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The Political Rise of "Technology Masters". From Carrying out an Order to Designing a Model of Society

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Abstract

This article aims to discuss the evolution over the centuries of the role and social position of those mastering the technologies of their time. We suggest that the Industrial Revolution, the rationalization of technical and managerial processes, then the rise of IT, the ascent of cryptocurrencies and finally the emergence of the neoliberal state have lifted a fringe of these individuals to the top of the social hierarchy. Among the "technology masters", we distinguish three families: those who remain at the service of the State and the established order, those who have exploited, consciously or not, the withdrawal of the neoliberal State to offer services and innovations formerly assumed by the public sector, and finally those who have consciously taken advantage of this same withdrawal and the recognition they enjoy in society to propose other models (free software, open source, crypto anarchism, technical alternatives, etc.).

Keywords: power, engineer, cryptocurrency, technology, neoliberalism.

JEL Classification: N10; O30; O35.

Introduction

Of the 10 richest people in the world in 2022[1], all have at least a degree in computer science and physics, or an initial engineering background, before devoting themselves to developing their own businesses. Of these 10, only 2 (Bernard Arnault and Mukesh Ambani) inherited the family business. All the others built their fortunes on the innovations they developed. None of them are artists, teachers, doctors, lawyers or heads of state. How can we interpret the over-representation of technical profiles in this ranking compared to their presence in the general population?

This question is to be more broadly put in an international context in which technique is gradually taking the lead of our lives. In so doing, the authors Tigani and Calzada speak of "technopolitical" elites to describe how technology (whether through social networks, artificial intelligence or communication) is gaining political control over our societies (Tigani, 2024). According to Epstein, faith in technology has become the new religion (Epstein, 2024). And according to Varoufakis, capitalism is even living out its final hours, gradually being replaced by a new political system that he calls "techno-feudalism" (Varoufakis, 2023). The aim of this article is then to propose a reading, in the form of a short essay, of how those who master the technologies of their time, that we call "technology masters", would have climbed the rungs of the social hierarchy over the centuries.

[1] See Forbes ranking: https://www.forbes.fr/classements/classement-exclusif-milliardaires-2022-elon-musk-devient-lhomme-le-plus-riche-du-monde-devant-jeff-bezos-le-francais-bernard-arnault-en-troisieme-position/, accessed 11/7/2022

We do not understand technology here in its etymological sense, developed by Guillerme and Sebestik, i.e. as "a discourse on techniques" (Sebestik & Guillerme, 1966), but in Carnino's sense of techniques themselves, "industrial procedures and material products" (Carnino, 2010, 83) or the "scientific rationalization of technique that has become techno-science" (Carnino, 2010, 84). By "technology", we mean the most recent technical developments and cutting-edge processes.

In our perspective, "technology masters" are individuals trained in an emerging technical specialty or in the latest technical developments. These are first and foremost engineers, whether generalists or not, but they also include individuals with little or no formal education who have mastered a modern technology, for example, in our time, computer scientists who, without necessarily enjoying the academic status of engineer, are sometimes self-taught or have taken programming courses[2]. The contemporary correlation between “technology masters” and those whom society considers to be engineers remains strong, since, according to Carnino, "technology, as we understand it today, appears [...] when technical production is concentrated in the hands of engineers and entrepreneurs" (Carnino, 2010, 84). Similarly, in his definition of "applied science" in the 19th century, Charles Laboulaye considered that "[the task of engineers would be] to make constant use of the latest advances in science to translate them into industrial progress" (Laboulaye, 1870).

Finally, we understand social hierarchy as "the ranking of individuals or groups within a population according to material or immaterial dimensions accepted as social markers within that population" (Dubois & Ordabayeva, 2015, 334). In particular, we consider, in line with Bourdieu, that individuals situated in the "social space" at the top of this hierarchy are those with the highest "overall volume of capital", all capitals combined, thus conferring on them the most power (Bourdieu, 1984, 3).

Like Friedberg, Foucault and Luhmann, we see power as the mastery of uncertainty (Friedberg, 1972; Foucault, 1994/1997; Luhmann, 1975/2018) or, in the negative, as the mastery of information (Russo, 1966; Lempen, 1980; Thépaut, 2006). Using Shannon's information theory (Shannon, 1948), power can then be understood as control over the occurrence of events or, by extension, as the increased ability to predict the future and postdict the past. In this, our definition echoes that of Bourdieu, who saw classification battles as "struggles for the monopoly of power to make people see and believe, to make people know and recognize, [...] to impose a vision of the social world" (Bourdieu, 1980, 65).

Our reading of the way in which the “technology masters” have climbed the ladder of the social hierarchy over the centuries, i.e., have accumulated power, is divided into five stages. It follows a chronological sequence from ancient times, when these individuals were first at the service of society, to our contemporary world, where, in a kind of reversal, some of them are now helping to shape that same society.

1. When Technology Masters Worked in the Service of Others

In Antiquity, the term "engineer" did not exist as such, and was rather replaced by "mechanic", "builder", "architect", "expert", etc. (Vérin, 1998, 12). The architect, etymologically the chief technician, was sometimes an expert in war machines, sundials, urban planning or hydraulics (Vitruvius, 2016). He was the individual who indeed mastered the technologies of his time. According to Pierre Gros, the person responsible for the technical aspects of building construction in the Hellenistic and Augustan periods was merely a "cog in the wheel", dependent on a principal and a financier (Gros, 1983). History forgets him to remember the sponsor. It is the latter who concentrates all the symbolic, political and financial capital, and who occupies the top of the social hierarchy. Hence the expression: "Caesar pontem fecit", Caesar had a bridge built.

[2] With respect to the debates on whether the Software Engineers are indeed engineers, one can read Nathan Ensmenger (Ensmenger, 2010).

As the centuries went by, history began to recognize and remember the names of engineers and architects responsible for landmark achievements (Vitruvius, Vauban, Le Vau, Eiffel, etc.). This transformation accelerated with the revolution in weapons technology and the need to integrate mathematics and science into the mechanical arts (Vérin, 1998). The technology masters then enjoyed greater symbolic and social capital, but here again, they were merely the architects of constructions and buildings desired by others. From the point of view of social relations, these engineers remain largely subject to a decision-maker, to the availability of finance, and continue to work "to order". Unless they were themselves financially wealthy (like the engineer Marc Séguin, who, thanks to his other activities as an entrepreneur, attempted to build the first suspension bridge over a river in 1822, or Charles Babbage, who, thanks to his family environment in the banking sector, could be considered a precursor of the computer), they first had to approach financiers or patrons to give life to their creativity. Gutenberg, for example, developed printing after convincing banker Johann Fust to support him; the Montgolfier brothers made their small-scale hot-air balloon experiments by "mobilizing industrial networks and [by] eliciting broad political investment" (Thébaud-Sorger, 2010, 229). Unless the first experiments can be carried out without too much investment - as for Nicéphore Niepce, the inventor of photography, who carried out some of his experiments directly from his apartment - the innovator's capacity for experimentation is correlated to his access to financing.

2. How Technology Masters started to benefit from the Spin-Offs of their Activity

If, for millennia, inventors did not have a name, or if the industrial and economic spin-offs of inventions were, before 1800, often taken up by others, particularly investors, the 19th century saw a paradigm shift. On April 10, 1790, in the United States, and on January 7, 1791, in France, the first patent laws were introduced to protect the intellectual property of an invention. Between 1815 and 1889, the number of patents registered in Austria-Hungary, France, the German states, Great Britain and the United States increased 100-fold (Lapointe, 2000). For the first time, engineers could become the operators of their own creations. Thomas Edison became one of America's wealthiest industrialists, founding General Electric to replicate his own inventions in an automated way. Henry Ford, who designed limited-series automobile models with the support of several financiers, became the director of his assembly-line car manufacturing company and one of the market leaders. In other words, if the “technology masters” succeed in gathering the material resources needed to create new technologies, he or she can then become the one who benefits, through the use of patents, or even through the industrialization that takes place, from the economic spin-offs resulting from his or her creativity. In this case, the symbolic benefits also accrue to the inventor. Mastering the technologies of one's time, or being at the cutting edge of innovation, is therefore not a sufficient condition for climbing the social hierarchy (i.e., researchers in fundamental physics), since this mastery must be coupled with a willingness and ability to develop this technology on a national or international industrial scale, and with the success of this industrial development.

In parallel with the increasingly important place taken by many inventor-engineers in the spheres of economic and industrial power, certain institutional mechanisms also invited “technology masters” to find themselves at the helm of major corporations. It was from this period onwards that the term "engineer" came to represent a social status sanctioned by a diploma. In France, while those trained at the Ecole des Ponts et Chaussées might have been perceived in the 18th century as designers or "artists" (Picon & Yvon, 1993), the successive foundations of the Ecole des Mines, the Ecole Centrale des Travaux Publics, later the Ecole Polytechnique, and then the Ecole Centrale des Arts et Manufactures at the turn of the 18th and 19th centuries, led engineers to social recognition and new outlets. Following the English model of the engineer, i.e. a model "[centered] on the rationalization of industrial processes and systems" (Vérin, 1998, 19), the École des Mines explicitly trained engineers to manage the great national mines. The decree of March 19, 1783 aims to train future students to "manage works with as much safety as economy" (Arrest du Conseil d’État du Roi portant établissement d’une École de Mines, 1783). The École centrale des arts et manufactures created in 1828 "emphasized the effectiveness of knowledge" (Vérin, 1998, 19) and "had to provide students with the means to invent with ease" (Picon, 1992, 601). As for the Polytechnique engineer, he or she must be "the one who has the 'highest

mathematics', at the latest science in the making, mathematics that commands, in the order of knowledge, access to the physical sciences and their applications" (Vérin, 1998, 18). While the Ecole Polytechnique focused on military training, it also prepared its students to become the country's scholarly elite. Following Auguste Comte's positivist and rationalist hierarchy of sciences, mastery of mathematics would in fact authorize mastery of other disciplines (Comte, 2009) and, consequently, management of France's major public companies.

At the time, it was out of the question for these French engineers to increase their personal economic capital by acquiring shares in private companies. An 1851 decree even forbade individuals from the Corps des Mines "to take any interest whatsoever in the exploitation of mines, pits, quarries and mineral establishments located on the territory of the Republic, on pain of being considered as having resigned" (République Française, 1851, 1280). Nonetheless, this evolution of early 19th-century engineering schools illustrates, in France, the idea that was gradually spreading in parallel in the various Western countries, according to which engineers were best suited to managing large industries and companies. In a capitalist spirit of return on investment, the scientific organization of work, i.e., the Taylorian approach to work, must enable processes to be optimized. What's more, in a "risk society" where individuals seek to control risk (Beck, 1986/1992), individuals trained in both technical aspects and mathematical theory seem best placed to reduce risk and, at the same time, increase profits. Engineers are gradually recognized not only for their knowledge of physics, but also for their management skills. They thus become engineer-managers.

The emergence of the concept of "general engineer" reflects this same trend. There would no longer be any need to be a specialist (whether in mining, bridges, hydraulics, civil engineering, telecommunications, forestry or agronomy), since all sectors of activity could supposedly be apprehended in the same way, according to the same quantitative and managerial approach. As Armand Hatchuel describes, from its foundation to the present day, the Ecole des Mines has never ceased to broaden the outlets for its training, from mining, to railways and chemicals, to banking (Hatchuel, 2006, 15). The decree of October 8, 1991 on the Ecole des Mines no longer proposes any limitations, as it specifies that the school must train engineers "with high-level scientific, technical and general skills, making them suitable for positions of responsibility in industry and government"[3].

Hervé Joly notes that, in the post-war period, "the new industrial CEOs were often general engineers [...]. In 1960, at least seven of France's largest industrial companies (Marine-Firminy, Sidélor, Ugine, Pechiney, Kuhlmann, Peñarroya, Compagnie française des pétroles-CFP) had a CEO from the corps [des Mines]" (Joly, 2012, 27–28). These engineer-managers have been increasingly invited to sit on boards of directors. Of the 585 CAC40 executives in 2007 (i.e., members of boards of directors and supervisory boards, and members of "executive committees"), 247, or more than half, came from an engineering school (Dudouet & Joly, 2010, 39).

In any case, the 19th and 20th centuries saw an evolution in the place occupied by the first individuals supposed to have mastered technology, namely engineers, in the Western social hierarchy. Not only were some of them able to become the entrepreneurs of their own inventions and head vast industrial empires - these are the inventor-engineers - but others, the engineer-managers, were legitimized by their course of study to occupy this same type of position (with the caveat that, through their generalist training and their assumption of positions directly at the top of the hierarchy, they lost some of their ability to understand the technical details of the technologies and industrial processes for which they were responsible). While a handful of inventor-engineers have been able to enrich themselves, i.e., increase their financial capital, many manager-engineers have at least gained in social and symbolic capital, as illustrated by the reputation progressively conferred in France on the so-called "Grandes écoles".

[3] Decree No. 91-1033 of 8 October 1991 on the Ecole Nationale Supérieure des Mines de Paris (Mines Paris).

3. Technology Masters bypassed Financiers and became Independent Entrepreneurs in the Digital Age

Since the early 1970s, a new avenue of emancipation has opened up for “technology masters”: computing. The miniaturization of electronics and, in particular, processors, has enabled the most advanced IT-savvy to innovate from home or from easily accessible locations, without having to go through the validation of a chief or funder. The two best-known figures in this first wave of computer scientists are undoubtedly Steve Jobs, founder of Apple and the Macintosh Plus, and Bill Gates, founder of Microsoft and inventor of the Windows operating system. While we shouldn't be fooled by the myth of the genius or of the entrepreneur (Shane, 2009; Galluzzo, 2023), and although they benefited from a favourable social environment where financiers, electronics engineers and computer scientists had been present in large numbers since the 1930s (in the USA, and in Silicon Valley for Steve Jobs in particular (Lécuyer, 2007)), their success also indicates that it has become possible to develop and sell a product independently, even for individuals from working or middle classes.

Steve Jobs, born in California in 1955, the son of a machinist and an accountant, didn't come from a privileged background. But with his tech-savvy high-school classmate, Steve Wozniak, and through the "Homebrew Computer Club", a small club of electronic board tinkerers that regularly met in the garage of one of the participants, the two buddies needed a few thousand dollars in advances that their relatives granted them to procure the equipment, and "the Jobs family home [was enough to become] the assembly plant for the fifty Apple I's." (Isaacson, 2011).

Bill Gates, brought up in a more privileged family than Steve Jobs, was the son of a lawyer and a professor from a banking family. He achieved his first technical and commercial successes by responding to a challenge from the company behind the Altair 8800, one of the first microcomputers. With his friend Paul Allen, Bill Gates relied on his university's computer equipment and, for a few dollars, bought the technical manual for this microcomputer from a Cambridge electronics store (Wallace & Erickson, 1993, 75). At the ages of 19 and 21, Bill Gates and Paul Allen founded Microsoft without needing any specific financial resources or premises other than those offered by their university.

In the 1990's and 2000's, similar dynamics took hold, even more significantly, with the rise of the Internet. Of course, a favourable technical and social environment was still necessary, but the computer scientists of this new generation were at the same time partly freed from geographical anchorage. Computers have become personal, and the Internet is accessible from most of the world's major cities. Through online discussion forums, user manuals and coding courses, anyone can learn, inform themselves and develop their own product from the comfort of their own home. The “technology masters” need less and less university validation to put their knowledge into practice, and increasingly engage in "self-training" (Nagels & Carré, 2016).

This generation includes Larry Page and Sergey Brin, born in 1972 and 1973 respectively in the USA and Russia. Studying at Stanford, a university with privileged access to the Internet, they began applying the subjects they studied in 1996. They invested in low-cost hardware, installed their equipment in their dorm rooms and gave birth to Google (Lowe, 2009, 52–53). At the same time, Jeff Bezos, himself a computer scientist, launched Amazon, with the help of two fellow developers, from the garage of his parents' Seattle home (Ryan, 2009, 35). And in February 2004, Mark Zuckerberg started Facebook with a single computer at Harvard University. Faced with the rapid popularity of his creation in American universities, he joined forces with his fellow students to set up shop a few months later in Palo Alto, California. Many Chinese entrepreneurs started out in similar conditions. Whether it's Jack Ma, the founder of Alibaba, Robin Li, the founder of Baidu, or Ma Huateng, the founder of Tencent, none of them are heirs. They all come from middle-class or working-class backgrounds, have dabbled in IT at some point in their careers, and have succeeded in turning their ideas for technological innovation into lucrative businesses.

Admittedly, some computer scientists defend the principle of free software, or even open-source software, putting the collective rather than the individual first, and not seeking to make a fortune from their inventions (like the founders of Linux, Mozilla or Sci-Hub, for example). They put the interests of the community ahead of their own interests. But today, technical advantages can also be transformed into symbolic and financial capital, depending on the choices made. The point here is not to extol the "meritocratic illusion" (Guilbaud, 2018) , to keep the legend of the self-made man alive, and to ignore the fact that for Facebook to succeed, dozens of other similar projects have perished (PlanetAll, SixDegrees, MiGente, etc.). The point, however, is that the rise of the social hierarchy for “technology masters”, recognized first by the increase in their economic capital since the progressive social division of labour, is, unlike in previous centuries, not impossible. While many IT entrepreneurs have needed to raise capital to develop on a large scale, the support of friends and family has often been enough to get the ball rolling. This is not to say that social determinants should be erased, that Steve Jobs, Bill Gates, Jeff Bezos, Marc Zuckerberg, Larry Page, Jack Ma, Robin Li or Ma Huateng did not benefit from a favourable family and intellectual environment, in countries at the top of technology at the time, from the support of their often-prestigious universities, or from well-placed acquaintances, in other words, from advantageous social capital. It should be noted, however, that these inventors were no longer as dependent as they once were on sponsors who would have come up with the ideas for them, nor on investors who might have refused them an advance and stopped them in their creative tracks. Finally, it should be noted that, if these individuals are today at the head of a company, it is also - and this is one of our hypotheses - because they were able to start their adventure independently, because they were able to test their own ideas in practice, and because they mastered, at least at the birth of their concept, the entire technical process. These various factors, combined with the multiplication of the impact of the Internet beyond national borders, and the choice to develop "proprietary" products that generate a profit on each sale, have enabled them to "accelerate" their way to the top of the social hierarchy (Rosa, 2013). It is this acceleration that, according to our argument, has enabled them to emerge among the world's greatest fortunes in a few decades.

4. Technology Masters Developed Their Own Financial Processes and Services Through Cryptocurrencies

Since the emergence of financial capitalism in the 1980s, the worlds of finance and engineering have come closer together (Godechot, 2016). Because of the mathematical demands of high-frequency trading, young graduates were increasingly valued for their ability to build statistical models and hired as traders or "financial engineers" on trading floors. However, these trader-engineers remained the executors of bank managers, themselves dependent on central banks and national and international regulations. In recent years, those who have mastered technology, and above all IT, have reached a new stage: that of their control over finance itself.

From the very beginnings of computing, the idea of a crypto-currency, i.e., a decentralized digital currency that could be exchanged on a network, has been existing. Several attempts were made, including David Chaum's e-cash in 1983, digi cash in 1990, Wei Dai's b-money in 1998, Nick Szabo's bit gold and Vivek Vishnumurthy's Karma in 2003. Each had its shortcomings (keeping a trusted third party, lack of reliability, difficulty of implementation, etc.) and none of them offered sufficient satisfaction to their users. At the end of 2008, Satoshi Nakamoto[4] published the white paper for a cryptocurrency based on blockchain technology, which he named Bitcoin, and on January 3, 2009, established its first block in the hope of resolving all the difficulties encountered to date by previous decentralized digital currency projects (Nakamoto, 2008). Since then, the success of Bitcoin and its underlying principles have not waned, and the innovations it has spawned are appearing at exponential speed. At the time of writing, 41 cryptocurrency projects are valued at over $1 billion, and 188 at over $100 million. The total value of capital committed to the market is close to $1,000 billion[5], or roughly the annual budget of the US federal government.

[4] Whose real identity is still unknown today.
[5] According to the CoinMarketCap platform: https://coinmarketcap.com/, accessed on 22/6/2023.

The sociological profile of the business leaders at the helm of these projects, and therefore of "technology masters", differs from that of the same type of leaders a hundred years earlier, or from that of the CAC40 bosses mentioned earlier. They are still predominantly men, but they are younger (average age 38, compared with the CAC 40's average age of 55 (Chikh, 2013, 90)), come from both working-class and affluent backgrounds, and hail from a variety of countries. Many are North American, but many others are from emerging countries such as China, India, Korea, Turkey or Argentina. Not all have a long university education, and a number of them, like Steve Jobs and Bill Gates before them, have even dropped out to devote themselves fully to their project. As a result, they start at the bottom of the ladder, knowing first-hand the details of the entire technical process they're putting in place, and mastering mechanisms they might not have known with such finesse had they pursued their studies. Like the innovators mentioned in the previous section, the developers behind these new projects often initiated theirs, according to their own testimony, independently, with the help of a personal computer, an Internet connection and possibly a small team of IT friends.

Table 1. Sociological profile (gender, nationality, age and diploma) of cryptocurrencies entrepreneurs.

Name	Project	Gender	Nationality	Birth Year	Diploma
Satoshi Nakamoto	Bitcoin	N/A	N/A	N/A	N/A
Vitalik Buterin	Ethereum	M	Russo-Canadian	1994	Left school at 20
Changpeng Zhao	Binance	M	Chinese-Canadian	1977	Computer science degree
Jesse Powell	Kraken	M	American	1980	Philosophy studies (abandoned?)
Brian Armstrong	Coinbase	M	American	1983	Master's degree in computer science
Fred Ehrsam	Coinbase	M	American	1988	Bachelor's degree in computer science
Hayden Adams	Uniswap	M	American	1991	Bachelor's degree in engineering
Sergey Nazarov	Chainlink	M	Russo-American	1988	Degree in philosophy and management, and technology enthusiast
Anatoly Yakovenko	Solana	M	Russian American	1982	Bachelor's degree in computer science
Charles Hoskinson	Ethereum, Cardano	M	American	1987	Drop-out in mathematics
Billy Markus	Doge	M			
Jed McCaleb	Ripple, Stellar	M	American	1975	
Chris Larsen	Ripple	M			
Gavin Wood	Ethereum, Polkadot	M	English	1980	PhD in computer science
Joseph Lubin	Ethereum, Consensys	M	Canadian		
Emin Gün Sirer	Avax	M	Turkish-American	1975	PhD in computer science
Sandeep Nailwal	Polygon	M	Indian	1990	Master's degree
Sebastien Borget	The Sandbox	M	French	1983	Master in Computer Science/Engineering
Esteban Ordano	Decentraland	M	Argentinian		Computer engineer

Source: Personal research

The wealthiest among them, generally with tens of billions of dollars, are the creators, not of a cryptocurrency, but of a cryptocurrency exchange platform, i.e. the equivalent of a bank (such as Binance, Kraken or Coinbase). Their wealth has been built up in less than ten years and, for most of them, in less than five[6]. By crossing blockchain technology with their financial knowledge, sometimes self-taught, a new generation of individuals has emancipated themselves from the situation of trading room engineers by abstaining from the need to go through traditional commercial banks. They have even taken the liberty of mocking conventional finance by humorously naming their innovations Pancake Swap[7], Kebab Swap[8], Dogecoin[9] or Bored Ape Yacht Club[10].

Until the 2010s, those who mastered technology had the opportunity to become bosses (through their degree, heritage or innovative spirit) and to have a say in certain commercial banks. But central banks, those that control and issue money, remained state institutions in the political-economic realm. Thanks to blockchain technology and the various forms of cryptocurrency, some of the “technology masters” have themselves rethought money and all the associated dynamics: rules for generation, distribution, remuneration, interest, loans, exchanges[11], insurance[12], auditing[13] and so on.

The many applications of cryptocurrencies (decentralized finance, "smart contracts", non-fungible tokens, etc.) have enabled developers to set up a variety of financing mechanisms: ICO (Initial Coin Offering), IEO (Initial Exchange Offering), IDO (Initial Dex Offering), IGO (Initial Game Offering), IFO (Initial Farming Offering), ITO (Initial Token Offering), and so on. Although each mechanism is based on a different logic, they all offer the opportunity for the individuals deploying them to finance their project and increase the relative value of their currency. Offerings of this kind are no longer only used to finance the initiatives of IT developers, but also the projects of singers, designers, graphic artists, film-makers, etc., thus supplanting, for some individuals, classic online participative financing systems such as Kick Starter, Kisskiss Bankbank or Ulule.

5. Technology Masters Gained Social and Political Power

The stranglehold on exchanges (whether financial or social) exercised by some of those who have mastered technology does not stop there, and increasingly extends to public affairs. Technology and politics have certainly always been intertwined: the Pharaohs' development through the construction of pyramids, the layout of Roman cities according to water networks, the evolution of armed conflicts according to military innovations (fortifications, means of transport, weaponry, etc.), economic sovereignty dependent on the mastery of energy, the attractiveness of territories according to their proximity to transport hubs, and so on. But technology was first subject to the will of the rulers in power. And yet, particularly in countries where neoliberal doxa is prevalent, the balance of power between technology and politics seems to be shifting; and “technology masters”, as shown by recent publications, have the opportunity to play a growing social role (Bonaparte, 2024; Sadowski, 2025). Indeed, according to the Chicago School of thought behind neo-liberalism, most public services (with the exception of a few, such as the police, the army and justice) would be better provided by "healthy competition" between private companies than by the state itself (Mirowski & Plehwe, 2015).

As a result, the withdrawal of the latter leaves the way open for captains of industry and technological innovators to become the primary providers of services or activities once considered to be part of the common good (couriers, communication networks, energy creation, resource exploitation, space exploration, etc.). This situation

[6] Kraken was founded in 2011, Coinbase in 2012, and Binance in 2017
[7] A decentralised exchange platform with the crêpe as its standard.
[8] Another decentralized exchange platform referring to the kebab other decentralized exchange platform referring to the kebab.
[9] Coin whose logo is a Shiba Inu breed dog.
[10] The "Bored Monkey Club," an NFT project, has its currency, ApeCoin, ranked among the top fifty in value.
[11] In particular, DEXs (decentralized exchanges) have had to rethink the issue of cryptocurrency liquidity. They then created systems of "staking", "liquidity pools", "farming" and "AMMs" (automated market makers).
[12] See, for example, the Helmet or Nexus Mutual projects.
[13] See, for example, the Certik project.

offers some of these individuals a power they have never known and brings the Western world, according to Varoufakis (2023), to a new economic dynamic replacing capitalism called techno-feudalism.

As regards the information that underpins the notion of power as defined in the introduction, its control has largely shifted from the public to the private sector, and now extends beyond the national borders to which state institutions, for their part, remain subject. Some companies in the digital industry have privileged access to their users' data worldwide, thanks to the tools they offer. In 2020, Gmail had 1.8 billion users[14], WhatsApp had 2 billion[15], not to mention the data of individuals and large corporations hosted in the clouds managed by these same service providers[16]. These IT leaders also have the means to control communication channels and, once again, the information that flows through them. After being set up by consortia of access providers (Vodafone, Orange, Tata, etc.), the undersea cables through which over 95% of international Internet traffic transits (Morel, 2017, 20) should, according to Orange's director of international networks, be 95% owned by GAFAM by 2023/2024[17]. In our skies, constellations of private satellites are being set up to offer Internet access to the most remote areas, and to channel even more information through these satellites[18]. In addition, the Cambridge Analytica affair at Facebook in 2016, the deactivation of Donald Trump's account by Tweeter in 2021 or the relationship between Facebook and Russia in 2022[19] highlighted the way in which social networks, through the information they let pass or not, could ideologically orient their users (Berghel, 2018).

Technologies themselves are sometimes subject to interpretations, by political actors, about the thinking they would convey. The cryptocurrency sphere, for example, has generated contradictory comments. For some, they are a "right-wing" project, the spearhead of unbridled liberalism, deregulation of the financial exchange market and a fading role for the state. For others, crypto-currencies would, on the contrary, give power back to the people, enabling them to escape the stranglehold of a financial oligarchy that holds both the economic and political reins of society, and to abstract themselves from a state that has been perverted by lobbies serving not the common good, but the few. They convey a "left-wing" project. Two seemingly opposed models of society would thus be supported by the same technology: blockchain.

And yet, by suggesting its own obliteration, the neoliberal state is losing its ability to act as a force of proposition and orientation, and to define the long-term direction of public research. Representatives of this type of state are increasingly leaving the field open to private technological initiatives and innovations, to which they find themselves in a reactive posture. When emerging technologies are judged by these same individuals to pose a threat to their stability and economy, however, they once again assert the need for a strong state (even though they used to say the opposite). Swinging back and forth between the presence and discretion of the neoliberal state, they sometimes remind us of the importance of their role in limiting, banning or at the very least framing the technologies in question. When Facebook announced its intention to set up its Libra digital currency, Mark Zuckerberg was summoned to explain his activities to US federal representatives[20] and, faced with regulatory constraints in several countries, ended up abandoning the project. When Elon Musk sets his sights on sending men to Mars or creating brain implants, policymakers are forced to take a stand. In the wake of blockchain technology's growing financial clout, the SEC (the US federal financial markets regulator and watchdog) has taken legal action against Ripple, Bittrex US and Binance US, among others. Christine Lagarde, head of the European Central Bank,

[14] See: https://financesonline.com/number-of-active-gmail-users/, accessed 10/7/2022.
[15] See: https://about.fb.com/news/2020/02/two-billion-users/, accessed 10/7/2022.
[16] If Amazon dominates globally, 95% of the 500 US companies with the highest revenues would use Microsoft Cloud services (according to the company's own figures: https://www.microsoft.com/azure/partners/news/article/scaling-cloud-solutions-to-new-heights-with-microsofts-partner-ecosystem, accessed 10/7/2022).
[17] See: https://www.challenges.fr/high-tech/telecoms/la-guerre-des-cables-sous-marins_701609, accessed 10/7/2022
[18] Jeff Bezos and his Kuiper project are in the running. Elon Musk and his Starlink project are already up and running. And other projects are also being set up: OneWeb (by the Indian Bharti), Sfera (Russia), Guowang (China), etc.
[19] Adrien Toffolet, "The tug-of-war between the Kremlin and Facebook in six questions", RadioFrance.fr, 11 March 2022
[20] He spoke in the Senate on April 10, 2018 about the Cambridge Analytica case and on October 23, 2019 before the House Financial Services Committee about the Libra digital currency project.

has spoken out on several occasions to denounce cryptocurrencies, considering that "they [are] worthless" or an "anonymous libertarian hype".

Despite the media battle against this sector, private innovation and state institutions continuously influence each other. While crypto-currencies may have raised hopes of abandoning traditional currencies, the two types of currency actually seem to coexist (in the same way that television hasn't made radio disappear). The dollar, yuan and euro remain the reference currencies, and Bitcoin, Ethereum and Solana are still valued against them. What's more, many stable coins have been developed to be backed by the dollar (Tether, USD Coin, Binance USD, DAI, True USD, etc.), bridging the gap between decentralized and traditional finance. A number of large-scale projects in the field mix financing methods, in part via the general public and in part via investment funds. The Rarible platform, for example, has its own "governance tokens" and has raised several rounds of financing at the same time[21]. In addition, the European Central Bank is seeking to develop its own sovereign digital euro, inspired by blockchain technology. What's more, "the [European] Council adopted [in 2023] a regulation on crypto-asset markets (MiCA) [which would aim] to protect investors and preserve financial stability, while enabling innovation and promoting the attractiveness of the crypto-asset sector"[22]. As a result, several centralized exchange platforms are complying with national regulations and using KYC ("Know Your Customer") processes to share information collected with national financial services. Since May 4, 2022, Binance France SAS has been listed as a digital asset service provider (PSAN) by the French Financial Markets Authority (AMF)[23].

In areas of the world further removed from neoliberal ideology, and in particular in the Russian and Chinese cases, while technological projects can also be the fruit of private initiatives, they generally have to be endorsed and/or pass under the control of the political power in place. In China, although Jack Ma, Robin Li and Ma Huateng gradually received financial and political support, their freedom was limited by the power of the state. In 2018, for example, they were forced to join the "China Federation of Internet Companies" to "maintain a correct political orientation" and "safeguard China's interests and sovereignty"[24].

Be that as it may, some of “technology masters”, whether Chinese, American or of other nationalities, have become global political actors and influencers, received like heads of state, and whose financial resources are equivalent to those of states (Mhăllă, 2023, 70). Through the projects they carry out, the speeches they give, or the foundations they set up, their voices can generate financial movements, lead to the implementation of new public policies and modify the behaviour of several billion people at once.

Conclusion

The five stages we have followed over the course of this article outline a gradual emancipation from the tutelage of a sponsor, in particular that of the state, by some of the individuals mastering the technologies. At the same time, we have observed that this emancipation has not been expressed in the same way, depending on the individuals concerned, the era or the political regime. We have identified three families of “technology masters”.

The first family is made up of those who, through constraint, conviction, ease or statutory inertia, remain in the service of the State and the established order. These include engineers whose technical passion outweighs their desire to stand out from the crowd, researchers who are civil servants at the service of lines of investigation proposed or accepted by others, computer scientists who consider it ethical to remain the hinge of projects larger than their individual ambitions, or innovators limited by the weight of the state. The latter have more or less retained the social status they enjoyed in ancient times, that of qualified architect.

[21] See https://rarible.medium.com/nfts-for-everyone-rarible-raises-14-2-million-88abee23b764, accessed 10/7/2022

[22] According to https://www.consilium.europa.eu/fr/press/press-releases/2023/05/16/digital-finance-council-adopts-new-rules-on-markets-in-crypto-assets-mica/, accessed 20/6/2023

[23] See https://www.amf-france.org/fr/espace-professionnels/fintech/mes-relations-avec-lamf/obtenir-un-enregistrement-un-agrement-psan#Liste_des_PSAN_enregistrs_auprs_de_lAMF, accessed 10/7/2022

[24] See: https://chinamediaproject.org/2018/05/11/building-the-partys-internet/, accessed 10/7/2022

The second family is made up of those who, whether consciously or not, have taken advantage of the retreat of the neoliberal state to offer services and technological innovations previously provided by public enterprises. This has been compounded by the digitization of the world, which has broken down many frontiers, allowed direct connection with an ever-greater proportion of humanity, extended the skills of computer scientists into new fields (such as finance, entertainment or information), made them increasingly essential players for both states and citizens, and finally given technological innovators a power they had never known before. Individuals from this second family, mainly Americans, have gradually taken over from public institutions, and have become their own financiers, or even the financiers of others.

The third family corresponds to those who have taken advantage, this time consciously, of the withdrawal of the neoliberal state and the recognition they enjoy in society, to propose alternative models. These "technology masters" include promoters of free and open-source software, crypto anarchists of which Satoshi Nakamoto, the father of Bitcoin, is a prime example, and young engineers who announce at their graduation that they are committed to alternative societal paths[25].

In the end, the social hierarchy has not been climbed by all "technology masters". Only those who have consciously or unconsciously played the game of neoliberal societies and private initiative, and who have seen their innovations recognized and rewarded, have actually increased their social, symbolic and financial capital. Among these, individuals with certain advantages from the outset (education in a technology-oriented country, access to knowledge, a stimulating family environment, etc.) were more likely to actually gain power.

In other words, the emergence of many "technology masters" among the world's top fortunes certainly reflects the attraction/taste of modern societies for those who control risk, demonstrate creativity, and increase the benefits that are supposed to trickle down to all. These exceptional profiles are, however, a trompe-l'oeil behind which there are many technological innovators who have not enjoyed the same success, and a variety of individuals who have not wished or been able to benefit personally from their knowledge and creativity.

Credit Authorship Contribution Statement:

Ludovic Joxe was solely responsible for the conceptualization, research, analysis, and writing of this paper. The author developed the theoretical framework, conducted the literature review, and formulated the central argument regarding the political role of technology leaders. All interpretations, conclusions, and discussions presented in the paper are the author's original work.

Conflict of Interest Statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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[25] See https://etudiant.lefigaro.fr/article/nos-metiers-sont-destructeurs-le-discours-choc-des-etudiants-d-agroparistech-en-pleine-ceremonie-des-diplomes_f2549aea-d105-11ec-ae5b-3111653054e7/, accessed 21/6/2023

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