minimum to maximum harmonization; recasts Consumer Sales Directive for online contracts, creating regime separate from offline sales; introduces notion of conformity of goods; hierarchy of remedies for online sales; codifies case law on consumer's rights to withhold, refunds, time limits;	Proposed in December 2015, awaiting co-legislature.
Value added tax (VAT) for e-commerce[8]	Introduces threshold (€100,000 cross-border sales) for application of rules on suppliers of electronic services; one-stop shop for VAT registration for electronic services.	Adopted in December 2017, coming into forced in 2019 for e-services and 2021 for goods.
VAT rate on e-publications[9]	Allows e-publications to have same VAT as print publications.	Proposed in December 2016, awaiting co-legislature.
Telecommunications		
Modernization of EU telecom rules (European Electronic Communications Code)[10]	Amends 4 existing directives to establish common rules and regulatory objectives; improves coordination and use of radio-frequencies across the EU; facilitates process of switching suppliers; promotes rights to affordable contracts.	Proposed in September 2016, awaiting co-legislature.

Source: Erixon. 2018.

Currently, the pipeline for the DSM strategy, and its corresponding policies and initiatives, does not go not far enough in promoting regulatory homogeneity and the next Commission has to push harder to allow EU member states to take full advantage of the Digital Single Market, by reducing the cost of cross-border exchange of digital goods and services, expanding the free flow of data and reducing regulatory red tape.

A Distinct European Digital Mindset

A building block for a more competitive Europe is a sophisticated management of talent, a digital mindset and skills development. According to the Digital Economy and Society Index (DESI) of the EU,[36] 169 million Europeans between 16 and 74 years old – 44% – do not have basic digital skills. Of these, 77 million people have no digital skills at all. Furthermore, 37% or 80 million in the labour force do not have basic digital skills. The DESI report of 2017 projects a risk that Europe will lack 500,000 information and communication technology (ICT) specialists in 2020.[37]

[36] Digital Economy and Society Index (DESI) is a composite index that summarises relevant indicators on Europe's digital performance and tracks the evolution of EU member states in digital competitiveness, see: https://ec.europa.eu/digital-single-market/en/desi.
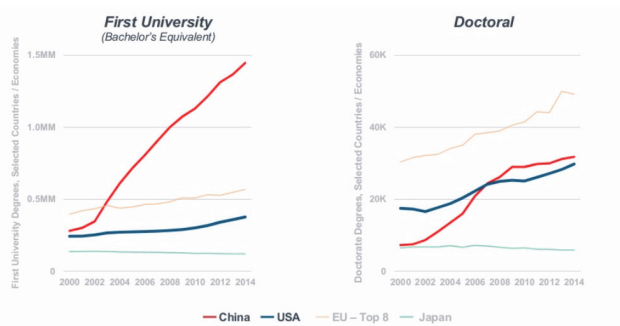
[37] European Commission. 2018. "Europe's Digital Progress Report 2017". https://ec.europa.eu/digital-single-market/en/european-digital-progress-report. Accessed 18 December 2018.

Digital Economy and Society Index (DESI) 2018 ranking

Source: European Commission, DESI. 2018.

While the Nordic countries of Denmark, Sweden, Finland, and the Netherlands have the most advanced digital economies in the EU, Romania, Greece and Italy have the lowest scores on the DESI. If Europe is ever going to meet its as-yet-unfulfilled promise as a global digital player, a continent-wide concerted effort to shape mindsets and skills is needed. The EU Commission launched the Digital Skills and Jobs Coalition, which brings together Member States and stakeholders from the private and public sectors to tackle Europe's existing digital skills gap and ensure the workforce is ready for the jobs of tomorrow. They defined four target areas: ICT professionals, labour force, citizens and education. The Coalition has a goal to train 1 million unemployed young people for digital jobs by 2020, to support the upskilling and retraining of the workforce and, in particular, to support small and medium enterprises (SMEs) and to modernise education and training for digital skills. Its activities have benefited several million citizens, with over 3.7 million train-ings in digital skills provided, more than a million digital skills certifications issued, and 4,500 events conducted, from Riga TechGirls to Outreach with Educational Robotics.[38] Part of such an effort are also the Digital Innovation Hubs, which act as one-stop-shops where especially SMEs, start-ups and mid-size companies can get access to technology-testing, financing advice, market intelligence and networking opportunities. The EU Commission is investing 100 million EUR per year from 2016 to 2020.

---

[38] DESI Report 2018. Human capital. Riga Tech Girls, e.g., was the first community in Latvia dedicated to educating and inspiring girls and women about technology.

First University
(Bachelor's Equivalent)

Doctoral

First University Degrees, Selected Countries / Economies

1.5MM

1.0MM

0.5MM

0

2000 2002 2004 2006 2008 2010 2012 2014

Doctorate Degrees, Selected Countries / Economies

60K

40K

20K

0

2000 2002 2004 2006 2008 2010 2012 2014

— China — USA — EU – Top 8 — Japan

Source: Annual Natural Science or Engineering Degrees in Kleiner Perkins. 2018.

Beyond closing the digital skills gap, targeting students and technology experts becomes essential to offering opportunities to pursue trainings in advanced digital technologies, such as data analytics, robotics, Artificial Intelligence, blockchain technology, cybersecurity and high-performance computing. In this regard, Europe has potential: more Doctoral degrees in Natural Sciences and Engineering are pursued than in the US or China. In stark contrast, however, is the rapidly growing number of Chinese students with a first degree in Natural Sciences or Engineering.[39]

It seems that technological advances will demand unprecedented flexibility when it comes to learning. To predict what kind of knowledge and skills will still be relevant 20 years from now could be a rather difficult task, especially as some of the industries of tomorrow might not even exist yet. While education and basic science are potential equalisers, Europe's strength could also arise from a different digital mindset and legal-philosophical tradition. Based on its culture, Europe should strive to set global standards and become a global norm leader, using its leverage and relevance due to its solid legal traditions, enduring focus on values and a European market of 500 million relatively rich consumers.[40] Setting standards on AI, Big Data, the IoT, critical thinking and a 360 degree ethical perspective become equally important to maintaining a competitive edge.[41] Germany's digital modernisation strategy, "Industry 4.0", is as much a way of upgrading its manufacturing base through machine-learning tools as a concept for a digital society.

[39] Kleiner Perkins. 2018. "Internet Trends Report 2018". https://www.kleinerperkins.com/files/INTERNET_TRENDS_REPORT_2018.pdf. Accessed 18 December 2018. S. 227.

[40] European Parliamentary Research Service. 2018. "Global Trends to 2035: Economy and Society". Brussels.

[41] Trajtenberg, Manuel. 2017. "AI as the next GPT: a Political-Economy Perspective". https://www.nber.org/papers/w24245. Accessed 18 December 2018.

Interestingly, the diverse European culture and their soft power mechanisms, which some perceive as a weakness, could become an asset.[42] As the basis of competition in a globalised world has shifted more and more to the creation and assimilation of knowledge and digitalisation, surprisingly the role of diversity has grown. Differences in cultures, values, economic structures, political institutions and regulations all contribute to competitive success. Here, Europe provides a unique perspective, which could mediate positions and bridge the gap between the two fairly extreme poles of the US and China in digital transformation. Or, as German chancellor Angela Merkel has pointed out with regard to data or AI: "In the US, control over personal data is privatised to a large extent. In China the opposite is true: the state has mounted a takeover". Europe has to find its place.[43]

Europe: Show some Gravitas!

The world is in the midst of an exceptional revolution: Digitalisation has been a rather silent process moving horizontally through our economy and society, but with disrupting impact. It challenges not only businesses or societies but political entities as well. The current global digital power map knows two centres of gravity: the US and China.

The competition between the US and China seems like a New Moon Race and a test of two different systems. In this regard, Europe should defy gravity and show some gravitas in the digital transformation. Gravitas was one of the Roman virtues and valued as promoting collective and individual greatness. Hence, Europe must find its own way in the digital transformation if it wishes to remain relevant. It has to be done on the basis of strength, of competitiveness. Looking at the start-up ecosystem, the advanced technological developments, market share in the digital economy and the market capitalisation of the tech companies, Europe is clearly behind the US and China. To become a digital powerhouse, Europe will have to overcome its divisions, digital and otherwise, fight for its digital sovereignty and restore its digital ability to act autonomously.

The biggest threats are lack of time, dedication and vision. The digital innovation is accelerating, and competition is increasing. The EU must proceed with greater urgency and pool its combined resources. Most of Europe has the skills and

---

[42] Puddephatt, Andrew, Torreblanca, José Ignacio, and Prislan, Nika. "The New Great Game". https://www.ecfr.eu/page/-/The_New_Great_Game_ECFR.pdf. Accessed 18 December 2018.

[43] The Economist. "Can the EU become another AI superpower?". https://www.economist.com/business/2018/09/20/can-the-eu-become-another-ai-superpower. Accessed 18 December 2018.

experience necessary to improve productivity, to enhance innovation capability, and to customise products and services. Europe should use their good or leading position continent-wide, in areas such as robotics, Industry 4.0, networked mobility, or smart energy networks.[44] Europe's current position is built on a heritage of world-class science, business, education, entrepreneurship and innovation. Today, the EU has to play an active role in building world-class infrastructure, a digital education system based on innovation and values, and a strong Digital Single Market to move confidently in an open, global and competitive world.

Mario Voigt is Professor of Digital Transformation and Politics at the Quadriga University Berlin. He has been keynote speaker in more than 40 countries and published five books, numerous studies and articles on digital communication, digital transformation, and big data. Prof. Voigt is a consultant to companies, NGOs and public affairs campaigns and in the 2017 Bundestag election campaign, he was strategy consultant for mobilisation for Angela Merkel's re-election bid. Since 2009, Voigt has been elected twice as a Member of the State Parliament Thuringia and is a speaker on business, science and digital society.

References

Bertelsmann Stiftung. 2016. China 2030. Szenarien und Strategien für Deutschland.

Candelon, François, Reeves, Martin, and Daniel Wu. 2018. "18 of the Top 20 Tech Companies Are in the Western US and Eastern China. Can Anywhere Else Catch Up?". Harvard Business Review. 3 May 2018.

CB Insights. 2018. "Artificial Intelligence Trends To Watch In 2018". https://www.cbinsights.com/research/report/artificial-intelligence-trends-2018/. Accessed 18 December 2018.

CB Insights. 2018. "The Global Unicorn Club". https://www.cbinsights.com/research-unicorn-companies. Accessed 18 December 2018.

---

[44] Körner, Kevin, Schattenberg, Marc, and Heymann, Eric. 2018. "Digital economics. How AI and robotics are changing our work and our lives". https://www.dbresearch.com/PROD/RPS_EN-PROD/PROD0000000000468705/Digital_economics%3A_How_AI_and_robotics_are_changin.pdf. Accessed 18 December 2018.

Delponte, Laura. 2018. "European Artificial Intelligence (AI) leadership, the path for an integrated vision". http://www.europarl.europa.eu/RegData/etudes/STUD/2018/626074/IPOL_STU(2018)626074_EN.pdf. Accessed 18 December 2018.

Desjardins, Jeff. 2017. "The 57 Startups That Became Unicorns in 2017". https://www.visualcapitalist.com/57-startups-unicorns-in-2017/. Accessed 18 December 2018.

Erixon, Fredrik, and Lamprecht, Philipp. 2018. "Cooperation in Europe's Digital Economy. How do Countries Position Themselves?". http://ecipe.org/publications/cooperation-in-europes-digital-economy/. Accessed October 2018.

European Commission. 2018. "Broadband Coverage in Europe 2017. https://ec.europa.eu/digital-single-market/en/connectivity". Accessed 18 December 2018.

European Commission. 2018. "Factsheet: Artificial intelligence for Europe". https://ec.europa.eu/digital-single-market/en/news/factsheet-artificial-intelligence-europe. Accessed 18 December 2018.

European Commission. 2018. "Digital Transformation Monitor. USA-China-EU plans for AI: where do we stand?". https://ec.europa.eu/growth/tools-databases/dem/monitor/sites/default/files/DTM_AI%20USA-China-EU%20plans%20for%20AI%20v5.pdf. Accessed 18 December 2018.

European Commission. 2018. "Europe's Digital Progress Report 2017". https://ec.europa.eu/digital-single-market/en/european-digital-progress-report. Accessed 18 December 2018.

European Commission. 2018. "EU Member States sign up to cooperate on Artificial Intelligence". https://ec.europa.eu/digital-single-market/en/news/eu-member-states-sign-cooperate-artificial-intelligence. Accessed 18 December 2018.

European Commission. 2018. "Fair Taxation of the Digital Economy". https://ec.europa.eu/taxation_customs/business/company-tax/fair-taxation-digital-economy_en. Accessed 18 December 2018.

European Commission. 2018. "Shaping the Digital Single Market". https://ec.europa.eu/digital-single-market/en/policies/shaping-digital-single-market. Accessed 18 December 2018.

European Commission. 2018. "The Digital Economy and Society Index (DESI)". https://ec.europa.eu/digital-single-market/en/desi. Accessed 18 December 2018.

European Parliamentary Research Service. 2017. "Developing supercomputers in Europe. Brussels".

European Parliamentary Research Service. 2017. "Global Trends to 2035: Economy and Society". Brussels.

Evans, Peter, and Gawer, Annabelle. 2016. "The Rise of the Platform Enterprise: A Global Survey". Center for Global Enterprise, 2016.

Garcia Herrero, Alicia. 2018. "US-China trade war: What's in it for Europe?". http://bruegel. org/2018/08/us-china-trade-war-whats-in-it-for-europe/. Accessed 18 December 2018.

Gigova, Radina. 2017. "Who Vladimir Putin thinks will rule the world". https://edition. cnn.com/2017/09/01/world/putin-artificial-intelligence-will-rule-world/index.html. Accessed 18 December 2018.

Grand View Research. 2017. "Artificial Intelligence Market Analysis By Solution (Hardware, Software, Services), by Technology (Deep Learning, Machine Learning, Natural Language Processing, Machine Vision), by End-use, By Region, and Segment Forecasts, 2018 – 2025". https://www.grandviewresearch.com/industry-analysis/ artificial-intelligence-ai-market/methodology. Accessed 18 December 2018.

Kleiner Perkins. 2018. "Internet Trends Report 2018". https://www.kleinerperkins.com/ files/INTERNET_TRENDS_REPORT_2018.pdf. Accessed 18 December 2018. S. 227.

Körner, Kevin, Schattenberg, Marc, and Heymann, Eric. 2018. "Digital economics. How AI and robotics are changing our work and our lives". https://www.dbresearch.com/ PROD/RPS_EN-PROD/PROD0000000000468705/Digital_economics%3A_How_AI_and_ robotics_are_changin.pdf. Accessed 18 December 2018.

Lee, Kai-Fu. 2018. *AI Superpowers: China, Silicon Valley and the New World Order*.

Puddephatt, Andrew, Torreblanca, José Ignacio, and Prislan, Nika. "The New Great Game". https://www.ecfr.eu/page/-/The_New_Great_Game_ECFR.pdf. Accessed 18 December 2018.

Schmidt, Eric. 2014. "Why Europe needs a digital single market". https://www.weforum. org/agenda/2014/09/new-digital-era-europe/. Accessed 18 December 2018.

Scott, Mark. 2018. "Goodbye internet: How regional divides upended the world wide web". 28 January 2018, Politico. https://www.politico.eu/article/internet-governance- facebook-google-splinternet-europe-net-neutrality-data-protection-privacy-united- states-u-s/. Accessed 18 December 2018.

The Economist. "Can the EU become another AI superpower?". https://www.economist. com/business/2018/09/20/can-the-eu-become-another-ai-superpower. Accessed 18 December 2018.

Thompson, Nicholas. 2018. "Emmanuel Macron talks to wired about france's ai strategy", 31 March 2018. https://www.wired.com/story/emmanuel-macron-talks-to-wired- about-frances-ai-strategy/. Accessed 18 December 2018.7

Trajtenberg, Manuel. 2017. "AI as the next GPT: a Political-Economy Perspective". https:// www.nber.org/papers/w24245. Accessed 18 December 2018.

Woetzel, Jonathan et al. 2017. "China's digital economy. A leading global force". https:// www.mckinsey.com/featured-insights/china/chinas-digital-economy-a-leading-global- force. Accessed August 2018.