The Techno-Political Nexus

The Ukraine War, which raged on Europe’s eastern boundaries during the winter of 2022, illustrated the ever-deepening link between technology and politics. From the very first days of the war, it was clear that the politics of the war are deeply intertwined with the technological arena, in the intense struggle over controlling the narrative in the overt social platforms as well as in the darknet[[1]](#footnote-1), in the use of alternative virtual financial technology, and in cyber warfare (including in grass roots movements such as Anonymous) and in withholding commercial Western technology, even when it’s private. The technologization of war illuminates the increasingly growing manner and scope where technology serves as a formative influence by generating the events in the political domain and calls for a re-examination of the involvement of technology in the formation of present-day politics. This paper presents an overview of the influence of industrial technology and communication technology on political phenomena in the last millennium, with an emphasis on the latter new era and up to present days. The overview will include a cluster of examples of political events such as the commercial revolution that led to urbanization in Europe, the dwindling of maritime technology during the Ming dynasty, prominent political events in the modern era in which technology was a formative element - such as the Spring of Nations, Communism, Nazism, political upheavals of the 20th century, the century of genocides, geo-political transformations, cyber-jihad, the fugitive crisis, environmental immigration, political segregation, nationalism, the involvement of social media and mobile communication, influence on elections, the climate crisis, the new hybrid warfare, and more. This overview will address the socio-political dimensions of the technology of the Industrial Revolution of the modern era, including the technologies of the digital revolution and the Information Age and will present the patterns of technological agency as part of modern techno-political interaction. The technological agency will be analyzed from two main aspects:

1. Technology as a political agent causes, communicates and narrates
2. Overutilization or underutilization of technology and its political results

Technology and politics have a bilateral relationship, and thus, the technological agency that will be discussed here will be presented from two angles: First, the action of technology on politics (technology as the political agent that causes, connects and narrates). Technology, in its rolling dynamics, creates or contributes to the formation of the political situation, makes the media accessible to the masses and inscribes the narrative and the symbols of change in the common consciousness). Second, the way the political environment (its set of values and political practices) implements the technology (overutilization or underutilization of technology and its political results). The overview will lay the groundwork for further required analysis of how the technologies of the fourth and fifth industrial revolutions may affect the political dimension of society. The current exponential growth of science and technology seems to be acting as a transformative force in society's transition to the post-digital age, and this transition has and will probably have a broad impact and political significance. Street[[2]](#footnote-2) opened his book Political Change and Technical change (1992), thus:

*The world is evoked through technology. Such shorthand taps an important intuition: social and political change is marked and moved by technical change. If this intuition is accurate, then the implications for the study of politics are obvious. No student of politics can afford not to be a student of technology.[[3]](#footnote-3)*

Nowadays, when society is evidently undergoing technologization at an accelerated rate, understanding the political influence of technology is essential for understanding the political challenges, especially the democratic ones, that society would face and this understanding needs to be at the center of contemporary political philosophy. To that end, it is necessary to map the techno-political transformation process of the modern era, and its sequel will be written in the course of society’s journey into the future.

1. Technology as a political agent that causes, conveys, and narrates

As we delve deeper into history, the impact of technology on political reality seems to be profound. Technology has defined the boundaries of what is possible and the face of society, and has also served as a transformative power that generated (or at least significantly contributed to) dramatic changes while forming means and forms of communications and the social and political narrative. Toward the end of the 1st millennium (C.E.), there was a significant cumulative effect of the convergence of technology which brought Europe into a period of an economy based on money and urbanization and to an essential change in the structure and power relations in society. Throughout this period, there was a significant increase in agricultural produce, mainly thanks to improvements in agricultural, mobilization, and distribution technologies. In time, the use of the crank handle became more sophisticated, the wheel plow was developed, and water-powered mills were improved. Hydraulic power was used to grind grains, for the fabric industry, processing metals, sawing wood, making beer, and grinding mustard and materials for dyes. The shipping lanes saw ships improving in seaworthiness. Steadily the technology of the sail gained leverage. An additional use was for mixing papier pulp, which made paper manufacturing cheaper and more extensive. Shoeing technology around 1000 CE led to bronze cast horseshoes being a basic commodity, which in turn enabled transport and availability of raw materials, commodities and people. Horse collars, redesigned to fit the shoulders and side reins, made it possible to use the horses not only for transport but also for plowing. Technological ability and knowledge for increasing the yield of land-based produce allowed feeding a lot more people, which led to population growth and created a population flow into the cities. Europe has begun enjoying a period of stability and general growth of in per capita income[[4]](#footnote-4). The technological revolution revolted demographics, regime, culture, and trade along with the development of mercantilism in the city states of Italy, specifically Genoa, Venice, Pisa, and Amalfi[[5]](#footnote-5). Thus, during the first centuries of the second millennium the technological processes created a new European society and led to a political upheaval transforming European society from a feudal society with local economies, to an urban society whose economy is run through banking, finance and credit.

In the agrarian-feudal-local-decentralized political system, most of the population was subject to a feudal-vassal relationship of patronage and subordination to the ruling elite[[6]](#footnote-6). As urbanization took hold, it shattered the chains of feudalism and created an utterly different political system with new institutions, classes and political values that were held in a unifying urban structure[[7]](#footnote-7). The technological revolution at the end of the 1st millennium and its continuation in subsequent centuries, has entirely transformed the social narrative. Social mobility was a revolutionary idea in medieval society and was in complete contrast to the old feudal social order in which a person was born to a social class, which they could never change. The feudal narrative based the social contract on a stable political contract between masters and vassals with both sides beholden to the land, the class hierarchy was innate and social mobility was impossible. However, once technology made autonomy and mobility accessible to the lower classes, the feudal narrative was replaced by a brave new narrative and its motto was "Stadtluft macht frei” (Urban air makes you free!)[[8]](#footnote-8). Political emancipation increased along with the technological and scientific progress and in time led to the Enlightenment and the Modern Era. In due course, the concept of civil freedom materialized in its most essential form in the French Revolution, which was a political explosion caused by complex circumstances[[9]](#footnote-9), among them the improvement in agricultural technology that has indeed led to improvements in yield and population growth, however the revenue went mainly to the land owners and consequently it led to mass pauperization of farmers and to urban immigration[[10]](#footnote-10), while at the same time, print technology established itself and created the politization of the masses. Jürgen Habermas emphasized the role print media and fliers played as agents of change (along with debating clubs and cafes) in forming the public sphere[[11]](#footnote-11). Print technology and means of transport took the political discourse to the masses, which in turn led to changing the narrative of the social contract from a monarch ruling by divine right and a natural class system, to a narrative of government by the people by natural innate right of every citizen to liberty and participation in public affairs.

The modern era has brought to the Western world and public sphere new integration between technological power, political power, and economic power. The modern integration of forces was such that conceptually, each of them was supposed to complement, balance, and empower the others. In the view of classical liberalism, the industrial and scientific revolution was supposed to provide the infrastructure for comfortable, exciting, and advanced life, liberalism and democracy were supposed to provide the political foundation supporting freedom of body and thought, and Capitalism was supposed to provide an economic framework where everything is possible for anyone[[12]](#footnote-12). In practice, the forces forming the modern social apparatus were far more complex and ambivalent. on the one hand a tremendous contribution to human welfare, but on the other hand phenomena of ethical defeats and other failures. The complexity of each one and the symbiosis between them formed, and still are, the ongoing transformation of society. In recent years, as information technology in particular, continues to demonstrate the way it molds the political sphere, and as it has become increasingly clear that the exponential growth of technology summons a future with huge impact of technological force on our lives, there is a growing interest in researching the question of technological-political symbiosis. In this context, it can be noted that the scaling of various technologies according to how they interface with the political field, as referenced by Susskind: as technologies that are significantly political (such as nuclear power, since it acts as part of political interactions between countries); technologies that become political due to local political use (firearms in the UK are used mostly used to hunt wild game, whereas in the US the constructional right turns their ownership into a central political issue); and technologies that by their very nature formulate the social and political mindset (such as the invention of the mechanical clock that influenced mechanistic philosophy aspirations to a clockwork government - harmonious, ordered, and predictable)[[13]](#footnote-13). As for the focus of this paper in the technological agency aspects (by analyzing the manner in which many transformative changes formed in the politics of the modern era), the enormous impact of the technological power as a causal, linking, and narrativist political agency is readily apparent. Technology caused, or deeply influenced, the formation, provided the means of communication among the masses, and created an impact on the mindset through iconic branding and embodiment. The medium is most definitely the message[[14]](#footnote-14).

In mid-19th century Europe, the technology of the industrial revolution along with industrial capitalism brought a lot of sadness. This technology led to frustration, social gaps and masses of urban poor who suffered from high cost of living and estrangement. However, the technology of the media via the press, the political fliers and transport technology allowed subversive nationalistic ideas to take hold and spread throughout the continent. The first uprising of “The Spring of Nations'' occurred in Palermo, Sicily in January 1848, and somewhat later a series of political upheavals occurred, motivated by a new political narrative - nationality. During the winter of 1848, the Communist Manifesto was published. Ever since, the Marxist Spectre[[15]](#footnote-15) continued to haunt Europe until it led to the Communist revolution, which resulted in a radical political change, where at some point in the 20th century, approximately half the world population lived under a Communist political doctrine[[16]](#footnote-16). Marx saw the bourgeois technology as forming the transformative power that crashed feudalism and pulled up the bourgeoisie. the Bourgeoisie, in his view, brought about unprecedented technological progress, but at the same time it committed egregious ethical and strategic errors, which in turn created the proletariat anti-thesis. According to Marx, political freedom, as well as other values of modern society, was merely a hidden means of control by the bourgeois power. Marx saw his time as historic window of opportunity since according to him, capitalist economy achieved a surplus, and thus its natural requirements demanded the dissemination of resources to the masses, and he wrote:

*The development of Modern Industry, therefore, cuts from under its feet the very foundation on which the bourgeoisie produces and appropriates products. What the bourgeoisie therefore produces, above all, are its own grave-diggers. p.49[[17]](#footnote-17).*

A further advantage, in Marx’s view, was that, in practice, it was the same technology that created the bourgeoisie that could serve as the means to carry the new narrative and enable the masses to organize. He saw the capitalistic technology of media and transport as a means through which the proletariat could organize efficiently and promote their goals[[18]](#footnote-18). Karl Marx’s figure, as well as the Communist Manifesto itself, became a revolutionary branding that subverted what the socialists saw as sophisticated capitalist politics, and thus throughout the Bolshevik revolution, which in turn created images and posters that served the visual and symbolic branding of the politics of the revolution, were disseminated through the mass media and established the revolutionary message[[19]](#footnote-19), [[20]](#footnote-20) .

The second Industrial Revolution (1850–1914) influenced the multitude and diversity of means of warfare, logistics, energy, transport, and infrastructure that were at the disposal of the new political and national entities[[21]](#footnote-21). Thus, since the mid-19th century, a new period started off a century of bloodshed, during which scientific and technological advances continued to expand military capabilities, and in turn, their political use[[22]](#footnote-22). Even in the 20th and 21st century, all the way to contemporary times, technology and science formed the foundation for dramatic political transformations. As to Nazism, its rise was deeply intertwined in the use of various technologies, in establishing the Nazi brand through political symbolism in various media, extensive use of cinema and radio technologies, the sense of "grandeur" arriving at election rallies in airplanes descend from the sky, use of empowering lighting during speeches, and of course down the line, establishing the war and genocide machine in a range of scientific and technological capabilities'[[23]](#footnote-23) ' [[24]](#footnote-24) [[25]](#footnote-25) ' [[26]](#footnote-26). This illuminates another socio-political aspect of modern technology, which was exercised by providing a huge extermination force at the disposal of murderous politics. The 20th century was called by Albert Camus “an age of murder," and is even called by historians "The Century of Genocide,"[[27]](#footnote-27) during which frequent genocides were carried out on almost all continents[[28]](#footnote-28). Eric Weitz, who has studied four of the great outbreaks of genocide in the twentieth century: the Soviet Union under Stalin, Nazi Germany, Cambodia under the Khmer Rouge and the former Yugoslavia, finds its roots in the most powerful categories of the modern world: race and nation. He demonstrated how, in each case, a strong state striving for utopia developed an extremist ideology in the belief that only the destruction of a particular national and racial group would allow the dominant group to flourish[[29]](#footnote-29). However, murderous struggles among people and demonization of one enemy or another were not unusual throughout history. Institutional and politically guided genocide was the prime motivator of mass murder in the ancient world and in medieval times[[30]](#footnote-30). Total annihilation of the enemy (or an attempt to do so) was also a common practice. That is, the political aspiration to destroy populations existed and was exercised throughout history, but not in the systematic, methodical manner implemented in some of the genocides of the 20th century. The significant different, then, between past and modern genocides, is the availability of technology enabling the political echelon identification, tracking, the means of killing, advanced transport and infrastructure, running huge coercion camps, industrial technologies such as technologies for planning, managing, control and efficiency, development in chemistry and material engineering, to committing genocide in huge scales as well as harnessing the media to create a demonic narrative about the group being murdered. In fact, during the 20th century, tens of millions of people were exterminated only because the state wanted to kill them and had the technological means that enabled it to do so.

Nowadays, as part of ongoing process of the past few decades, global politics is transforming and is often subject to fundamentalism, sectarians, separatism and the emergence of a new world order. The political transformation includes the downfall of some of the state entities in the Middle East, migration of people from the Middle East and Africa to Europe, and escalation of the conflict between the Persians (who are part of the Shia (faction) that split from Islam in 680 C.E.) and some of the Sunnite Arab countries. Significant changes reshaping the global centers of power, China is establishing itself as a hegemonic world power and is intensively acquires infrastructures and power hubs, in the West there are phenomena such as social polarization caused by political differences, in some cases, a decrease in the sense of nationality as the basis of personal identity and the rise of identity politics. At the time of this writing, the United States is increasingly looking inwards and is pulling away from active involvement of its soldiers in external conflicts. The UK has also distanced itself from the European Union via the Brexit process. The growth of hyper-nationalism and populist politics leads to a view of globalization and multilateralism as arrangements that undermine the sovereign elections of a state. As such, there is a reason to assume the creation of "fenced globalization" - globalization that is less free and less open than before[[31]](#footnote-31).

The political transformations are inherently tied to the digital revolution and the emergence of the information age, which created a new global economy, a globally encompassing electronic trade system, and mass media, social media, and sharing media. The digital information technology of recent decades has made the world global, visual, and social and it forms social and political consciousness with images and symbols. During the Ukraine war an intense campaign was waged by the Ukrainian leadership on Twitter and other social networks, on the other side of the conflict, Russia enacted a law against spreading fake news, various blockchain applications were used[[32]](#footnote-32), Twitter and Facebook circumvented Russia’s blocking of networks for Russians by uploading a version in a Tor browser operating in the Darknet, expressions of protest from citizens found their way to tweets and social media posts, and images of refugees flooded social media and news outlet sites around the world. In the 2015 refugee crisis in Europe, the visual side and the explicit images also served to sway public opinion in favor of opening the borders. One especially memorable image is the photo of Aylan Kurdi, the toddler from Kobani, Syria, who was with his family in a group of refugees who boarded two boats in Bodrum, Turkey, and then tipped over after a few minutes. The heart wrenching image flooded the social networks on that same day, was seen on all news outlets around the world and brought about political transformations by making the West European policies toward refugees more flexible and favorable and to the assertion "Wir schaffen das" ("we can do this") made by German Chancellor Angela Merkel. When it became known that the Kurdi family wanted to reunite with their relatives in Canada, but the authorities in Turkey refused their exit visa application, it influenced the process of making the refugee issue a central issue in the prompt handling of refugee requests and even in the Federal elections in Canada a month later. The elections ended with Trudeau’s victory, who led a relentless line of supporting and encouraging acceptance of refugees[[33]](#footnote-33).

The geo-political changes currently happening in the Arab sphere are largely a product of the close linkage between technology and politics. The significant role social technology played in the political transformation was especially visible in the events of the Arab Spring. The Arab Spring started in 2010 when Mohamed Bouazizi, a young Tunisian, set himself on fire as a protest for his treatment by the authorities. This act started a wave of uprisings, which eventually engulfed North Africa and the Middle East, in which the protesters used Facebook and Twitter to share information and coordinate. The same thing happened in the migration of nations from the Arab sphere and Africa to central and western Europe. The implications of a global, visual, and social Internet for political change are apparent in the media on mobile devices that enabled spreading the information about the process, arrival routes, and recommendations to those who were left behind, which in turn increased the number of people flowing toward Europe. Technology allowed information to get everywhere, be seen, and be shared[[34]](#footnote-34). A clear example of the implications of the application of industrial technology and information technology upon politics is the Cyber-Jihad. The Al-Qaeda chapter in Iraq used to perpetrate local terrorist actions, especially against western targets and against Shiites, until on May 10, 2004, a grainy six-minute video was posted documenting the beheading of the American Nick Berg. The result was that the horrifying video became viral and in a short time was watched by millions. The head of the chapter, Abu Musab al-Zarqawi, realized the huge power of information technology at the service of political goals. Beheading was a common practice in that organization. When al-Zarkawi’s computer was seized by the Americans, they discovered dozens of similar videos that never receive the same kind of reaction and had no effect simply because they weren’t disseminated in the media. Since then, both al-Zarqawi, and especially his successor, al-Baghdadi, who carried on as ISIS, turned technology into a powerful tool of terrorism. In the Islamic state, it was the basis for their rapid expansion, and their media arm, al-Hayat Media Center, used social technology in constructing the narrative of the revival of the Caliphate, in a way that allowed them to recruit tens of thousands of people around the world. ISIS took Cyber-Jihad to a whole new level and their hugely successful campaign became an effective psychological warfare and mass recruitment tool[[35]](#footnote-35). The political and media activity of ISIS was inherently paradoxical, since on the one hand, they aspired to return to life as it used to be in the 7th century; on the other hand, they did that using, and thanks to, the most innovative modern and latest technological means of our time. For example, al-Baghdadi was filmed giving a speech advocating returning to the 7th-century meager and elementary way of life (as he perceived it), However, the means of filming, editing, the online magazines, and the ways of publicizing this speech, were all modern and up to date. The aspirations for bringing back the Caliphate were not at all new, but they only came to fruition when technology made it possible. ISIS has evolved using modern and advanced weapons, which are the product of modern industry; mobile phones that are also the product of scientific innovation; platforms such as the Internet and social media, which allowed them to send their messages worldwide and recruit supporters and fighters; as well as finance using various financial and criminal channels, and control of dozens of oil fields, the drilling of which is a product of knowledge, practice, implementation, and use of modern technological equipment.

Regarding social media and smart telephony, then every action, reaction, word or image that’s happening through them is part of the new social technological agency since they are a product of a new powerful technology and of advanced scientific knowledge. Such are digital imaging, image sensors, semiconductors and exponential miniaturization of MOS transistors, active-pixel sensors, proximity sensors, a magnetometer, a barometer, accelerometer, gyroscope, various wireless communication protocols (such as satellite navigation), lithium-ion batteries, mobile operating systems, base stations and cellular modems, software platforms, various hardware devices and so on. In fact, the new technology is already creating a new global political system. Whether through the use of the overt capabilities of social technology, like the Turkish President’s call to his supporters on Facebook Live to take to the streets in what was then claimed to be a military coup, or through the use of more covert technological tools. Moreover, two different/opposite virtual realities of Erdogan, which are reproduced in social media sociality, lead to the expansion of the polarized political climate in the context of society, for social media serves as a political tool for disseminating an agenda-building initiative to political poles[[36]](#footnote-36). Hybrid warfare in the political arena includes use of Big Data and psychographic, manipulation of public opinion used personalized activity on social media, use of viral campaigns, fake entities, hackers, as well as bots and trolls that attempt to remake the appearance of reality according to the agenda of whoever uses them to further their own goals. The explosive growth of global digital connectivity and its social and political impact are of concern to the national security organizations as well, among them DARPA (Defense Advanced Research Projects Agency), which identified a need to develop new tools and methods for investigating the alternate and virtual reality in various networks and decentralized platforms, seeking to identify the main motives of social strength and cooperation on one side, and of instability and divisiveness on the other[[37]](#footnote-37). In July 2011, DARPA issued a call for proposals for developing tools for social engineering, tools that would allow the identification of information on the Internet and influence events on social networks SMISC (Social Media in Strategic Communication). As part of this project, over two hundred studies were conducted with the goal of developing a new science of social networks based on the developing technology and to identify patterns, trends, campaigns, biases, and disinformation on the networks[[38]](#footnote-38). In 2016, DARPA created the Next Generation Social Science (NGS2) program, working to determine fundamental measures and causal mechanisms that explain and predict the emergence of collective identity, with the anticipation that successful NGS2 capabilities will have benefits for tackling other complex problems and topics, including resilience in social networks and structures, changes in cultural norms or beliefs, emergence of cooperation/competitions and social influences on preferences and cognition[[39]](#footnote-39). DARPA directed a special concern to narratives being disseminated using social technology due to its influence on the social fabric and on democratic procedures. Narratives could formulate memories, influence emotions, imply heuristics and judgment bias, and influence the distinctions and tensions between groups. Consequently, the program “Narrative Networks” was launched with the intent of identifying how narratives influence human behavior and cognition, and implementing the findings in the context of national security. The program set as one of its goals, to provide a response for entities and forces contributing to radicalization, violent social mobilization, uprisings, and terrorism among foreign populations, and more[[40]](#footnote-40). The evolutionary process of social media technology as a political agent that causes, connects and establishes a narrative, which becomes increasingly invasive and data biased, gives it manipulative and suggestive potential. The use of this power transforms political campaigns to an entirely new level of invasiveness and influence. An example of political manipulation performed using social media technology hit the media agenda, especially when the Cambridge Analytica affair was exposed. This political consulting firm was involved in election campaigns (Such as 2016 US presidential election, Brexit, and more), using data mining, data trading, data analysis and media strategy in order to influence election processes in countries across the world and use of disinformation. They described the use of tools for shaping public opinion through micro-targeting as a tool that allows the use of social media data for the purpose of emotional blackmail based on precise characterization of the voters, and without their consent. The company's campaign managers acted through data acquisition and an attempt to profile the users according to general personality traits, statuses, and “like''s on Facebook (while Facebook was aware of this security breach for two years)[[41]](#footnote-41) + [[42]](#footnote-42).

The contemporary political technological agent can act not just vis-a-vis the masses via mass media, but also by personalization to create a tailor made emotional political message that can be personal or group-oriented, informative or misinformative, scientific or pseudo-scientific, while constructing a narrative made up of facts, or of fake facts, and even while connecting between the targeted individuals to create a political force both online and offline. The new technological agency casts a heavy shadow on politics and raises questions relating to the tainting of democratic practices, questions of free will and the difficulties in conducting a substantive deliberative democracy.

**2.** Over-application or under-application of technology and their political implications

Another influence of technology on politics is in overutilization or underutilization of technology. An example of political influence where over or under utilization of technology can be seen in Chinese history. Until the mid-14th cent. China was a world leader in science and technology, where the plethora of Chinese discoveries included the “Big Four Inventions”:Manufacturing paper, print, the compass, and gunpowder. Scientific activity in China began to decrease during the 14th century.[[43]](#footnote-43) and continued its downward trend up to the 17th cent., while Europe and the Western world started to form modern science and technology. The Western technological progress created the “Great Divergence” which described the dawn of European expansion with its quick growth and Europe’s rise to global political dominance. Various explanations have been given to the question as to why Chinese technology went from leading to trailing behind Western technology, including the claim that the Ming dynasty’s political system was hostile to scientific progress. When the founder of the Ming dynasty, Hongwu, for example, encountered various mechanical objects in the Yuan dynasty castle - such as fountains with dancing balls, tiger-shaped automatons that operated on their own, objects with dragon heads that dispersed clouds of perfume and even mechanical clocks, he perceived them as an expression of Mongolian decadence and ordered them destroyed[[44]](#footnote-44).

Most of the scientific progress at the end of the Ming dynasty’s rule, was in fact a result of the actions of the Jesuits of China, who acted as mediators between Western scientific knowledge and Chinese knowledge. These actions also led to the return to China of technologies that originated there but have been absent from China due to the Ming dynasty politics (example, the field mill)[[45]](#footnote-45). China was the leading maritime power in the world, in its heyday. By the end of the 12th century. Its fleet included 52000 sailors and warriors, unprecedented sea-faring vessels, and advanced maritime technology. The Chinese fleet was the pinnacle of technology, it was large, sophisticated, powerful, and highly skilled and thus unmatched by any other fleet[[46]](#footnote-46). This continued until during the Ming regime, for various reasons, the official policy for maritime expansions changed to something between active limitation to ambivalence and led to the shrinking and dwindling of the maritime force[[47]](#footnote-47). Liu Ta-hsia, for example, even ordered the destruction of sea charts, to foil launching expeditions across the oceans[[48]](#footnote-48). In analogy to the Western model of establishing a global political and cultural hegemony through maritime exploration voyages and conquests, if the Chinese fleet had been utilized at that time by the political echelon to that end, it would have been reasonable to assume that at least on the basis of its maritime potential, China could have become a rising power in global politics. According to Jung-pang Lo, the Ming political approach was elitist, presuming that it is not honorable for the superior Chinese person to fight his inferiors who are no better than wolves and pigs. According to him, giving up the maritime and technological might have created a significant change in the character and temperament of the Chinese people and was an expression of political and mental passiveness. In contrast to the greed and lust for power of the West during Imperialist times which relied on maritime might, the political mentality of the Ming dynasty (which had a technological maritime potential available to it before it dwindled that was significantly superior to the West’s at the Age of Discovery) tended towards convergence, conservatism, philosophy, culture, and isolationism[[49]](#footnote-49).

With the rise of Communism in China in 1949, a period started where, according to the Soviet model, the politics of “the Cultural Revolution”, dictated, on the one hand, underutilization of technologies that were perceived as “bourgeois”, which are technologies that rise organically as fruits of free research and changing social and economics dynamics, and on the other hand, implementation of science and technology dictated in advance, while focusing on fields and specific applications that serve the new society[[50]](#footnote-50). This selective model came, as mentioned, from the USSR. There, as part of the technocratic Bolshevik vision of creating a new nation, science and technology were the key means for creating the material basis for the Communist modernism and for achieving global political and cultural dominance[[51]](#footnote-51). One arm of Soviet technology was aimed at creating the Communist economic apparatus and practices, while the other arm was as both an internal and external political tool. Soviet politics marked the various sciences with political identities and applied them accordingly in society and in research. Scientific research studies that were deemed to be “bourgeois” were oppressed or banned, while fields that were defined as Communist, that is, suitable to the spirit of dialectical materialism, were selected as significant for the progress of the nation[[52]](#footnote-52). For the Soviets, technology was the tactical means for creating a national identity and for proving their ideological superiority over the west, where the central scientific verticals that played a major role in the political game were pure science, nuclear physics, and space exploration. Either way, while the arms race between the USSR and the USA continued, during the 1980s a completely different race began to evolve. The vast and persistent overutilization by the Russians in the field of space technology was successful, but their success woke up the Americans. Russian successes, especially the 1957 Sputnik launch, drove American Capitalism to aim its power beyond large cars and comfy suburban life. The feeling of technological inferiority caused the United States to set a new national priority in scientific research, and among other things, an agency was founded by President Eisenhower, and it was named ARPA (the Advanced Research Projects Agency). As an aside, it should be noted that one of the first projects ARPA was tasked with was finding a technological solution that could maintain active communications within the United Stated and between it and the rest of the world during an nuclear attack by missiles from beyond the iron curtain, and the solution they found eventually led to creating the Internet. The Soviets enjoyed a technological level comparable to the United States, and at least for a while during the 1960s, enjoyed a technological lead in space exploration. During the 1980s the USSR even surpassed the United States in heavy industries and in producing 80% more steel, 78% more cement, and 42% more oil than the USA (Walker, 1986)[[53]](#footnote-53). The USSR had no lack of human capital, resources, or political drive to maintain the technological eveness with the US (Thomas and Kruse-Vaucienne, 1977)[[54]](#footnote-54), however, in conparison to the overutilization in militarization and heavy industries, the USSR lagged twenty years behind the USA in computing. The political fixation on focusing on “Communist” technologies - space exploration technologies and heavy industries, while their persistence in attaining goals in these fields under a hard and dogmatic political system, turned out to be a bad gamble for the Soviets when the information revolution came about and the significant power was no longer based on production and steel but was now based on networks, data, and silicon. The Communist state experiment, which lasted 74 years, finally crumbled in 1991, while presenting a chronicle of warped relations between politics and technology. The political activity dealt intentionally and ideologically in underutilization of the technologies that did not fit the core of Communism and overutilization of technologies and scientific disciplines that were deemed to be a good fit. The country was stuck, engaged in a last-ditch effort to resist innovation, and this need was eventually realized in a series of desperate reforms that failed under the toll of Soviet politics, which in turn caused the entire system to crash[[55]](#footnote-55). The Communist oversight of maintaining a lead in certain technologies, while underutilizing others, while the latter eventually became the tie breakers and the leading forces, has been internalized,presumably, by the present-day Chinese leadership towards the end of the 1st quarter of the 21st century. Currently, China's strategic efforts to decouple itself from reliance on foreign technology translate into self-sustainment and long-term technological competitiveness orientation. China seeks to retain access to foreign technology but slowly wean its dependence to prevent Soviet-style stagnation. China's long-term technological strategy involves the development and implementation of disruptive technologies in a variety of arenas. It may be noted in this context that in 2021, the Chinese launched a hypersonic glide vehicle that drew the alarm of the United States Chairman of the Joint Chiefs of Staff who called it a "Sputnik moment"[[56]](#footnote-56).

In general, the political milieu had, and still has, crucial influence on the manner, direction, and intensity of technological development. One of the clear examples of this in the modern era, for example, is the Internet, which was a product of research and development, partly for security and partly academic, with state finance. The Department of Defense Advanced Research Projects Agency studied options for running a network, with a special emphasis on survivability, and thus the core networks were linked up in1969 as part of the ARPANet project, and in 1983 the infrastructure was replaced by one based on TCP/IP protocols. In 1986 the National Science Foundation set up an inter-university backbone for sharing academic research, and further on the concept a global hypertext system was proposed where people could share information and link documents thus creating an international web of information. In 1991 the European Organization for Nuclear Research, CERN’s internal WWW service was opened up to the Internet[[57]](#footnote-57). The Internet became a global asset, a neutral public domain infrastructure by virtue of having been conceived in a liberal political environment. However, some regimes, allow intentionally limited access to the global connectivity space, for political reasons, and limit their citizens’ access to the network and to pluralism of opinion, thought, and its vast opportunities, and on the other hand, strive for massive, invasive, overutilization in surveillance technology[[58]](#footnote-58).

Regarding the extent of applying technology nowadays, overutilization of industrial technology brought about extremely destructive results and severe damage to the biosphere and a climate crisis. Over utilization was exercised especially in the industrialized countries. Historic contributions of greenhouse gases to the atmosphere track the timing of industrialization, with major emitters like the United States and Europe having emitted far more than countries like China and India, which became major contributors to climate change later on (IPCC, 2007a, 2007b)[[59]](#footnote-59), [[60]](#footnote-60). The underutilization of technology is manifest in a local lack of application of available technological solutions mainly to water and agriculture issues, and it also has far-reaching political ramifications, among them a dramatic increase in environmental immigration, fugitivity, rise in tensions and violence, radicalization and terrorism[[61]](#footnote-61),[[62]](#footnote-62). That is what happened in the 2015 refugee crisis which was largely a result of technology that wasn’t utilized, or of partial and failed utilization in the region. Although the impacts of climate change are global (forest fires across the western United States, Siberia, Turkey, and Europe, and unprecedented fatal flooding in Europe in 2021), vulnerability is Differential. The most detrimental impacts are experienced in the developing world, as these countries are generally more vulnerable to climate impacts and adaptation is low. Climate vulnerability is primarily concerned with the system's ability to modulate potential damage from climate change and to cope with the long-term consequences of this damage. Adaptation means developing the institutional and political capacities to mitigate risk from climate-related impacts[[63]](#footnote-63). One should emphasize that the development of political and institutional skills depends, among other things, also in being open to innovation, being sustainability oriented, and possessing technological capabilities. Ever since the 1970s, humanity has been facing enormous sustainability issues due to the gap between the growing human demand and the availability of food and water, which needed to be addressed technologically and politically. The state of water in the world is a general lack of sweet water and water pollution. In order to deal with the global water crisis, an industry of technologies to make water drinkable and accessible developed, such as water purification and water treatment and the desalination industry. Additionally, measures to increase agriculture sustainability using business processes and flexible agricultural methods were developed[[64]](#footnote-64), as well as leaps in development of various technologies in the agricultural eco-system. Regarding the Middle East, it is a region torn by wars and violent conflicts with causes that may be territorial, ethnic, tribal, religious, and so forth. This explosive tension is further complicated by a crash of the agricultural system due to failed systemic administration, and this in turn results in escalation of conflicts, violence, and emigration waves. Intra-country armed conflicts often break and are fueled by politics due to weak social and economic development and inefficient state institutions[[65]](#footnote-65). The countries with the most out-migration are those that have experienced the confluence of conflict, violence, and climate impacts such as protracted droughts. These include Syria, Iraq, Libya, and Yemen. The main drivers of intrastate armed conflicts are weak social and economic development and inefficient state institutions (Mach et al., 2019)[[66]](#footnote-66). The water crisis in the Middle East had dramatic political significance since this was one of the catalysts of the civil war in Syria, additional regional conflicts, and significant emigration to Europe. Climate changes threats interact with inter- and intrastate conflicts over resources (especially water), food systems collapse, the permeability of national borders, and international migration flows due to resource depletion (Baldwin et al., 2014)[[67]](#footnote-67). Furthermore, one should also note that while the climate changes created real hardships, the damage to the water and agriculture economy was mostly due to the dysfunctional regimes in the region who underutilized technology and other measures necessary to maintain a modern economy. Climate factors are in fact filtered through and constructed by political structures and the human subject's interaction with socio-economic vulnerabilities, particularly water and food insecurity. State-society relations are what shape the allocation and distribution of public resources and services, thus structures vulnerability to climate change[[68]](#footnote-68). Throughout the MENA, State authorities have profoundly shaped food and water access. ineffective policy responses have led to water shortages in both rural and urban areas in Iraq and Syria (Borgomeo et al., 2021)[[69]](#footnote-69) State authorities, for example, play a pivotal role in establishing property rights in arable land and water for some and not for others. Without the productive capacity to generate sufficient resources to sustain them, most Middle Eastern states resources were often captured by elite interests, and the neglect of rural areas and secondary cities. The trajectories of state-sponsored development in countries such as Syria served to marginalize vulnerable populations under conditions of climatic variability[[70]](#footnote-70). And thus, in vast regions of the Middle East water governance has failed, due to unmitigated, and often rogue, drilling, lack of cooperation between countries in the region, as well as failure in deploying smart water and agriculture technologies that would address the population’s needs. The result was critical harm to agriculture, loss of sustainability for large populations, abandonment of villages and rise in violent tensions and conflicts.

This phenomenon illustrates that not only technology is causing social change, but also its absence is doing so. Lack of technology is not necessarily caused by its non-existence, but often because of its absence from political action. The regimes in the region tend to have an elevated level of corruption and Cronyism and failed to divert institutional and financial resources for development of self-production and creation of infrastructure for sustaining agriculture and a sustainable water economy, Climate vulnerability was mediated by state policies of neglect and marginalization[[71]](#footnote-71) and one of the results of this local techno-political failure was a global-scale transformation along with the population’s displacement.

The multi-dimensional interactions between technology and politics are seen most clearly in the climate domain. Technology, used by humans, is the direct cause of global warming and of aggressive climate changes. The industrial age, followed by machinery and automation, brought with it an exponential use of fossil fuels and greenhouse gas emissions while severely impacting the biosphere[[72]](#footnote-72). An IPCC (The Intergovernmental Panel on Climate Change) report emphasized that the ecological systems have reached the edge of their ability to cope. The influence on society is dramatic and involved with direct or indirect harm to billions of people from drying up of lands, heat waves and huge fires, critical ecological damage, non-sustaining use of natural resources, rise in urbanization, as well as droughts, floods and food and water shortages leading to environmental emigration, followed by future damage such as harm to settlements due to melting of icebergs and rise in sea level[[73]](#footnote-73). However, even when technology provides certain solutions as part of the change over to alternative technologies, it requires making decisions with political implications.The use of technological development of photo-voltaic cells to produce solar energy, batteries, and electric engines, wind turbines, fuel cells, and nuclear power plants will indeed reduce the dependency on fossil fuels. However, adopting low carbon technologies may also be involved with significant abuses of human rights since these technologies make use of metals and minerals such as cobalt, copper, lithium, cadmium and other elements, and their mining sometimes causes environmental damage, mining blood-metals and child labor, on-going toxicity, uprooting communities, and massive exploitation of the miners[[74]](#footnote-74).

In fact, the approach to the climate crisis is mainly techno-political. The climate crisis issue is steeped in politics from almost every angle and aspect: from the entities generating it who are involved in a complex system of industrial and economic interests who influence the political class, its results, the proposed solutions and in making it an arena for political conflict influenced by a variety of agendas. Even in such an extreme existential situation, technology and politics are intertwined.

The reciprocity between technology and politics is bilateral and immanent, evolving in a process of mutual evolution, while the mutual ritual between technology and politics is embedded in human history throughout. Therefore, in this paper, the linkage in the technological-political interplay was analyzed from a historical perspective, presenting an analysis that dealt with two central patterns in which their forces to inter-operate:

1. The operation pattern of technology as a political agency that operates on the being and consciousness in three central dimensions:

* one - causing the alternation of being, process, crisis, or any other phenomenon which has direct or derived political influence.
* Second - mediation, linking, and creating the means and platforms of communications.
* Third - influencing the formation of central narratives in society, through the way mass communication is composed and through the opportunities it offers, and through a change of consciousness occurring regarding the new being.

1. The pattern of action through which the political environment (the consciousness, the value system and the political practices) implements technology in extreme circumstances through overutilization, or through selective and underutilization of available technologies that the political milieu doesn’t implement (out of a conscious choice based on its values at that time, or out of negligence and indifference), and the political results thereof.

This paper presented the central patterns of techno-political interactions that can be used as a basis for an analysis of the political dimensions that accompany the accelerated technologization of society. Technology is a political agent generating change, mediates it and forms the social narrative, while it is under or over usage may have crucial implications for social and political life. The deeper digitization, virtualization, and technologization of society go, the more essential knowing the political influences of technology becomes in understanding the political challenges, particularly the democratic ones, that society will face and should stand at the center of contemporary political philosophy attention.

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45. example, the field mill] reference: Needham (1965), pp. 255–257. [↑](#footnote-ref-45)
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