Policy Brief

Europe's Sputnik Moment: Remaining Relevant In The Global Defense Innovation Competition

By André Loesekrug-Pietri

While technological changes are transforming the global defense and strategic environment, Europe risks lagging behind. The explanations for its underdevelopment in defense innovation lay in the decades of a post-Cold War "peace dividend" and shrinking military budgets, diverging strategic cultures, and the division between civilian and military technology. Europe has missed out on several essential technologies. Despite positive initiatives, the innovation gap with competitor powers continues to widen.

Europe needs to embrace a more proactive approach in nurturing alternatives and preparing the "next big thing" that will leapfrog existing technologies. It must prioritize changing the way it thinks about and implements innovation policies. It is also not enough for Europe to be faster than before, it needs to be faster than others. Research spending needs to be less focused on means and more on results. European investments should focus on a few fields, because of their importance and enabling aspect for critical sectors. These are attribution capacity (key against cyberattacks), artificial intelligence (critical for anticipative and predictive models), next-generation semiconductors (for easier access to space and mastering communications on the ground), quantum computing (key for tthe resilience of IT infrastructures), and energy storage (for the fight against climate change).

Weaponization of space, cybersecurity doomsday, killer robots, artificial intelligence in combat systems, augmented soldiers—technology has become ubiquitous, on the battlefield and in strategic planning at military headquarters.

The world is at a tipping point. Technological progress is allowing established actors to scale their advantages to a level never seen before, and new ones to have global impact at a cost much lower than before. In this new era, military and civilian technologies are increasingly inseparable, and defense crises incorporate strategic, economic, and technological components simultaneously. In addition, strategic success no longer relies simply on size, but also on speed.

In the United States, one of the most important strategic moves in the past decade has been the implementation of the Third Offset strategy, initiated by Secretary of Defense Chuck Hagel in 2014 and Deputy Secretary Bob Work. The goal was to outpace the progress made by the country's top adversaries primarily through technology. The first months of 2019 have seen a multiplication of tactical moves by emerging powers with strong strategic consequences—be it the quantum computing communication links of China and Russia, the landing of a spacecraft on the dark side of the moon by China, or the destruction of a satellite by India.

Europe meanwhile is stuck in debates about the fragmentation of its capacities or its lack of strategic culture. These are critical topics, but as the discussion over them continues Europe stands unarmed for the current technological revolution. Despite worthy efforts,

countless policy papers and strong declarations, Europe seems stuck in a strategic black hole. Like the United States when its territory became vulnerable in 1957 with the Soviet Union's development of intercontinental ballistic missiles and launch of the first space satellite, this is Europe's Sputnik moment. It now has to radically change the way it works and the scale it works on, just as the United States acted boldly then, or face its strategic relevance vanishing. Worse still, if Europe is increasingly dependent on others for its prosperity, it may struggle to protect its democratic systems.

The Technological Revolution Is Underway

It can be difficult to conceptualize the technological revolution, but data illustrates the scale and pace of change. By one estimate, human society collectively generated 3 zettabytes of data from the eve of humanity to 2012—but between 2012 and 2018 that number rose to 22 zettabytes.[1] It is expected to double to 44 zettabytes by 2020. The world has entered the realms of exponential growth when it comes to technology—a notion completely outside traditional linear thinking.

The merging of technologies is unprecedented. Systems are the name of the game today, with connectivity increasing the power of each component—but also their vulnerability. The concept of dual use has also largely become irrelevant, as almost every technology has potential military or civilian applications. Drones were used solely in the military sphere initially, but they are becoming ubiquitous in agriculture, observation, and soon transportation and retail. Video games, in particular massively parallel gaming, have the potential to virtualize complex battlefield situations far beyond the best proprietary C2 (command and control) systems.

Technology is reshuffling the global landscape and giving smaller but more agile countries the opportunity to punch far above their weight: for example, Israel in cyber, Singapore in mobility, Dubai in logistics. The massive reduction of costs, from components to computing power, also allows non-state actors to have significant influence completely disproportional to their size or budgets. Examples of such technological leveling include the influence of Islamic State through social media, the potential disturbance generated by drones around critical infrastructure such as power plants or airports, or the capacity of non-state actors to act as major cybersecurity players, sometimes as proxies for states. Moreover, in this new world of disruptive technologies, marginal costs are reduced to zero, thus creating winner-takes-all dynamics—until the next disruption.

These tectonic shifts have not led to significant strategic thinking and responses in Europe, which remains focused on traditional capacity assessment. European countries are just beginning to understand the full vulnerability of their critical infrastructure, the disruptive effect technologies can have on their election systems and democratic processes, or the growing overlap between military and civilian theaters, as illustrated by the migrant crisis. The importance of scale is talked about but not acted upon. Many frameworks of cooperation exist at the personal and unit levels, but Europe lacks bold coordinated initiatives when it comes to joining forces in the two most important emerging theaters of cyber and space, or in technology innovation, with some exceptions like the joint nuclear testing capabilities of France and the United Kingdom.

For Europe, the scale revolution in technology bring new vulnerabilities. The controversy over the role of China's Huawei in Europe's 5G networks is part of a dawning realization that massive chunks of the continent's infrastructure and communication systems that are critical for the resilience of its organizations and societies are either no longer under sovereign control or are at risk. 5G networks, due to their distributed structure, no longer fit the old paradigm of "preserving the core and outsourcing the

1 David Reinsel, John Gantz and John Rydning, The Digitization of the World: From Edge to Core, International Data Corporation, 2018.

rest." However, the risk could be managed if Europe had a clear common strategy and could retain enough information technology (IT) capacity at home.

The number of connected devices globally is expected to grow from 2 billion in 2005 to 75 billion in 2025.[2] Their data will be stored in the cloud, but Europe's cloud providers, have only a 3 percent market share, making the European outcry over the U.S. Cloud Act more a posture than anything else.[3] Battery technology is critical for connectivity on the ground and for tomorrow's transportation, and this market is dominated by Asian producers. Synthetic biology is on the brink of radically changing the way lives and human performances are improved. Hypervelocity and antiballistic systems are radically changing the traditional military deterrence models, and progress in anti-access/area denial was one of the key drivers for the Third Offset strategy. The opportunity cost for Europe of not developing these technologies is massive and growing rapidly.

Attribution in cybersecurity is a case in point. There is growing worry that—due to the complexity of cyberattacks, of intrusions powered by artificial intelligence (AI), and of the use of proxies and different layers of the internet—only a very limited number of countries still master attribution; that is, the capacity to identify the actor responsible for an attack. This is usually done by a highly complex combination of IT capabilities and human intelligence, as well as access to IT backbones globally such as submarine cables. Without the capacity for attribution, states lose their capability to respond, whether from a legal point of view under Article 50 of the UN Charter or simply because they are in the dark about the attacker. European states have already partially lost this essential part of sovereignty.

Different crises are converging, making each more complex, unpredictable, and impactful. The combination of a fragmented world, a lower barrier of entry to accessing high technology, and a growing discrepancy between cheaper means to attack and increased means needed for defense create a completely new array of strategic threats. New or morphing sources of tension will increase the pressure on countries; for example, terrorist threats that put a heavy burden on domestic security forces, cyber risks for infrastructure, or climate change that will increase the occurrence of catastrophic natural events.

Lagging Behind

Very few of the abovementioned technologies are included in the European Defense Fund starting in 2019 despite the efforts of some enlightened leaders at the European Commission. Many senior political officials, and even some military ones, do not really understand the Third Offset strategy, if they have even heard of it, despite it dating back to 2014.

There are a several explanations for Europe's underdevelopment in this sphere. The decades of the post-Cold War "peace dividend" and shrinking military budgets have been followed by a scramble to increase spending that has focused mostly on conventional capabilities. Europe also has a problem of scale in its divided market that makes the barrier of entry very costly for European players. In addition, there is a persistent myth about the separation between civil and military technology, which is obvious in Germany, but is also perceptible in France where the concept of a military-industrial base is still actively used (*Base Industrielle et Technologique de Défense*) despite the fact that an increased number of breakthrough technologies come from the larger technology ecosystem. This leads to a growing disadvantage in military systems and much higher costs for single military procurement due to smaller scale.

Key European industries like automobiles, steel, and services are being disrupted by foreign innovators pioneering technology complexity. For Europe, missing out on setting standards in enabling and

2 Statista, Internet of Things (IoT) connected devices installed base worldwide from 2015 to 2025 (in billions), 2019.

3 The Clarifying Lawful Overseas Use of Data (Cloud) Act, enacted in 2018, allows U.S. federal law enforcement to compel U.S.-based technology companies to provide requested data stored on their servers, regardless of whether the data are stored in the United States or on foreign soil.

multiplier technologies like 5G or AI means missing out on the foundational research and development and the prototyping necessary to create, for example, autonomous vehicles, smart cities, personalized medicine, or energy renewables. Only two European firms are among the Top 50 global technology companies by market capitalization. Europe does not have the best research capacity, either, despite what some say. Even if some of the world's best researchers were born and trained in Europe, they do not work there: at the 2018 edition of NeurIPS, the yearly gathering of key AI researchers, 414 out of slightly more than 500 papers were from the United States (with 60 from Google researchers alone), and only 7 percent from Europe. This is an absence today that will have an impact tomorrow.

Europe has also missed out on several essential technology "bricks." Notorious examples can be found in the semiconductor industry and its fundamental components—graphic processing units (GPUs, or video chips) for processing large amounts of data; in the software industry that generates an increased portion of the added value in aerospace and autonomous systems; in the automotive industry; in cloud systems for data and cybersecurity; in satellites constellations for communications; and in the operations of large underwater cable networks.

The increase in alliances between large European original equipment manufacturers and major non-European IT providers (for example, Volkswagen with Nvidia, Atos with Google, Airbus with Palantir, or Free with Huawei) raises the question of whether Europe uses strategically the size of its market to develop not a replacement but at least an alternative to foreign providers. Such alliances also extend to the public sector, as in the case of education ministries partnering with Microsoft, with Facebook on digital literacy, or with Palantir by intelligence services.

In 5G, Europe may very soon face an impossible dilemma in choosing between the Chinese provider, which bears clear security risks, or a possible combination of Ericsson and Nokia, which invest only a fraction of the amount the former does in research

and development and may be rapidly outpaced, thus impacting the capacity of the enabled sectors (such as connected cars and industry 4.0) to be on the cutting edge. There is no European 6G strategy in sight.

The solution is not "Buy European" legislation, which in the case of 5G may be counterproductive, since this may lead to Europe losing ground in the industries that these technologies enable, such as autonomous driving. But a much more proactive approach is needed in nurturing European alternatives and preparing the next big technology that will leapfrog existing one.

Artificial intelligence is a point in case as it has made strong inroads into strategic thinking since 2017 and is part of updated national strategies such as France's *Loi de Programmation Militaire* of 2018. However, national approaches prevail, and this is just another form of linear thinking that does not understand that, with current technologies mainly dominated by machine learning, big data and large markets are key. Purely national approaches will fail to create the large datasets needed to train the algorithms, and domestic regulation impede the creation of a continent-size market. This is turn increases the barriers of entry, reduces the capacity to scale, and perpetuates a vicious circle. Many leaders call for a single European digital market but at the same time promote national AI strategies, not realizing the contradiction between the two.

Stuck in a Strategic Stone Age

A lot has been said about Europe's fragmented strategic interests, be it in procurement for next-generation weapon systems or different rules of engagement in operational theaters. One attempt to reduce this is the French-led European Intervention Initiative launched in 2018, which aims to foster the creation of a shared strategic culture. This is absolutely critical, but the slow progress made highlights the need to increase the speed with which such initiatives, whether EU-driven or at the country level, are executed. Proposals such

as the one for a shared European aircraft carrier or tensions over export controls demonstrate that Europe is still in the Stone Age when it comes to a shared strategic culture. On the other hand, if blaming countries for adopting non-EU weapon systems may be justified from an industrial and strategic point of view, such decisions can be easily understood from a tactical point of view; for example, in the context of immediate heightening tensions in the Baltic or the crossing of red lines such as in Crimea.

The strategic aspect of technology is more obvious by the day, illustrated for instance by the International Traffic in Arms Regulations rules preventing export contracts by some European countries, or the role of interoperability (of weapon systems and of payloads) in the fully fragmented European situation when it comes to the fifth-generation fighter jet. The European strategy on medium-altitude long-endurance drones, a critical component for any theater, has fallen short of going either for speed and cost (as China did with the Winglong drone) or for technology leapfrogging. Europe has rather chosen to go for a drone that resembles a well improved version of the Reaper, with the risk that when the Eurodrone starts operations in 2023-2025 a technology disruption may have already made it less relevant. No real reflection has been started to dramatically reduce the timeframe for developing it.

Beyond the military realm, the absence of a clear, shared strategic vision from the EU and its member states is having spreading ripple effects. There is a correlation between the strong ties China is building up with Central and Eastern European states—through the 16+1 annual meetings—and the increased intra-EU tensions when it comes to joint approaches in defense procurement or strategic projects like a common approach to foreign investments. Italy, a founding member of the EU and member of NATO, has been the first G7 country to officially join China's Belt and Road Initiative. Germany's sensitivity to burden sharing with southern European countries, disregarding larger strategic and political considerations, is one of the factors creating worrying entropic forces rather than concentric ones.

The relationship between the EU and its member states and the large technology companies is like the Stockholm Syndrome—a mix of admiration and dependency—with France leading the pack.[4] Some European countries acknowledge that these companies have now more power than many medium-sized countries by sending ambassadors to Silicon Valley. Facebook's Mark Zuckerberg was treated like a head of state when he attended a hearing of the European Parliament, for which he symbolically provided the closing statement. A few dozen people curating content at Twitter or Facebook have more regulatory power on social media that the 751 members of the European Parliament, and thus curate the public debate that is the core component of Europe's democracies. Financial sanctions for companies' misbehavior do not seem to impress Silicon Valley either.

EU competition law seems to be stuck in the past century. In the AI age, the competition for the leading research talent will determine success or failure—and allowing Google's to acquire Deepmind (the developer of AlphaGo and AlphaGoZero) probably distorted competition more by letting the company acquire some of the brightest European minds, than the botched Siemens-Alstom merger could have. The EU's General Data Protection Regulation has had a great impact and has become the global reference about personal data, asserting Europe's leadership in this global debate. But it may actually make the barrier of entry much higher for new players such as hoped-for European "unicorns" that could challenge the United States' Amazon, Apple, Facebook, and Google, or China's Alibaba, Baidu, Tencent, and Xiaomi.

Europe lacks foresight. It needs to overcome fragmentation, whether between countries or between industries. The EU's new investment screening mechanism is a small step in the right direction as it favors the exchange of information, but it is still lightyears behind from the Committee

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4 André Loesekrug-Pietri, Zuck, Europe & VivaTech – le syndrome de Stockholm ? FrenchWeb, May 2018.

on Foreign Investment in the United States, which was recently updated with the Foreign Investment Risk Review Modernization Act. Europe also lacks a vision in relation to the Belt and Road Initiative. It needs to identify the priorities when it comes to technology leapfrogging. It needs to identify its core interest where it must ensure complete technological sovereignty at scale.

Meeting the Sputnik Moment with Bold Actions

Europe being satisfied with its traditional "small steps" will only increase the gap with its competitors. On the other hand, there is an immense opportunity to leapfrog over them if Europeans are ready to radically change their approach.

A sober but radical overhaul of Europe's research spending is needed, one that is less focused on means and more on results and on testing radical new methodologies. As the instrument set up to lead European convergence, the European Commission needs to depart from its administrative role, imposed by member states, and regain leadership and vision, and set priorities. The EU has spent €190 billion over 35 years in research programs but failed to leverage major technology breakthroughs in telecommunications, semiconductors, space, synthetic biology, or quantum computing. Europe cannot continue to make major budget allocations to the new European Defense Fund without clear strategic priorities on areas where it can lead again. Otherwise, the risk is that, as too often with the EU framework programs for research, heavily funded programs are created with little real follow-up or assessment of their leapfrogging impact.

Europe should prioritize (for now) cyber attribution capacity, general AI, next-generation semiconductors, access to space, quantum computing, and energy storage. Among the battles that Europe should and could win, several stand out, not only because of their importance, but because of their enabling aspect for critical sectors. Regaining the capacity of attribution in cybersecurity is the key

for prevention and deterrence. AI is critical for the anticipative and predictive models that hold some of the keys of an increasingly complex world. Easy access to space as well as mastering hypervelocity holds the key to security, autonomous systems, and communication on the ground. Quantum and high-performance computing will be instrumental for the future of healthcare and more generally the resilience of IT infrastructure. Finally, breakthroughs in energy—on storage, small nuclear power, or carbon capture—hold the key to addressing the grave threats posed by climate change.

It is time for a radical overhaul of Europe's decision mechanisms. Committee approaches and decisions based on direct economic returns for individual countries, regions, or cities (made under pressure from national and local representatives) are politically understandable but increasingly counterproductive from a technological perspective. They are also incompatible with the efficient use of taxpayers' money when experimentation and risk taking is increasingly the only way to achieve success. Europe needs to involve in its policies the entire technology ecosystem, which has these abilities, so as to get the best of the public and private sectors and to ensure decision-making is agile and bold. It needs to incorporate speed as a major political criterion or risk irrelevance—it is not enough for Europe be faster than before, it needs to be faster than others.

The acceleration of time, the incapacity to attribute, the vanishing frontier between war and peace—as illustrated in a cyber realm characterized by permanent conflict[5]—are a septic shock to leadership and governance structures. They require a combination of clear vision and sense of purpose that has to be stronger than ever before, with a need to delegate operational decisions to the closest level to the ground to be impactful. Failing to adapt its decision processes to the acceleration of technology and time will leave Europe permanently coping with events rather than shaping them.

5 Jean-Louis Gergorin and Leo Isaac-Dognin, Cyber, la Guerre Permanente, Editions du Cerf, 2019

Europe needs to understand that technologies increasingly carry values, as demonstrated by the role of social media in shaping and polarizing political debates, by facial recognition that changes the social contract, or by gene editing that is opening the door to modified or augmented humans. Europe's values are at risk if it loses the technological battle.

Europe needs to focus on the "next big things," for the double imperative that it is late on many technological fronts, and that success and impact are increasingly linked to being the fastest. Sputnik was the trigger for a radical overhaul of the way the United States looked at the future and set itself the incredibly ambitious goal of going to the moon. The challenge today for Europe is not about climbing the technological steps a bit faster, or defending itself, or creating a competitor to Google or Amazon, but to build on science and technology to anticipate how it can shape the future. Europe has the values and the creativity to invent the future it wants—on the condition that its political and economic leaders use its untapped power.

The technological revolution is an opportunity. Beyond the vertiginous impact it has on "old" European societies, it is an exceptional opportunity to gather all of the continent's energies. But this will only be possible if Europe is able to set itself a clear vision, disrupt its decision-making mechanism and break the increasingly irrelevant barriers between the civil and military, private and public spheres, and demonstrate that integrated European approaches can work. This is Europe's Sputnik moment.

About the Author

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