



ART

ANALYSIS AND RESEARCH TEAM

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Reflection Paper: In a world where societies are increasingly impacted by Artificial Intelligence - What role for EU leaders?

Artificial intelligence (AI) is above all a political issue. It has become an existential matter for the future of the EU, its prosperity, its security but also the viability of its socio-liberal democratic model. It is a tool that can radically improve people's lives and business competitiveness, but it can also cause serious harm. AI is an instrument of power, a challenge to democracy, a force for transforming the labour market and impacting social cohesion, and a source of both challenges and opportunities for the earth and the environment.

AI is one of the most disruptive technological developments in recent history, as well as an enabler for many other technological innovations¹. The pace of technological development now outstrips the political decision-making process. As a result, politicians are often in reactive mode. Yet digital technology and AI are central to the new geopolitics of power, with cyberspace becoming a key battleground in which democratic and liberal values are pitted against nationalist and authoritarian states.

The US and China, as well as other countries such as Russia, have understood this. The UK has also recently published an ambitious plan to make Britain a global AI superpower². They have all put AI at the centre of their political strategy. They have set ambitious short and longer-term goals that they are backing with significant financial resources. There is little evidence that Europeans collectively have grasped the full extent of the importance of AI for their societies and for their strategic interests. The

EU has undertaken pioneering work in encouraging the uptake of trustworthy AI and in setting rules for the use of data³. However, Europe is unlikely to be able to compete successfully without a combination of clear political will and sufficient resources. At the moment not all Member States even have a national AI strategy, and those who do have rather different approaches⁴. Where there are discussions at European level, these tend to be disparate and compartmentalised (digital, trade, competitiveness, competition, law enforcement).

The objective of securing support for their own specific set of standards for AI and new technologies is an intrinsic part of a number of recent diplomatic initiatives from both the US and China⁵. The US Summit for Democracy in December is a clear example of how the US is deploying a wider strategy to consolidate US leadership in this area.

The EU is lagging behind the US and China on many AI key drivers. Both the US and China are pushing to gain acceptance for their own technologies. These reflect their respective social models: the first being business-driven and democratic, the second state-driven and authoritarian. The EU, which naturally finds itself closer to the US model, nevertheless has its own distinct characteristics and is therefore aspiring to generate its own model⁶.

But is a European independent approach on AI - a "third way" - still possible? Do we have the

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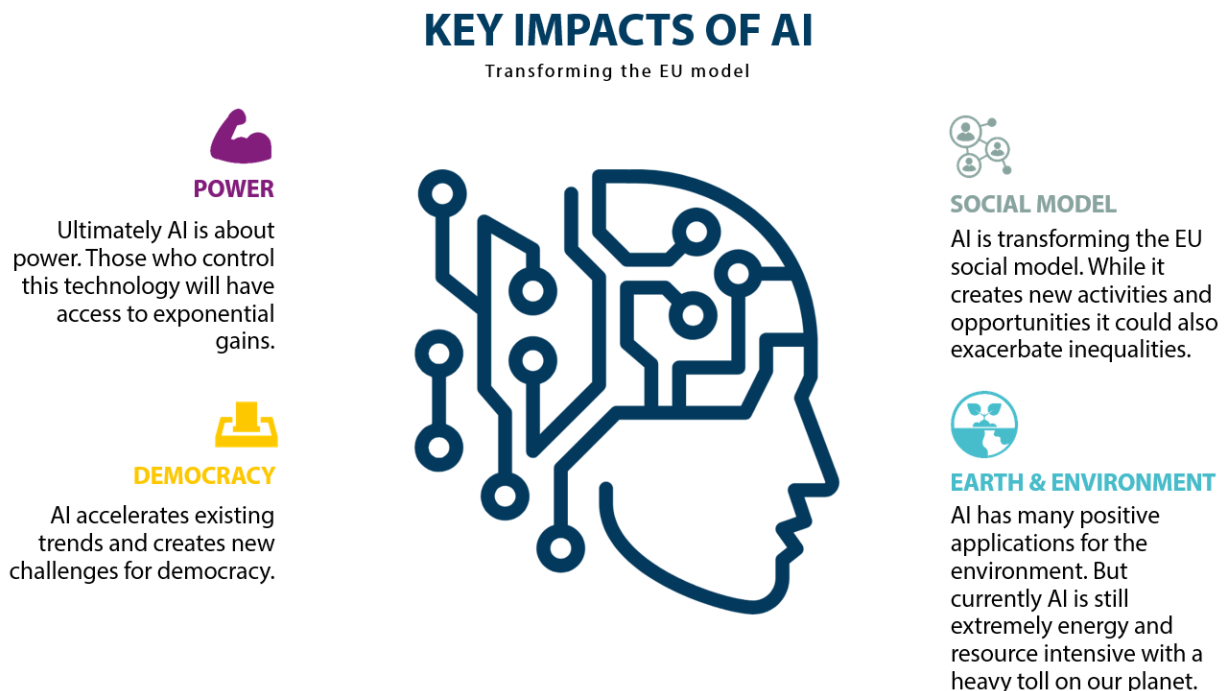
political will and means to achieve this objective? How can we ensure that important initiatives at sectorial level, such as the EU-US Trade and Technology Council support this ambition?

This ART paper builds on interviews with top European experts on key aspects of AI and its impacts in the run up to the October European Council. It includes the results of a GSC analytical exercise using the futures wheel method, which offered an opportunity to examine a hypothesis in

which China, in line with its current AI strategy, achieves world primacy in AI and to assess how this would affect the EU.

Having examined the political impact of AI from the angles of power, democracy, social cohesion and environment, this paper:

1. Assesses the challenges for Europe in developing its own “third way”,
2. Underlines the importance of continuing political engagement within the EU at the highest level.



Source: ART

I. THE POLITICAL IMPACT OF AI: POWER, DEMOCRACY, SOCIAL MODEL AND EARTH

It is not clear whether AI will one day replicate human intelligence and become fully autonomous. But specific AI systems are **already deployed and used on a large scale** in areas such as facial

recognition, scoring for human resources recruitment, accessing loans, profiling customers, fraud detection, cybersecurity or operating weapons.

What is AI?

There are **different perceptions of what AI is**. The “technical school” considers AI as the simple application of maths, rules and/or statistics in a computer program, supplemented by big data and performing repetitive tasks better than humans. “Sceptics” consider that it is not a good use of resources to generate AI that will never fully evolve in a way that allows it to outstrip many human functions and capacities. “Utopians” believe that AI and algorithms will solve all human problems and remove weaknesses. “Dystopians” cultivate fear of AI functioning as an independent agent ending in a singularity (i.e. an Artificial General Intelligence that will transcend human intelligence and develop a self-awareness)⁷.

Whilst they are not yet able to replicate human reasoning, AI systems do already perform better and quicker than humans on specific tasks, in particular in finding patterns in extremely large quantities of data, optimizing processes and prediction. **AI could bring huge benefits to humans when used appropriately**. Massive gains are expected in many sectors such industry, agriculture, security, disaster management or health. For instance, deep learning algorithms are drastically reducing the diagnosis-treatment-recovery cycle for seriously ill patients, and DeepMind’s AI can accurately predict the likelihood of rain in the next 90 minutes, one of weather forecasting’s toughest challenges⁸.

There is a **debate about the extent to which AI and new technology can be explained**. Some experts consider there is no “black box” of algorithms because coders know how it works. Other experts judge that the increasing complexity of AI and technologies such as blockchain or quantum computing make it more difficult to explain how they function and that we are reaching the limits of human understanding (e.g. already in 2015, Google research engine had more than 2 billion lines of code, with more than 45,000 modifications per day).

AI, which is heavily reliant on data extraction and computation power, now plays **a central role in the digital revolution and tech industry**, which is evolving at an exponential rate. In 2018 it was estimated that the quantity of data being produced was doubling every eighteen months, with a projected total increase in global data volume of 530% by 2025⁹. Several of the experts consulted considered that we are not just facing a new industrial revolution but a radically different world.

Exponential advances are outpacing the linear development of the social and political institutions which arose out of the industrial revolution¹⁰. The digital revolution is by nature very different, and impacts directly on **power, democracy, the social model and the environment**, four key elements of the EU model¹¹. Our capacity to understand and anticipate these rapid developments is becoming an ever greater challenge.

FEATURES OF AI

- **Pervasive:** affecting all areas of human life and activities. Combining low visibility with high impact (e.g. shifting from telephone to smartphone).
- **Disruptive:** AI being a transformative technology, it enables many other key technological developments such as quantum computing, biotechnologies, robotics or cybersecurity.
- **Cumulative:** productivity gains are very high but concentrated (in a few companies, people, regions), generating monopolies and a massive comparative advantage for the winners in the AI race. The speed of scaling is key.
- **Extractive**¹²: AI is a "mining industry". Mining of physical resources for the heavy infrastructure required (datacenters, clouds, etc). This has a heavy impact on the environment (mineral extraction, use of natural resources such as water to cool data centres), consuming of huge amounts of energy. Mining of data, using brutal computational power to run algorithms on databases, and extracting users' attention, all available for the taking. Both processes generate a chain of low-cost workers (in the mines, stores, delivering services...).
- **Exponential:** having seemingly no limits, nurtured by the idea of exponential growth, with a global reach. Every cluster of innovations increases the speed and tempo of innovation.
- **Reductionist:** data economy tends to reduce the human subject to a data object, simplifying context and human complexity to statistical inferences, shifting from causality to correlation (e.g. predictive police/justice).
- **Unpredictable:** accelerating innovation and breakthroughs (genetic engineering and nanotech, digital immortality through digital twins, augmented cognitive/physical capacities...), making the future both closer and unknown.

Unlike the industrial revolution, digital technology is generating powerful technical tools which do not necessarily respond to a pre-defined need but which create new demands (e.g. the number of apps available on our phone far exceed those we actually use¹³). The pace of technological development also outstrips the political decision-making process, which finds itself in reactive mode.

Digital technologies and AI are creating more uncertainty about even the relatively near future in an already fast evolving world. These developments require complex decisions, and accentuate **dilemmas** such as how to find a balance between security and privacy, or innovation and regulation.

AI DILEMMAS

On Power, Democracy, Social Model and Earth/Environment



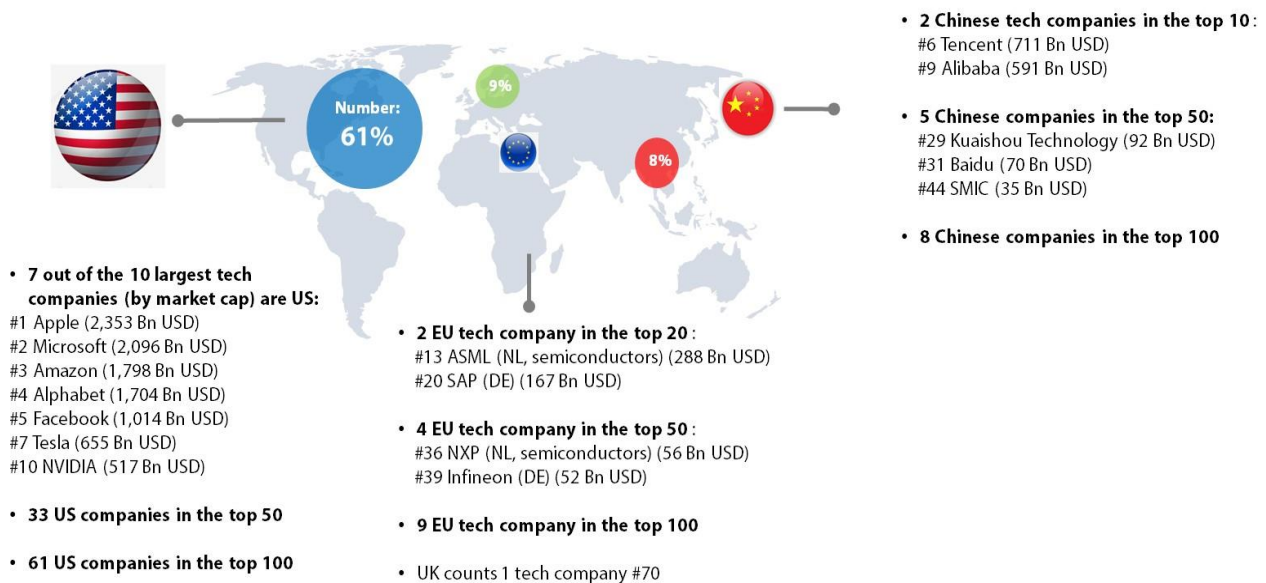
Source: ART

Power

Ultimately, **AI is about power**. Those who control this technology and its infrastructure, with sufficient data, energy and resources, will have access to exponential gains, opening the door to other critical technologies. This will also allow them to influence

others, and to project their values, and their political and social models. In so doing they will achieve a dominant position, whether they be a state actor or a private company.

Market capitalization of the largest tech companies: the EU is barely in the picture¹⁴



Source: ART (Figures from Companiesmarketcap.com, 6 July 2021)

AI consolidates biases and beliefs. It draws on and learns from databases which inevitably reflect past economic and social reality, and which are often limited to a particular group in society or relate only to very specific local situations. AI tends to favour dominant models and trends. And algorithms enable AI to influence and manipulate emotions and opinions (filter bubbles, algorithmic amplification, tracking of emotions, deep fake, fake news, etc.).

AI also facilitates a **shift from public to private power**, with a blurring of the lines between public and private functions, including in the military field. This leads to a growing risk of the privatization of public goods and questioning of the relevance of some public services. Major non-European tech companies have grown - either naturally or through acquisitions - into behemoths that outstrip their competitors, and cannot easily be controlled or influenced. They drive innovation outside the public arena, fuelled by a high concentration of data, talent, infrastructure and capital. As a result of their rapid growth, many of these companies have

established themselves as monopolies, limiting the possibilities for others to enter the market or for existing companies to scale up rapidly.

In line with **libertarian, objectivism and cybernetic culture**¹⁵, numerous AI projects use localised technology that can have the effect of circumventing or weakening the state. Many tech companies see themselves as offering more effective and rapid solutions than state actors. By basing their product on a virtual community without borders, they can appropriate market power to the detriment of private individuals, including in areas historically reserved for the state, such as currency, education, identity, space exploration and - increasingly - security. There is a risk that in future, a few powerful tech leaders could claim a legitimate role in establishing the general interest.

The practices of surveillance, classification and tracking of individuals, such as consumer profiling and security scoring, **are increasingly used by both private and public entities** either

separately or in cooperation. For instance US law enforcement agencies increasingly depend on the tech industry for their work. Examples include the accessing of doorbell cameras sold by Amazon for protecting private property, and trawling individual location data provided by Google geo-reference tools on an unprecedented scale¹⁶. This makes it even more difficult to set limits and safeguards on the exercise of such practices and to preserve individual rights and freedoms. At the same time, individuals are increasingly ready to accept limitations on their privacy in return for convenience (e.g. face recognition used for unlocking iPhones). The discrepancy between the power of big tech companies and their lack of transparency and accountability to society as a whole raises fundamental issues about the respective roles of the state and the private sector.

Democracy

AI contributes to the acceleration of some existing trends, and creates new challenges for democracy.

In liberal democracies, **AI systems may facilitate the degradation of the social cohesion which is needed to give democracy its legitimacy.** Various phenomena such as the algorithmic amplification of mis/disinformation, hate speech and terrorist content, conspiracy theories and deep fake, the ability to customise messages to individuals, when used on a massive scale, weaken trust in democratic processes, public institutions and objective scientific truth. The misuse of AI risks exacerbating the existing trend towards a polarization of opinions, not just on policy issues but also in relation to core values. This can lead to an undermining of the freedom of expression and the sharing of objective information.

Social media and their AI algorithms have changed the nature of democratic debate, of public deliberation and citizen participation. On the one hand, they have enabled much greater participation in politics, particularly by young people, but they are hollowing out face-to-face social life and are undermining the capacity of civil society to flourish. Social media amplifies criticism of representative democracy. At its worst, it can alienate support for traditional political parties, push an anti-technocracy, anti-elite discourse, generate impatience with the length of the democratic process, and give credence to the idea that every opinion has the same value. AI systems help give greater weight to the importance of the individual

AI plays a growing role in **geopolitical rivalry and the balance of power**. AI is increasingly described as the "new nuclear". It is expected to offer a decisive advantage to those who exploit it to generate new types of threat or new ways to conduct warfare. Those lagging behind, whether for technological or ethical reasons, will end up using soldiers to fight machines and being strategically and tactically outpaced. Russia and Turkey are already testing the use of AI in the battlefield.

Imbalances of power between those able to use AI and those left behind, notably developing countries, may also lead indirectly to wider tensions. That could include the struggle to control critical resources and energy sources.

over the collective good, including by amplifying ideologies based on identity. Algorithmic amplification increases tensions and uncertainty around the limits of free speech.

Performance tends to take precedence over civil rights. Citizens are now used to having constant and immediate access to personalized services through their smartphones. This can create heightened expectations from citizens that the public sector should be able to match this speed and efficiency of delivery, which is not always the case. The pandemic has accelerated this trend. These expectations can by stealth lead to a higher toleration or even embrace of illiberal and illegitimate political systems on the grounds that they deliver more efficiently.

AI systems can reinforce the effectiveness of non-democratic governments. The ability to concentrate and centralise information tends to reinforce authoritarian states by enhancing their ability to control their own population, improving their capacity to spy on their opponents, interfere in elections and weaponize social media beyond their borders in order to increase polarization and distrust in democracy. By promoting their own expertise and AI systems beyond their borders¹⁷, they can expand their business model to include potentially like-minded countries, and by militarizing the use of AI systems, can increase the overall threat to democratic states. **Organized crime and terrorist groups** are also empowered by the open and value-free access to AI, making

them far more dangerous (e.g. in the area of biotechnology, existing online labs powered by AI

Social model

AI is already transforming the labour market and the workplace. Whilst it creates new activities and services, it also generates concerns about the quality and quantity of jobs, as well as about the viability of the modern welfare state. Training and education will be crucial, both to improve the understanding how AI works and to provide the workforce with necessary new skills.

There is no definitive view over the gains and losses generated by **automation**. On the positive side, AI may create many new types of jobs in the medium term, in the same way that banks moved to create new jobs in the areas of financial services (insurance, etc.) following the introduction of ATMs in the 1990s. AI may also create numerous jobs directly related to the operation, maintenance and programming needed to support AI itself. Some question this analysis, and are concerned that the development of AI will concentrate productivity gains in the hands of relatively few higher qualified individuals. They also doubt the feasibility of re-training low-skilled workers for AI-related jobs. However, examples of this already exist: China has started training farmers to pilot drones in order to achieve higher productivity in the agricultural sector with promising results.

It is also very important to understand the impact of AI on **socio-economic inequalities and revenues**. The tech industry has accelerated the phasing out of the redistributive model based on the loop in which value is turned into wealth which is then spread across society. In a tech economy, wealth is

Earth and the environment

AI is both a challenge and an opportunity for the earth and the environment¹⁸.

AI offers the promise of **optimising** industrial processes and the use of energy, thus reducing the carbon footprint of human activity. It could also act as a catalyst for breakthroughs in key areas such as biotech. Together with other digital technologies, in particular robotisation, AI can also improve the ability to **anticipate and cope with the impacts of climate change** and extreme weather events. In the area of agriculture, it can help ensure the continuity of food supply chains and promote a range of different approaches to production,

may in the near future enable the sequencing of viruses outside laboratories).

increasingly concentrated in the hands of few people, companies and cities, with more limited scope or willingness to push for redistribution and tackling inequality (the nature of the tech industry means that it is able to reduce significantly its tax liability). This creates a challenge for governments to adapt the existing taxation model and to ensure the sustainability of the welfare state model and its safety nets. It may deepen further the cleavage between those with access to high-value goods (education, health, security, housing, augmented capacities) and the have-nots. The **middle-classes**, which are the core of western liberal democracies, are particularly threatened by the automation generated by AI, at least in the short to medium-term.

Jobs dignity and workers' rights are also at stake. The "gig-economy" generates a new sector of employment which is more precarious, but which may well become the main source of employment for low-skilled youth in particular. The idea of a universal income may not be accepted as an alternative to jobs, as employment is still seen as offering purpose and dignity. At the same time, some workplaces risk being increasingly influenced by AI, both as a result of the use of more intrusive control of personnel, and as part of a shift to the commoditisation of the workforce through the use of algorithms. This is part of a longer-term wider trend of using data to facilitate productivity as a way of increasing capital, whilst salaries and purchasing power stagnate.

thereby reducing the use of chemicals and increasing overall crop productivity. AI could also **accelerate research** into new renewable energy or help accelerate the development and commercialisation of existing research. AI and digital therefore have considerable potential to help achieve the objectives of the green deal.

There are however other aspects of the current infrastructure underpinning AI which are much less positive for the environment. The common perception of AI and other digital technology is that of an immaterial world. The terminology used in this field is also pushing in that direction. Words like

"cloud" give the false impression of a light footprint. The reality is very different. Its infrastructure is far from being immaterial. Huge data centres are needed, which are both **resource-intensive** (water to cool the systems or rare earths that are extracted using extremely polluting processes) and **energy consuming** (to support the massive computational power needed by current AI). This is having a major impact on the environment and is likely to increase, although just how much is difficult to assess given the lack of data from the tech industry.

The resource and energy intensive processes underpinning AI and digital raise the wider issue of **social cost and how to prioritise scarce resources**. Given the finite limits to energy and other vital resources, and the increasing pressure to

reduce dependency on them as part of reaching the objectives set by the green deal, priorities will have to be set¹⁹. As one expert put it: should we prioritise using energy for AI for gaming and entertainment or for medical treatment? In general, the energy used by AI greatly exceeds the equivalent energy used by human brains: the hardware used to run Deep Mind's AI programs for playing Go uses 22,000 times more energy than the human brain (440 KW compared to 20 W). And technology such as quantum computing, blockchain and NFT²⁰ also use massive amounts of energy. All this means that society will need to question when and where it is justified to devote large quantities of energy to AI. Indeed the question arises as to what extent the green and digital transitions are mutually compatible.

II. A EUROPEAN THIRD WAY?

If the EU wants both to be a serious player in the development of AI, and at the same time develop its own specific model, it will have to face up to some tough choices. In 2018 the EU adopted a comprehensive strategy and a Coordinated Plan on AI²¹. But if the EU cannot deliver, others will be able to set the rules. That risks creating a loss of legitimacy and trust from EU citizens in their national and EU institutions. Ultimately, it would leave the EU without the capacity to act autonomously.

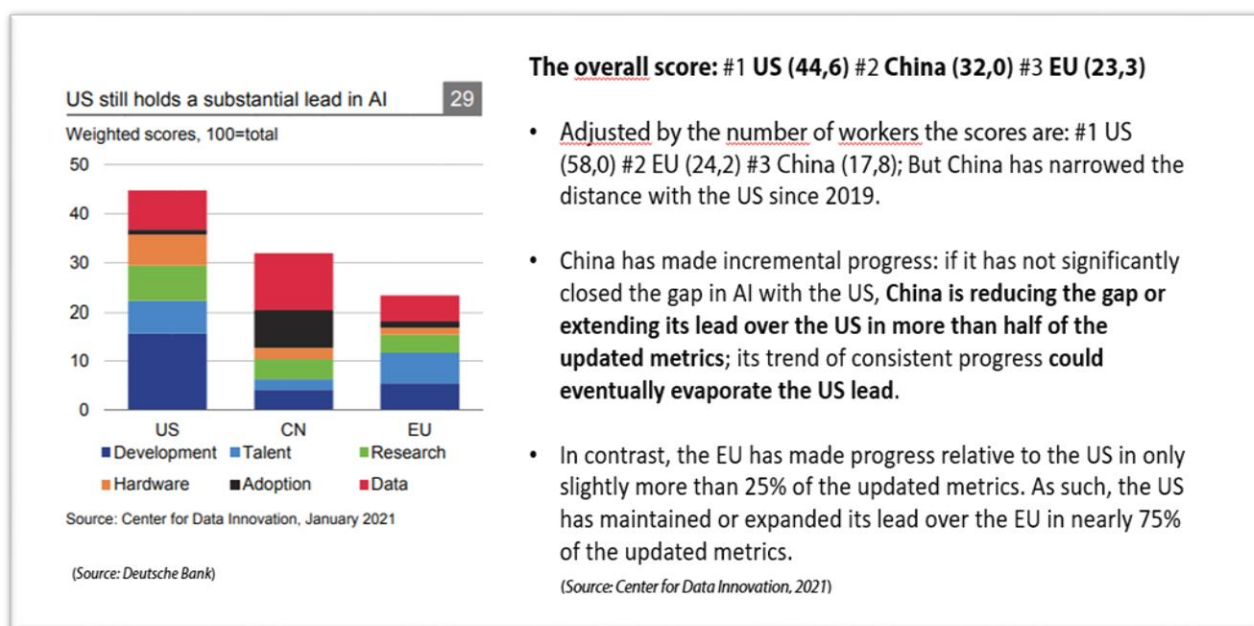
Values are important, but without the exercise of hard power based on clearly defined interests, they have limited impact. The EU's competitors have put AI at the centre of their global power strategies, which involves them recovering control over the big tech companies. In the US, pressure is increasingly being exerted on the tech giants through competition cases, while in China big tech groups are being brought back under tight political control. At the same time Russia is investing massively in military AI. What these countries have

in common is that they are aligning their tech industry to their national interests.

The EU is lagging behind in terms of both embracing and developing AI. US tech companies dominate the sector, but China is rapidly catching up through an aggressive and ambitious strategy. Social media in both the US and China also play a role as vectors of cultural and political influence in Europe.

Although the EU is home to a number of leading research capabilities and top-level players in some niche areas (telecoms, satellites and launchers, undersea cables, and super-computers), its approach is fragmented, and it has been unable to act as host to either a large Internet platform or cloud provider. The EU struggles to transfer quality AI research into viable business models and applications. The EU's digital gap has become an AI gap²². And with Brexit the EU has lost one of the major European players in AI (see annex).

Comparison of the US, China and the EU on AI



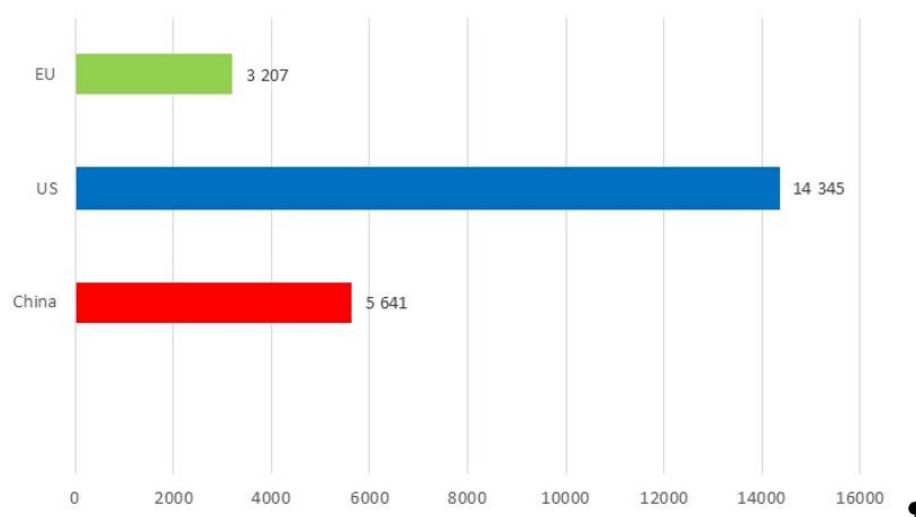
Note: On the basis of the Center for Data Innovation study (2021 – update of 2019 study), the US still has a substantial overall lead, but China has continued to reduce the gap in some important areas; the EU continues to fall behind.

If the EU continues to lag behind the big digital powers, **the attractiveness of the EU model will decline**. The "Brussels effect" cannot be taken for granted, not least as Europe's overall share in the global economy decreases. In any case, the "Brussels effect" is largely a function of the economic weight of the EU in a given sector. Without a serious tech and AI industry, the EU will struggle to influence global tech and AI standards.

The EU and its Member States must invest more in digital technology, and focus on delivering the **next wave of technological breakthroughs**. However, without a genuine digital single market, the

capacity of European companies to scale up quickly will be very limited. In the long term, it will prevent the EU from creating European global champions. In addition, Europe does not have an adequate system for providing sufficient risk capital compared to the US or China. This is partly a function of the European risk avoidance culture. In the absence of sufficient venture capital, public funding, including public procurement, will be needed to fill the gap. Mobilizing significant funding within a short timeframe is important, but Europeans must also get better at translating innovation into large-scale business and commercialising its high quality research.

Venture capital and private equity funding in AI (million USD) - 2021



Source: ART (Figures from Center for Data Innovation, 2021)

Note: The US leads for venture capital in AI (>4 times than the EU in 2019). The US (estimated \$14.3 billion) led China (estimated \$5.6 billion) and the EU (estimated \$3.2 billion) in venture capital and private equity funding for AI firms in 2019. The EU has lagged behind the US and China every year since 2016.

Despite the head start that the US and China have over Europe in many areas of technology, the EU still has the potential to compete, but it will take time to build the necessary structures. The EU has the brainpower and technical expertise to become

a serious competitor in areas such as the development and production of semiconductors, but strong political will and a high level of ambition are needed if it is to develop its own capacities quickly (and before it is too late).

Comparison between the US, China and the EU in key enablers of AI

	Dev.	Talent	Research	Hardware	Adoption	Data
#1						
#2						
#3						

- **The US leads in 4 categories (talent, research, development, and hardware), and China leads in 2 (adoption and data)**
- The EU:
 - is just behind the US for **talents** & just ahead of US for **adoption**
 - is just behind China for **research** & ahead China for **development**
 - lags behind US & China in **hardware** and **data**

Source: ART (Figures from Center for Data Innovation, 2021)

The risk for the EU is that it will find itself torn between the US, championing technology in support of democratic values, and China, leading in regulated and state-controlled AI. In this great power competition, the EU could end up losing its capacity to shape and even influence international standards and the governance of AI, which risks becoming a battlefield between the US and China. In such a scenario, it might be difficult for the EU to

avoid taking sides. This would probably create divisions between Member States, undermining EU cohesion. There are already indications of what this might mean, with concerns from some Member States that initiatives such as the EU-US Trade and Technology Council will inevitably lead to the EU having no choice but to align with US technological standards.

Looking at a not so distant hypothetical future: China becomes the leader in AI in 2030

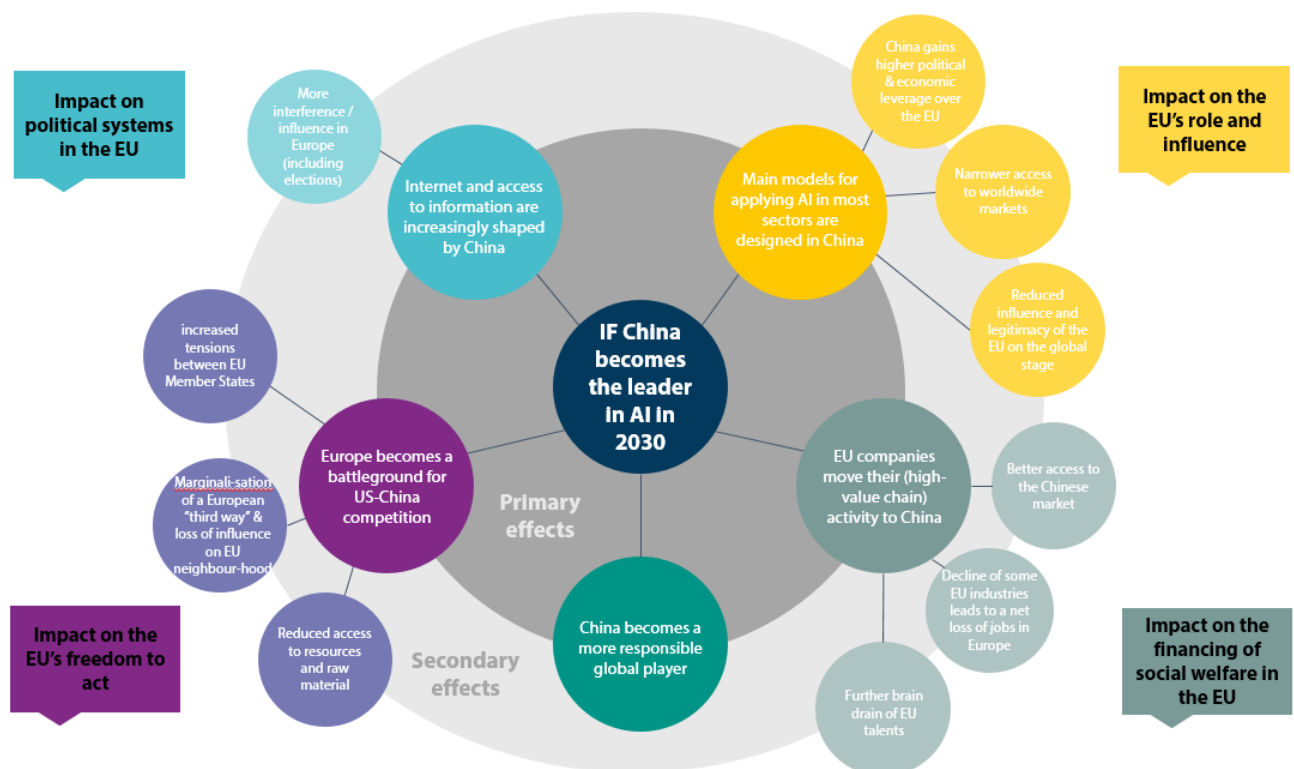
A GSC analytical exercise using the futures wheel method²³

China has taken full measure of the critical role of AI for businesses and society. Already in 2017 China's State Council issued a *"New Generation Artificial Intelligence Development Plan"* - a strategy to make China a global leader, if not THE global leader, on AI by 2030. Whilst some consider the Chinese level of ambition unrealistic, the US National Security Commission on AI (NSC on AI) takes China's ambitions and quick progress very seriously. Whether or not all its objectives will be achieved on time, China is spending and will continue to invest considerable political capital and resources in the implementation of its plan.

Not only has China developed principles relating to ethics, human well-being and societal risks, but **it also intends to establish itself as a driving force in setting international standards for AI and ethical norms.**

Commissioner Vestager once said on AI *"China has the data, the US has the money, and we have the purpose"*. Recent developments have however shown that both the US and China have the purpose, the data, and are investing heavily in AI.

Based on these considerations, ART, supported by other GSC colleagues, facilitated an **analytical exercise** to look into a hypothesis in which China, in line with its current AI strategy, achieves AI world primacy and to assess what this would mean for the EU:



Source: ART

III. PUTTING THE EUROPEAN COUNCIL AT THE CENTRE

The only guarantee that the EU can retain its autonomy of decision-making and secure its collective prosperity is by developing its own distinctive AI model. Whether we like it or not, AI cannot be stopped, and others are moving ahead fast. If Europe lags too far behind the US, China and other rising digital powers, it is likely to end up marginalized, and the European social model could even be undermined. AI technology is pervasive and is growing exponentially, which means that it is already difficult for Europe to make up for the existing technology gap, let alone become a global leader.

Building a European "third way" requires **strong unity from Member States**. This means more than just understanding the political implications of AI. It will depend on a shared determination to make Europe a digital power and to take the necessary action to bring this about. This will only be possible if all Member States work together. Discussions at the highest political level should be used to raise awareness of how much Europe is falling behind, assess the willingness of Member States to cooperate, and launch a set of initiatives which would be subject to regular peer review. Given the speed at which AI is evolving, the overall approach would need to be innovative, flexible and light on bureaucracy. Engagement at leaders level is likely to be the only way of overriding narrow sectoral

interests and encouraging a genuine horizontal approach. It would also offer a coherent framework for the development and implementation of policy across the institutions, in particular the Commission and European External Action Service.

Such a process could benefit from the support of a network of selected **independent high-level European experts**. By bringing experience and expertise to the table, they could help in understanding and anticipating technological breakthroughs, and in assessing their impact, risks and opportunities. Expert input would encourage the innovative thinking that is necessary for Europe to face the range of challenges presented by AI. Understanding the nature of AI systems is particularly important given their increasing complexity.

By way of comparison, the **US President has recently revitalised the Presidential Council of Advisors on Science and Technology (PCAST)**, the direct descendent of the scientific advisory committee established by Eisenhower in 1957 right after the launch of Sputnik, which was regarded by the US as a strategic surprise.²⁴ The President has framed the agenda of PCAST through five key questions, of which three are concerned with research and innovation. All of these are framed in terms of how they support US interests.

The five key questions from the US President to the PCAST²⁵

- What can we learn from the pandemic to address our public health needs?
- How can we create bold new solutions to address climate change?
- How can we lead the world in new technologies?
- How do we guarantee innovation to benefit all Americans?
- How can we strengthen the American research and innovation enterprise?

AI is constantly evolving, but Europe cannot afford to wait to see where that evolution leads. The EU should harness the power of AI for the benefit of all its citizens. It must show that AI can be a positive force for improving the lives of every individual, and at the same time provide the reassurance that Europeans are being protected from the misuse of AI.

In a world where societies are increasingly impacted by AI, the EU and its Member States have to regain political control over the AI revolution. The example

of the EU has been a source of inspiration for much of the rest of the world. Today, that model faces significant challenges. To remain relevant in the digital age, the EU will also need to look at how to adapt, not least to take account of the socio-economic changes which are being driven by AI. That will mean **reinvigorating Europe's democratic framework, modernizing its social pact and business model, and reassessing how it relates to the environment**.

ANNEX: EU LAGGING BEHIND US AND CHINA IN ARTIFICIAL INTELLIGENCE²⁶

The EU digital market remains fragmented, because of EU regulation, market structure, a preference for small/medium sized firms and national economic interests. US tech companies benefit from a large and fully integrated domestic market, while Chinese companies are protected against competition from foreign companies, which allows them to scale up.

The EU is not able to benefit from an integrated civil-military tech ecosystem or from any sizeable investment in defence. EU spending on Research and Technology (R&T) in the defence sector is only recovering slowly from spending cuts over the last decade. The US spends 3 times more on Defence R&T than the EU.

Despite a high degree of innovation and a significant number of digital startups, **Europe remains a net importer of digital services:** while most AI-related investments in Europe are from European sources, many of the continent's most successful digital companies—such as Skype (Estonia/Sweden), Shazam (UK), and Momondo (UK), among others—have been acquired by American or Chinese tech giants.²⁷

Cultural differences and innovation ecosystems play an important role in the acceptability by policymakers of new (and sometimes disruptive) technologies. Personal privacy and regulation are important for the EU, but this often comes at a cost to innovation and risk-taking. The US and China have also been willing to develop large ecosystems linking companies, universities, research institutes and venture capital, with the express aim of building digital champions.

Brexit could slow Europe's collective progress on AI: London is Europe's most important AI hub, with 1,000 AI companies, 35 tech hubs, with reputed research centers such as the Alan Turing Institute.²⁸ The UK accounted for 57% of EU AI firm's funding in 2019.²⁹

A US/China economic decoupling with respect to standards, data governance and critical inputs (supply chain equipment) **entails potential risks for the EU**, e.g. an increasing fragmentation of markets or of the global Internet ("Splinternet"), requiring dual systems or flexible architecture by exports and investors.

Even in those areas where the EU was ahead (e.g. AI), it is now rapidly losing ground, with fewer opportunities to recover. Numerous European initiatives in key technologies have been launched (cloud GAIA-X and the Important Project of Common European interest "Next Generation Cloud Infrastructure and Services", blockchain, quantum, space, data, cybersecurity, European Defence Fund, the EU consortium on 6G Hera-X, the future Observatory for critical technologies, etc.) **but delivering quickly remains a major challenge** (e.g. the proposal for European data spaces in the European strategy for data of February 2020 has still not been implemented).

The **EU Digital decade's objectives** might seem not ambitious enough or too far ahead compared to the pace of US and China (e.g. reaching approximately 100 unicorns in 2030 still means having 3,7 times fewer unicorns than the US and 1,5 times fewer than China had in 2021).

REFERENCES

¹ AI plays a key role in the wider digital revolution and tech industry.

² In September 2021 the UK published its national “*ten-year plan to make Britain a global AI superpower*”. The strategy covers all relevant policy areas and includes a set of key actions for the short to medium term.

³ Relevant documents include a Strategy on AI and a Coordinated Plan with Member States (2018), Ethical Guidelines for trustworthy AI and policy and investment recommendations by a High-Level Expert Group, a Communication on building trust in human-centric AI (2019), and a White paper (2020). These were followed in 2021 by the tabling of a strategy fostering a European approach on AI and a revised Coordinated Plan, as well as an EU AI Act aimed at addressing the risks generated by specific uses of AI (“AI package”). Strategies and legislative proposals relating to digital, data and cybersecurity have been also published.

⁴ *Artificial Intelligence Diplomacy*, Study by Ulrike Franke for the European Parliament, June 2021.

⁵ For instance Quad and AUKUS, the UK proposal for a G7+3 and the Chinese digital silk road within the Belt and Road Initiative.

⁶ The European approach to AI is mainly set out in the 2021 AI Package aimed at making the EU a global leader in trustworthy AI.

⁷ Huge progress in AI happened during the second half of the 20th century, due to bigger computation power and unlimited access to large databases on the Internet. The “symbolic” AI (knowledge is represented by a set of rules) and the “connectionist” AI (neural networks) are the main methodologies. Today, “neuro-symbolic systems” combine symbolic AI for reasoning and neural nets for perception. Currently, these methodologies face some limitations, such as handling bias in datasets or the difficulty to generalize their abilities. It may be possible that algorithms evolve beyond the realm of mathematics and statistics and start to incorporate elements from physical laws (quantum physics) or biology (biotech).

⁸ *Assessment of Machine Learning Detection of Environmental Enteropathy and Celiac Disease in Children* (<https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2735765>); DeepMind’s AI predicts almost exactly when and where it’s going to rain, MIT Technology Review, 30 September 2021.

⁹ See *European data strategy - Making the EU a role model for a society empowered by data*.

https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy_en

¹⁰ *Mind the exponential gap*, Laetitia Vitaud, September 2021.

¹¹ Conclusions of the special meeting of the European Council (1 and 2 October 2020): “*Digital development must safeguard our values, fundamental rights and security, and be socially balanced. Such a human-centred approach will increase the attractiveness of the European model.*”

¹² See in particular *The Atlas of AI*, Kate Crawford, Yale University Press (2021).

¹³ See also Amazon’s *Astro is a Robot Without a Cause*, *Wired*, September 2021.

¹⁴ *Companiesmarketcap.com*, 6 July 2021. In July 2021, 61% of the 100 largest tech companies were US, 9% were from the EU and 8% from China (the ranking doesn’t include neither telco companies nor e-commerce except Amazon & Alibaba). There are two EU companies in the top 20 of tech companies market capitalisation (#13 ASML and #20 SAP).

¹⁵ The objectivism by Ayn Rand is a political and philosophical project where self-interest and individual liberties are central. For cybernetics, Norbert Wiener theorized that humans and machines could be at the same level (intelligent behaviour was the result of feedback mechanisms, that could possibly be simulated by machines) and connected in the same information network, leading to a self-regulated society organized in a network. These theories contribute to the belief that tech is the utmost achievement of individuality.

¹⁶ *How a Secret Google Geofence Warrant Helped Catch the Capitol Riot Mob*, *Wired*, 30 September 2021. Google receives over 10,000 geofence search warrants a year for location data in the US.

¹⁷ China is very active in selling its technologies to African countries, e.g. facial recommendation tools to the government of Zimbabwe.

¹⁸ See *The Atlas of AI*, Kate Crawford, Yale University Press (2021).

¹⁹ According to OpenAI, since 2012, the amount of computational power used to train the largest AI systems doubled on average every two years between 1959 and 2012. It is now doubling every 3 to 4 months. *AI and Compute*, OpenAI blog, 7 November 2019.

²⁰ Non Fungible Tokens (NFTs) are digital unique objects, that cannot be interchanged with something else (paintings, cards...). They are supported by blockchain technology.

²¹ In addition to a strategy, a Coordinated Plan on Artificial Intelligence between the Commission and Member States was adopted in 2018. It was reviewed in 2021 in order to accelerate investment in AI, deliver on AI strategies and programmes, and align AI policy to avoid fragmentation ([Plan on AI | Shaping Europe’s digital future \(europa.eu\)](https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy_en)).

²² The digital- and AI-based share of Europe’s ICT sector accounted in 2017 for around 1.7% of GDP, lower than the share in China at 2.2% and only half the 3.3% share in the US (*AI frontier: Tackling Europe’s gap in digital and AI*, McKinsey Global Institute, February 2019).

²³ The futures wheel is a method for visualisation of first and second order future consequences of a particular hypothetical change or development.

²⁴ Including experts in astrophysics and agriculture, biochemistry and computer engineering, ecology and entrepreneurship, immunology and nanotechnology, neuroscience and national security, social science and cybersecurity, it would mix high-profile academics and industry representatives, including from Google and Microsoft. Defense Advanced Research Projects Agency (DARPA) was also created in 1957 after the Sputnik launch.

²⁵ *Biden Doubles the Size of the President's Science and Technology Council*, Nextgov, 22 September 2021.

²⁶ The main source is *Who is winning the AI race: China, the EU or the US?*, Center for Data Innovation, 2021 update.

²⁷ *Europe and AI: Leading, Lagging Behind, or Carving Its Own Way?* Erik Brattberg, Raluca Csernaton, and Venesa Rugova, Carnegie, July 2020.

²⁸ *Europe and AI: Leading, Lagging Behind, or Carving Its Own Way?* Erik Brattberg, Raluca Csernaton, and Venesa Rugova, Carnegie, July 2020.

²⁹ *Who is winning the AI race: China, the EU or the US?*, Center for Data Innovation, 2021 update.