Blockchain Technology and Decentralized Governance: Is the State Still Necessary?

Marcella Atzori, Ph. D.[*]

December, 2015

Abstract

The Italian version of this paper can be found at http://ssrn.com/abstract=2731132

The core technology of Bitcoin, the blockchain, has recently emerged as a disruptive innovation with a wide range of applications, potentially able to redesign our interactions in business, politics and society at large. Although scholarly interest in this subject is growing, a comprehensive analysis of blockchain applications from a political perspective is severely lacking to date. This paper aims to fill this gap and it discusses the key points of blockchain-based decentralized governance, which challenges to varying degrees the traditional mechanisms of State authority, citizenship and democracy. In particular, the paper verifies to which extent blockchain and decentralized platforms can be considered as *hyper-political tools*, capable to manage social interactions on large scale and dismiss traditional central authorities. The analysis highlights risks related to a dominant position of private powers in distributed ecosystems, which may lead to a general disempowerment of citizens and to the emergence of a *stateless global society*. While technological utopians urge the demise of any centralized institution, this paper advocates the role of the State as a necessary central point of coordination in society, showing that decentralization through algorithm-based consensus is an organizational theory, not a stand-alone political theory.

Keywords: Bitcoin, blockchain, Decentralized Autonomous Organizations, decentralization, democracy, Ethereum, encryption, governance, politics, State, peer-to-peer networks.

---

[*] MARCELLA ATZORI is a political analyst and academic researcher, specialized in technopolitics and global affairs, with a focus on decentralized architectures, blockchain applications and alternative models of governance. She holds a Master Degree in Political Science, a Ph.D in International Relations and a Master Degree in Digital Currency from University of Nicosia, Cyprus.
Email address: marcella.atzori@gmx.com

I.

INTRODUCTION

1.1   The blockchain technology and the era of trust-by-computation.

In a white paper published in November 2008, Satoshi Nakamoto proposed Bitcoin as the first electronic payment system based on a decentralized peer-to-peer network, without the need for a trusted third party[1].The core technology of this protocol, the blockchain, is widely acknowledged as a major breakthrough in fault-tolerant distributed computing, after decades of research in this field. In overly concise terms, we can define the blockchain as a database that contains all the transactions ever executed in the Bitcoin network. It consists of a permanent, distributed, digital ledger, resistant to tampering and carried out collectively by all the nodes of the system. The formidable innovation introduced by this technology is that the network is open and participants do not need to know or trust each other to interact: the electronic transactions can be automatically verified and recorded by the nodes of the network through cryptographic algorithms, without human intervention, central authority, point of control or third party (e.g. governments, banks, financial institutions or other organizations). Even if some nodes are unreliable, dishonest or malicious, the network is able to correctly verify the transactions and protect the ledger from tampering through a mathematical mechanism called *proof-of-work[2],* which makes human intervention or controlling authority unnecessary.

The rationale for this protocol is the *decentralized trust* or *trust-by-computation* and its importance can hardly be overstated: indeed, it represents "a shift from trusting people to trusting math" (Antonopoulos, 2014), with applicability that goes far beyond the creation of decentralized digital currencies. As an irreversible and tamper-proof public records repository for documents, contracts, properties, and assets, the blockchain can be used to embed information and instructions, with a wide range of applications. These include, for instance:

---

1   For   a   general   introduction   to   Bitcoin,   see   https://en.bitcoin.it/wiki/Main_Page   and http://www.michaelnielsen.org/ddi/how-the-bitcoin-protocol-actually-works/. For more in-depth technical explanations, see Antonopoulos (2015).

2   The *proof-of work* consists of a difficult and time-consuming mathematical puzzle, required to the networks nodes called "miners" as a condition to be reliable, verify the transactions of the network and get a reward. The whole process is called "mining". The *proof-of-work* is difficult to produce, but easy for other nodes to verify. See http://www.coindesk.com/information/how-bitcoin-mining-works/

smart contracts[3], namely automatized, self-executing actions in the agreements between two or multiple parties; *multi-signature transactions[4],* which require the consent of multiple parties for their execution; *smart properties[5],* namely digital ownership of tangible and intangible assets embedded to the blockchain, which can be tracked or exchanged on the blockchain itself. In these cases, the advantage of the blockchain consists of removing the need of a trusted third party (e.g. a notary) and enforcing the execution of instructions by a cryptographic code, with protection of participants against risks of fraud and a significant reduction of management overheads. Because of the remarkable advantages related to automation, transparency, auditability and cost-effectiveness, the blockchain may represent a disruptive innovation for many varieties of contracts and business activities.

Other important applications of the blockchain include for example: the creation of decentralized domain name system resistant to top-level domains censorship (e.g. Namecoin[6]); decentralized voting systems for tamper-proof ballots and election results (e.g. Bitcongress[7], followmyvote.com); decentralized autonomous organization/corporations /societies (*DAOs/DACs/DASs*)[8], namely self-sufficient agents derived from artificial intelligence and capable to execute tasks without human involvement, for which the blockchain can provide additional functionality.

The fields of application of the blockchain paradigm are potentially countless, since it allows "the disintermediation and decentralization of all transactions of any type between all parties on a global basis" (Swan 2015, p. x), "with the potential for reconfiguring all human activity as pervasively as did the Web" (Swan 2015, p. vii). For this very reason, the blockchain has been described as "fundamental for forward progress in society as Magna Charta or the Rosetta Stone" (Swan 2015, p. viii), and it is often referred to as a "Black Swan" – namely an accident of major impact in history that cannot be anticipated, creates surprise to the observer and can only be rationalized by hindsight (Taleb, 2007).

---

3   See   https://en.bitcoin.it/wiki/Contract;   Swan   (2015),   pp.   16-18.   See   also http://pear.accc.uic.edu/ojs/index.php/fm/article/view/548/469

4   See https://bitcoin.org/en/bitcoin-for-businesses#multisig explaining that the multi-sig feature allows Bitcoins or other cryptocurrencies "to be spent only if a subset of a group of people authorize the transaction. This can be used by a board of directors to prevent any member to make expenditures without enough consent from other members, as well as to track which members allowed each payment".

5   See https://en.bitcoin.it/wiki/Smart_Property and Swan (2014), pp. 14-16.

6   See https://namecoin.info; M. Swan (2015), pp. 33-35 and https://wiki.namecoin.info

7   See http://bitcongress.org; Danny Bradbury, "How Block Chain Technology Could Usher in Digital Democracy",   available   at   http://www.coindesk.com/block-chain-technology-digital-democracy/ ("BitCongress is using the Ethereum platform to build a script-based altcoin called votecoin, that will use its network to hash and verify votes. It will use an application, Axiomity, both to organise and decide the parameters   for   votes,   and   to   handle   the   voting   process").   See   also https://www.cryptocoinsnews.com/blockchain-voting-used-by-danish-political-party/ (reporting that in 2014, the Danish Party "Liberal Alliance" was the first major political party in the world to vote using the blockchain).

8   See M. Swan (2015), pp. 23-26 and Buterin (2014a).

1.2   The emergence of blockchain-based governance.

The blockchain technology potentially allows individuals and communities to redesign their interactions in politics, business and society at large, with an unprecedented process of disintermediation on large scale, based on automated and trustless transactions. This process might rapidly change even the tenets that underpin existing political systems and governance models, calling into question the traditional role of State and centralized institutions. Indeed, many blockchain advocates claim that the civil society could organize itself and protect its own interests more effectively, by replacing the traditional functions of State with blockchain-based services and decentralized, open source platforms (e.g. Ethereum[9], Omni Layer[10], Eris[11]). Driven by the enthusiasm for the new possibilities offered by information technology, along with a profound dissatisfaction with the current political systems, they hence encourage citizens to be part of the blockchain revolution and self-create their own systems of governance, in which centralization, coercion and hierarchies are replaced by mechanisms of distributed consensus.

Broadly speaking, the advocates of decentralization tend to have in common the same "dissociative" attitude towards centralized institutions and the State in particular, "failing to see its value adding contribution" (Paquet & Wilson 2015, p. 21). The dominant discourse mostly emerged through the media, and generally dominated by IT specialists and financial operators, sees governments "as somewhat of an encumbrance – too slow, too corrupt, too lacking in innovation, and benefiting too few" (Paquet & Wilson 2015, p. 21). It is important to note, however, that there exists a certain variety of positions towards to the role of the State in the decentralized governance, and the dividing lines between disintermediation of government services, free market and even anarchism are often blurred.

Many enthusiasts simply promote the blockchain as a more efficient, decentralized and consensus-driven public repository, which can have a number of applications in order to make citizens less dependent on governments, yet within a society that is ultimately founded upon the State authority. Techno-libertarians and crypto-anarchists hold instead a more extremist position. They are generally inclined to consider the State as an illegitimate, unnecessary and irremediably obsolete depository of power, and they openly encourage the use of the new information technology as a liberating force against the very concept of authority. According to this view, we are at a stage in history when individuals can gradually overcome any centralized political institution through distributed consensus and create the conditions for an idealistic society of equals, characterized by flat, rather than hierarchical, structures.

---

9   https://www.ethereum.org
10 http://www.omnilayer.org
11 https://erisindustries.com

Although the view about the role of the State may differ, a growing category of political technopreneurs and evangelists of decentralization have already developed projects for the creation of cryptonations – namely stateless, do-it-yourself governance services entirely based on the blockchain (e.g. Bitnation[12]). The aim of this paper is to critically examine such proposals, which challenge to varying degrees the traditional mechanisms of State authority, citizenship and democracy.

We would point out that applications of blockchain technology are still in a defining stage and they represent an extremely fast-moving field, with little established theory, few recognized experts and no easy answers. Scholar debate on this subject is still in its infancy and mostly dominated by technical, financial and legal issues related to Bitcoin. As a consequence, a comprehensive analysis of the impact of blockchain technology on political governance and democracy at large is severely lacking to date. We hope that our paper will increase the understanding of problems at stake and motivate further study and transdisciplinary research in this field, which certainly requires careful consideration.

This paper is organized as follows. After presenting the key principles and assumptions related to the blockchain-based governance, also in an historical perspective (Sections II, III), we will assess risks and benefits of a possible migration of government services to the blockchain (Section IV). We will then verify the performance of blockchain and decentralization platforms as *hyper-political tools*, capable to manage social interactions on large scale and dismiss any central political authority (Section V): the analysis will particularly focus on risks related to a dominant position of private powers in distributed ecosystems and on the possible emergence of a *stateless global society*. The paper will also investigate whether and to which extent the blockchain governance can mitigate coercion, centralization and hierarchic structures in society (Section VI). Although the blockchain governance is technically able to disrupt the idea of State, conclusions (Section VII) will show that it cannot be considered a stand alone political theory.

We wish to stress that the purpose of this paper is not to advocate the idea of State *a priori,* as an immovable institution. We are aware that the complexity of an increasing interconnected society requires to overcome some limits of the nation-state, and we are hence fully in agreement on the necessity to promote citizens-based participatory politics to the greatest extent: citizens indeed should never be just "passive recipients of government paternalism" (Paquet & Wilson 2015, p. 21). And yet, even if the transformative power of the blockchain on society cannot be overrated, an objective analysis of its political applications should not be prone towards any technological determinism. On the contrary, proposals for new models of governance should be investigated with great care and critically assessed, especially against the risk to promote anti-political instruments or to conceive politics according to mere market logic.

---

12 https://bitnation.co

II.

THE BLOCKCHAIN-BASED GOVERNANCE:
FUNDAMENTAL PRINCIPLES AND ASSUMPTIONS

To date, a comprehensive discussion of possible blockchain-based models of governance does not yet exist at academic level. Since a coherent and consistent body of thought on this subject is missing, for the purpose of our paper we have collected information from a number of sources as accurately as possible, though probably in a non-exhaustive manner. Swan (2015) represents a valuable point of reference for our analysis, since she offers a detailed and complete overview of possible applications of the blockchain technology, including government services. Some assumptions, proposals and visions presented below have arisen through the Internet within a growing global network of new technologies supporters, developers and entrepreneurs; other ideas instead seem to be recurrent themes in conferences, blogs, forums and specialist websites, and for all we know they are not exclusively attributable to a specific author.

That said, the main principles of blockchain-based governance can be summarized as follows:

(a) Centralized organizations and the problem of scale.
Throughout history, centralized political organizations like State, bureaucracy and representative democracy have been a solution to a scaling problem. They have been mostly developed for the purpose of reaching consensus and coordination between heterogeneous or distant groups of people, facilitating their mutual interactions.

(b) State as a Single Point of Failure (SPOF).
Although they were built in response to specific historical necessities, organizations with top-down centralized coordination and hierarchical structures tend to be inherently inefficient: they are based on coercion and they may lack flexibility and capacity to evolve, providing inadequate responsiveness to challenges and to the growing societal demands. In particular, governments are proved to be systematically exposed to significant risks, such as lack of transparency, corruption, regulatory capture, misuse of power and even regression into authoritarianism, due to the concentration of power in the hands of few[13]. Which leads to the classic matter: "Quis custodiet ipsos custodes?" (Who will watch the watchmen?).
A centralized authority in any hierarchical organization can be defined in computer terms as a *Single Point of Failure (SPOF)*: if its functioning is not optimal, the whole

---

13 "Power corrupts. You can read about that in the writings of the ancient Greek philosophers, and nothing really has changed – only that scale of power, and the scale of misery that can be created when that power is wielded to do bad things" (Andreas Antonopoulos interviewed by Sparkes, 2014).

system and its participants will be negatively affected by it. Decentralization aims to reduce or prevent such concentration of power and it is a fundamental condition for citizens to achieve political efficacy, equality, transparency, and freedom.

(c) Distributed architecture and trust-by-computation:"Code is law"[14].

Centralized vertical authority has become the main organizational model in society, simply because there has not been a better alternative so far. For the first time in history, citizens can now reach consensus and coordination at global level through cryptographically verified peer-to-peer procedures, without the intermediation of a third party. The blockchain technology ushers in a new era of decentralization on large-scale, in which human factor is minimized and trust shifts from the human agents of a central organization to an open source code. In such distributed architecture, "code is law": the protocol is open-source and it can be review by anyone; the network is not owned nor controlled by any single entity; data are simultaneously kept by all nodes, thus ensuring proper redundancy[15]. Neutrality of the code, distributed consensus and auditability of transactions can significantly reduce or overcome frictions and failures inherent in decision-making process of centralized organizations (e.g. lack of transparency, corruption, coercion, etc.). Many new decentralized governance models and services can therefore be implemented and experienced through the blockchain, without the oversight of governments (Swan, 2015).

(d) Power of individuals and politics by instant, atomic interactions.

While the State bases its action on coercion, the blockchain can provide governance services in a more efficient and decentralized way, without having to relying on force. This allows a more horizontal and distributed diffusion of authority, in which the source of legitimacy are the individuals themselves. Using the blockchain as a permanent, encryption-secured public record repository, humans agents as representatives can be replaced by smart contracts and *Decentralized Autonomous Corporations* (Swan, 2015). The collective relationship between individuals and the State can be fully or partially automated by "a series of instant atomic interactions" (Buterin, 2014a).

> "Instead of a hierarchical structure managed by a set of humans interacting in person…via the legal system, a decentralized organization involves a set of humans interacting with each other according to a protocol specified in code, and enforced on the blockchain" (Buterin, 2014a).

---

14 This expression – also quoted by Farmer (2003) – was taken from the book *Code and Other Laws of Cyberspace* by Lawrence Lessig, published in 1999.

15 The advantage of redundancy is that if one node goes down, data is never lost, because it is simultaneously transmitted and duplicated to all other nodes.

Under economic and political point of view, these consensus-based models are more efficient than pooled-models and may offer "a more representative and equitable way of interacting with reality" (Swan 2015, p. 47).

(e) "Putting a nation on the blockchain"[16]: a Starbucks-style public administration.
The blockchain technology allows more granular and personalized government services. Using the blockchain as a permanent public records repository, it is possible to store all government legal documents, such as contracts, identification cards, passports, lands deeds, etc. in a cheaper, more efficient and decentralized way. Anyone can create its own blockchain nation and a decentralized do-it-yourself-governance system (Swan, 2015).

> "Blockchain-based governance systems could offer a range of services traditionally provided by governments, all of which could be completely voluntary, with user-citizens opting in and out at will" (Swan 2015, p. 48).

> "Governments could shift from being the forced one-size-fits-all 'greater good' model at present to one that can be tailored to the needs of individuals. Imagine a world of governance services as individualized as Starbucks coffee orders" (Swan 2015, p. 46).

> "Through simply downloading an app on your smartphone, you can choose your code of law, your preferred arbitration method, write a smart contract, and get married, title your land, notarize a will, incorporate a company, get health insurance, and much more, in just a few minutes for a couple of dollars. It is backed by an ID and reputation system, dispute resolution, and an app library where people can upload and share or sell their own do-it-yourself governance apps" (Bitnation-blog.com, 2015).

(f) Borderless, globalized government services.
Through the blockchain, governance services can also become global and border-less.

> "The idea is to uplift transnational organizations from the limitations of geography-based, nation-state jurisdiction to a truly global cloud" (Swan 2015, p. 32).

> "Just because you live in particular geography should not restrict you to certain governments services and mean that you have only one government provider". Indeed, "individuals are increasingly mobile between nation-state and could benefit from one overall governance system rather than the host of inefficiencies in comply with multiple nation-state" (Swan 2015, p. 49).

---

16 This expression is taken from Swan, 2015, p. 47.

(g) Systems of direct democracy.
Democracy can become more effective through the direct participation of citizens in the decision-making process. The blockchain technology can implement new models of participation, such as Liquid Democracy (http://liquidfeedback.org; Swan, 2015) and random-sample elections[17].

(h) *Futarchy: "Vote for values, but bet on belief".*
Futarchy was proposed by economist Robin Hanson[18] as an engineering approach to public policies. The system essentially consists on prediction market speculating and betting through cryptocurrencies and tokens. It based on two processes:

> "Individuals first vote on generally specified outcomes (like 'increase GDP'), and second, vote on specific proposals for achieving these outcomes" (Swan 2015, p. 53).

> "If the proposal is accepted, then all trades on the rejection market would be reverted, but on the acceptance market after some time everyone would be paid some amount per token based on the futarchy's chosen success metric, and vice versa if the proposal is rejected" (Buterin, 2014b).

Discussed as a new possible governance model based on Ethereum platform (Buterin, 2014b; Swan, 2015), *futarchy* represents "a quintessential example of the potential transformative power of blockchain technology" (Swan 2015, p.53).

About the role of State in the blockchain-based governance, positions are different and may include:

(i) A decentralized society, still based upon the State authority.
To decentralize services through the blockchain does not mean to dismiss the State, but to promote good governance.

> "This is not some kind of crazy 'we don't need governments' manifesto. It's simply that we can make better governments when we don't concentrate power as much in the hands of a few people" (Andreas Antonopoulos, interviewed by Sparkes, 2014).

> "The end point is not lawlessness and anarchy, but that legal frameworks become more granular and personalized to the situation" (Swan 2015, p. 17).

(j) A new social contract, characterized by Decentralized Autonomous Societies and the final demise of the State.
With the diffusion of the new technologies, it will be finally possible for citizens to eliminate the need for centralized institutions and design a new social contract based

---

17 See http://rsvoting.org/whitepaper/white_paper.pdf
18 See http://mason.gmu.edu/~rhanson/futarchy2013.pdf

on consensus rather than coercion, for a more transparent, autonomous and innovative global society. The new social contract would include systems for decentralized communication and collaboration, as well as decentralized arbitration systems in order to resolve conflicts through smart contracts, with rules consented by the participants and compatible with common law or natural law[19].

In the end, the State will simply wither away because of lack of consent.

> "Basically what we are doing is making nation state governments entirely irrelevant. And no government, whether democratic or autocratic, can survive without the consent of its subjects" (Bitnation-blog.com, 2015).

Society will be hence transformed into a blockchain-based, self-sustainable system, run by algorithms and free-market rules.

> "I envisage a situation where governments aren't necessary. That the free market will be able to provide all the goods and services to secure your life, liberty and property without having to rely on coercion. That's where this all ultimately leads. The end result is that governments will have less power than free markets. Essentially, the free market will be able to provide justice more effectively and more efficiently than the government can. If you think about it, what is the reason for government? It's a way of reaching global consensus over the theory of right and wrong, global consensus over who's guilty and who's innocent, over who owns what. They're going to be losing legitimacy as more open, transparent systems are able to provide that function without having to rely on force" (Daniel Larimer, interviewed by Sparkes, 2014).

(k) Franchulates.

With the full application of free market rules, the blockchain technology may allow the emergence of "franchulates", as in Neal Stephenson's novel *Snow Crash* (Swan, 2015).

Franchulates are a combination of "franchise" and "consulate". In Stephenson's book, they consist of private corporations which have replaced the State in all its functions, competing to each other to provide goods and services. In this society, the Constitution is disrupted and citizens have no rights; the State is reduced to a hollow entity with no real power; businesses behave as government agencies, and "citizenship is subsumed in brand loyalty" (Lipschutz 2010, p. 92). In this anarchic-capitalist scenario, in which public policy has been replaced by business membership, "the citizen-costumer is king" (Lipschutz 2010, p. 92).

The blockchain technology has the potential to transform our societies in something very similar to Stevenson's vision. For its advocates, the core idea is that "governments need to become more like business and less of a default monopoly

---

19 See https://letstalkbitcoin.com/blog/post/we-talk-share-create-exchange-resolve-decentralized-autonomous-society. See also
   https://www.reddit.com/r/revolution/comments/1yvmsn/distributed_autonomous_society_a_state_without/

provider of governments services" (Swan 2015, p.47). Accordingly, governments "should have a more proactive relationship with costumer-citizens, offering value propositions and services that are demanded and valued by different market segments of constituents" (Swan 2015, p. 47).

Further elements useful for discussion:

(l) Authority floating freely, cognitive dissonance and societal maturity.
Decentralization through the blockchain technology represents a "natural progression of humanity" (Andreas Antonopoulos interviewed by Sparkes, 2014) and a "natural efficiency process" (Swan 2015, p. 31). Nonetheless, "it will take time for the idea of decentralized trust through computation to become a part of mainstream consciousness, and until then, the idea creates cognitive dissonance for those accustomed to centralized trust systems" (Antonopoulos, 2014).

> "A side benefit of blockchain governance is that it might force individuals and societies to grow into a new level of maturity in how topics like governance, authority, independence, and participation are conceptualized and executed. We are not used to governance being a personal responsibility and a peer-to-peer system as opposed to something externally imposed by a distant centralized institution… **Authority floating freely** has already happened in other industries such as information… It might seem harder to let go of centralized authority in matters of government...but there is no reason that social maturity could not develop in similar context" (Swan 2015, p. 54).

III.

THE BREAKDOWN OF THE STATE:
AN HISTORICAL OVERVIEW

3.1   Marxist determinism and anarcho-capitalism.

The first consideration is that most of principles and assertions presented above are all but new in the history of modern political thought. The anti-government rhetoric which often accompanies the blockchain advocates, as well as the idea to run society only through individual contracts is, for instance, at the very heart of Proudhon's social contract[20]. But there are also other similarities interesting to note.

The strong individualism and the critic to centralized, hierarchical organizations; the State depicted as an outmoded instrument of oppression and the idea of coercion as a source of all evil; the possibility for individuals to finally govern themselves, disrupting the current political paradigms; and the gradual, spontaneous demise of the state, once a vast majority of people will have reached a certain level of consciousness – all these elements are rooted in the anarchic mainstream and in the determinism of the Marxist doctrine. According to Marxism, indeed, the State will not be suddenly abolished, but it will simply "wither away", once certain conditions are met – in this case, when the production processes will be reorganized by the workers according to principles of freedom and equality. At which point, the Marxism claims that "all members of society, or at least a vast majority, [will] have learned to administer the state *themselves*", having reached a sufficient level of maturity and political consciousness, and they "will put the whole state machinery where it will then belong–into the museum of antiquities, next to the spinning wheel and the bronze ax" (Engels, 1884). With a gradual and spontaneous process, citizens will finally be accustomed to live in a society "without force, without coercion, without subordination, without the special apparatus of coercion which is called the state" (Lenin 1917, p. 42).

This seems to be exactly the ultimate purpose of crypto-anarchists – as well as an implicit desire of many advocates of decentralization. In spite of these interesting similarities, however, there is at least one crucial difference here that should be noted. While for Marxism the demise of the State is the natural consequence of capitalism disruption, for the most fervent blockchain advocates it is rather the opposite: it represents the final victory of free markets and self-interested individuals over public institutions, in a process of economic liberalization which can be more properly defined as anarcho-capitalism (Section II, point *j*, *k).*

---

20 Proudhon explained this theory in *General Idea of the Revolution in the Nineteenth Century* (1851).

3.2   Decentralization and new models of governance.

With reference to more recent political dynamics, the drive towards decentralization can be seen as a part of a wider anti-government phenomenon, which has progressively emerged in Western democracies during the last decades, modifying the relationship between citizens and central authority (Paquet & Wilson, 2015). According to this new trend, different interest groups in society are less inclined than previously to compete against each other for the control of the State: rather, they cease to recognize its political monopoly, emphasizing its weak performance and failures, and exploring new possibilities to organizing activities and services in a more efficient way (Paquet & Wilson, 2015).

Over the last forty years, various models of deliberative democracy and decentralized public governance have been developed to this aim, and in many aspects the blockchain-based governance represents the latest development of this trend.

Expressing criticism against the limits of the traditional forms of political participation, the concept of *deliberative democracy* has been discussed since the 1980's as an ideal of political autonomy and self-governance. Based on the core principle that representative democracy should be enhanced by forms of direct civic participation, this approach has put particular emphasis on values such as public reasoning, deliberation among equal citizens, transparency, and accountability of the decision- making process (Basset, 1980; Bohman & Rehg, 1997).

At the same time, the view of the State monopoly as a *Single Point of Failure* (SPOF) and the search for less state-centric policy instruments have also paved the way to an increased interaction among public, private and nongovernmental subjects for the fulfillment of public interest activities. The notion of *New Public Administration* – and thereafter *New Public Governance* – has been proposed to define such new framework of decentralized governing practices, emerged in the Western countries since the 1970s. In this context, advocates of a market-oriented approach to public policies, such as Osborne and Gaebler (1992), have claimed that governments should focus on "steering" rather than "rowing", setting priorities and goals instead of directly deliver services, in order to better meet citizens' needs. On one side, these practices have addressed the growing need to experiment an entrepreneurial model of leadership, finding innovative solutions to the mismanagement of State and bureaucracy across the traditional organizational and institutional boundaries; on the other side, however, they have resulted in a controversial and socially costly process of public expenditure review, deregulation and corporatization of public bodies, in the attempt to improve efficiency and reduce costs of services through neo-liberal policies.

Scholars have described as *governance without government* (Peters & Pierre, 1998; Rhodes, 1997) this emerging pattern of management, characterized by a major shift of power from public to private sector, and by an increasingly dominant role of the market in public affairs. In this context, researchers has also given particular emphasis to the power of networks to downplay the role of State and dominate public policy, due to ability of networks to self-organize, develop resilience and evade government control (de Bruijn & ten Heuvelhof, 1997; Kooiman, 1993; Marsh & Rhodes, 1992; Peters & Pierre, 1998).

In the last decade, the effects of globalization have created new pressures on institutions for further decentralization and more participative political practices (Shabbir, Cheema & Rondinelli, 2007). As a result, control and social coordination – which have always been essential roles of the State – have become far more complex and fractured than in the past, now involving the sharing of authority with a growing number of non-state actors, operative agencies, stakeholders, and networks at local and global level. Concepts and practices of public governance have evolved accordingly and literature has conceptualized a rich variety of new organizational models, with the discussion of *multi-stakeholder* (Freeman, 1984; Almeida, Getschko & Afonso, 2015); *decentralized* (Shabbir, Cheema & Rondinelli, 2007); *distributed* (Abbott, 2000; Paquet, 2000); and *collaborative governance* (Ansell & Gash, 2008; Donahue, 2004). Although their meanings and definitions may change depending on context, these models share some basic features, such as: a trend towards deconcentration of hierarchical structures; a more responsive, transparent and accountable approach to decision-making; and the inclusion of multiple interest bearers in a platform of dialogue, in order to find consensus-based solutions to common problems.

3.3   The role of cyberspace, peer-to-peer networks and encryption.

The restless development of information technology, the increasing digitization, and the ubiquitous nature of connectivity have represented a further catalyst for governance decentralization. Eliminating the barrier of communication costs and using a distributed architecture with multidirectional connections among all nodes, the Internet and cyberspace have allowed the emergence of the "networked public sphere" (Benkler 2006, p. 212) as a great facilitator of freedom of expression. Like never before in history, citizens have had the possibility – among many other things – to intensify interactions between interest groups and social movements at local and transnational level; express grievances and discontent through non-institutional channels; engage in new collaborative processes; and experiment alternative governance models, in a climate of greater political awareness, but also growing distrust of government actors.

This has caused a further erosion of the old concepts of Westphalian nation state and territorial-based governance, with its traditional functions related to sovereignty, authority and national boundaries increasingly called into question.

In this context, even the diffused enthusiasm towards cryptography as a defensive political instrument has certainly played a crucial role. The idea to use strong encryption to protect citizens' freedom and privacy from governments and big corporations can be traced back to the cypherpunk and crypto - anarchist culture of the late 1970s. The core principles of these heterogeneous countercultural movements can be found in the "The Crypto Anarchist Manifesto" (May, 1988) and in the "Cypherpunk's Manifesto" (Hughes, 1993), stating that freedom of speech, individual privacy in communication and anonymous transaction systems are essential conditions for an open society, and they should be used to foster social and political change. Especially after September 11, these principles have led to a growing use of

anonymity-protecting peer-to peer networks (e.g. Freenet[21], Free Haven[22]), capable to resist censorship and circumvent the oppressive online mass surveillance systems put in place by governments and businesses (Farmer, 2003).

3.4. The final stage of decentralization: the blockchain-based governance.

All the processes described so far have one major common thread: they have explored new forms of coordination and interaction between State and society, with a significant shift of power from central institutions to individuals and/or markets. The blockchain-based governance can be considered as the final stage of this process of decentralization and disempowerment of institutions, insofar as:

- it proclaims the social benefits of a bottom-up approach to politics, emphasizing consensual forms of self-government and direct participation of citizens to decision-making process, in a similar way as deliberative democracy (and other alternative models of governance);
- it fails to see any added value in central coordination and it promotes the primacy of economics over politics, following a logic of privatization of government services, as prompted by the *New Public Governance* ("governments need to become more like business; "markets can do better than the State");
- it encourages the political use of strong encryption to enhance citizens' freedom and privacy;
- it relies on peer-to-peer global networks and online interest groups, which aim to decentralize hierarchical structures, be independent as far as possible from government powers, and challenge their agenda.

The final result is the idea that public policies and government services should be directly managed by private networks of individuals, through a decentralized model of governance based on distributed trust and market rules.
In the next sections, we will discuss possible practical outcomes of this model.

---

21 https://freenetproject.org
22 http://freehaven.net

IV.

DECENTRALIZING GOVERNMENT SERVICES
THROUGH THE BLOCKCHAIN: ISSUES AND CONCERNS

To which extent is it possible to decentralized public administration and government services through the blockchain technology? Can we dismiss State archives, physical ledgers and human notaries, and "put a nation on the blockchain"? (Section II, point *e*).

Undoubtedly, the blockchain has remarkable properties as a distributed ledger, such as efficiency, cost-effectiveness, irreversibility, transparency, auditability and censorship resistance. Yet, the proposal to decentralize government services through an open, unpermissioned blockchain entails a whole set of unknowns, which may overweight the benefits. Although the blockchain is frequently described as a "universal, permanent, continuous ledger" (Swan 2015, p. 46), these claims are somehow overstated, since they do not take enough account of the several performance risks at stake.

4.1   Security problems and technical weakness of current distributed blockchains.

The first problematic aspect is that current public, unpermissioned distributed ledgers as Bitcoin have a highly speculative nature, with an inherent trade-off between dimension of the network and decentralization. Scalability leads to a natural process of centralization of the computing power in the network, due to the decrease of the number of miners able to perform the mathematical verification required by the protocol, which has growing costs. Bitcoin, for example, is currently run by increasingly centralized mining farms, which turn out to be engaged in secretive, colossal mining operations in China[23], or traded on the stock-exchange in Australia[24], with possible risks of collusion or cartelization. Therefore, a decentralized *Starbuck-style governance* (Section II, point *e)* based on such a blockchain would dangerously expose citizens' records and essential rights to private interests and to unpredictable market dynamics (e.g. uncertainty of mining profitability, volatility of prices, discontinuity of investments, speculative attacks, etc.).

Moreover, even if reliant on an apparently robust peer-to-peer network, a public blockchain is inherently volatile and it can be forked or dismissed by the community at any time, because not attractive or remunerative anymore. It is hence questionable whether a fully decentralized blockchain like Bitcoin can be defined as a "universal ledger". Since there is no guarantee that it will still be operative or even exist in the future, persistence and preservation

---

23 See http://motherboard.vice.com/read/chinas-biggest-secret-bitcoin-mine
24 See   http://siliconangle.com/blog/2015/09/08/australian-bitcoin-mining-firm-bitcoin-group-to-go-public-on-the-asx-in-november/

of contracts and government services may become "susceptible to invalidity through obsolescence and boredom" (DuPont & Maurer, 2015).

A further complication is that data recorded in the blockchain are entirely reliant on connectivity. "If the electronic network were shut off, or if everyone moved on to a new system, there is no paper-based backup archiving the existence (or execution) of these contracts". And "contracts, by contrast, are all about managing uncertainty" (DuPont & Maurer, 2015).

There are several other technical issues that should be carefully assessed, when considering to migrate government services to an open, unpermissioned blockchain.

Despite the enthusiasm of its advocates, the scientific community generally agrees in stating that Bitcoin and its many clones are based on a still immature and highly vulnerable technology. A full analysis of Bitcoin technical weaknesses falls beyond the scope of this paper, but we will offer a brief summary of the most relevant researches on this topic.

Concerns have been raised, for instance, about the incentive mechanism of Bitcoin mining protocol: a research made by Ittaly and Gün Sirer (2014) has demonstrated that a colluding, minority group of "selfish miners", consisting of 1/3 of all miners of the network, may in fact be able to strategically control the system and break its decentralized nature. The research has therefore concluded that services and data built on the top of the Bitcoin blockchain, such as virtual notaries, are currently at risk.

According to the theory of *Programmed Self-Destruction* (Curtois, 2014), fatal engineering mistakes in the Bitcoin architecture will eventually result in a process of programmed decline and rapid self-destruction. Problems outlined in this research include:

- excessively fast erosion of profitability for existing mining machines;
- enormous investments in hashing infrastructure, still with poor general security of the system;
- insufficient network neutrality;
- lack of reliable data about the volume of transactions and irrational expectations of investors.

In particular, the self-destruction of Bitcoin network could be caused by a fatal combination of four factors:

- inefficiency of the *The Longest Chain Rule[25]*, which leads to unnecessary instability and growing risks of attacks to the network;
- deflationary monetary policies;
- poor network neutrality and moral hazard;
- rapid hash power shifting from one coin to another, due to high competition.

Although "In Cryptography We Trust" is the motto of many supporters around the world, researches also show that Bitcoin blockchain currently suffers from major vulnerabilities related to the use of elliptic curve cryptography (ECC), including weak key generation, poor

---

25 About the rule of the longest blockchain, see https://en.bitcoin.it/wiki/How_bitcoin_works and also http://bitsonblocks.net/tag/longest-chain-rule/ Part 3 - CONSENSUS: How do you resolve conflicts?

signature randomness, insufficient entropy and software bugs (Bos, Halderman, Heninger, Moore, Naehrig et al., 2014).

In particular, Bitcoin elliptic curve cryptography is not quantum-safe and the emergence of quantum computers could disrupt it at any time. In this regard, Bitcoin core developers simply claim that given an appropriate amount of advance warning (such as one month), they may be able to take emergency measures through a centralized authority and keep the blockchain safe: "The authority system will introduce centralization, but it will only be a temporary emergency measure, and after a few years the system can be retired entirely" (Buterin, 2013).

The solution proposed is rather naive, if we consider that in all probability quantum computers may already be secretly in use by some governments and in any case they may merge "with little or no warning to the public or other interested parties", as the renowned cryptographer Ralph C. Merkle pointed out (merkle.com)[26]. But most importantly, the proposal to fix technical problems through a central authority or "benevolent dictator" would entail the direct power of *private* entities over government services and essential citizens' data, without any formal legitimacy nor control.

Needless to say, history is full of "benevolent dictators" who bypassed procedural legality and gave themselves full powers, with the declared noble objective of serving the community and restore order. But if history has taught us anything, it is that the question of legitimacy is crucial: it should hence be considered with great care, especially by those libertarians who genuinely believe in decentralization through the blockchain – and through Bitcoin in particular – as a new political model to enhance individual freedoms and collective rights.

In overall, the benefits of open, unpermissioned blockchains for government services seems to be offset by several risks, related to:

- moral hazard, scalability problems, trend towards centralization and likely dependency of networks on private oligarchies, such as miner corporations, which may rapidly conduct stock exchange mergers and acquisitions, gaining considerable power on global scale;
- domination of market logic over essential public services and citizens' rights, which should be rather protected by speculations of any kind;
- possible lack of service continuity and /or preservation of data in the medium-long run with no delineation of liability, due to market dynamics and/or serious technical flaws;
- raising of a dominant techno-elite with growing supervisory powers over strategic services at global level, without the necessary formal legitimacy.

---

26 Ralph C. Merkle, co- inventor of the public-key cryptography, has warned that "the likely development of quantum computers (QCs) in the next one or two decades would compromise all widely used public-key cryptosystems (PKCSs)" and "it may already be too late to deploy a QC-resistant PKCS standard throughout the world before quantum computers become available" (merkle.com). In this regard, see also the video "Quantum Computers and Public-Key Cryptosystems" at https://www.verisign.com/en_US/innovation/verisign-labs/speakers-series/quantum-computers/index.xhtml?inc=www.verisigninc.com In August 2015, the National Security Agency officially declared that "elliptic curve cryptography is not the long term solution many once hoped it would be" and it announced a transition to new quantum resistant cryptographic algorithms. See https://www.nsa.gov/ia/programs/suiteb_cryptography/

We should thus conclude that government services can hardly represent the best area of applicability for fully decentralized blockchains, such as Bitcoin. Government records require high performance and a high degree of reliability, accessibility and predictability, being not tolerant of any service interruption or failure: a flaw in the management or in the implementation of the network would compromise the security and the civil rights of millions of citizens. Moreover, a formal and transparent process of legitimization must be strictly required when dealing with government services, in order to avoid the indiscriminate emergence of private powers over public affairs.

Centralized and democratically legitimated public institutions are therefore crucial to ensure accessibility for extremely sensitive data in the long run and to preserve them from uncontrolled centralization, market speculations, technical flaws, and private supervisory powers. On the contrary, an indiscriminate process of decentralization and "gamification" (DuPont & Maurer, 2015) of public administration through token-based incentives may turn out to be an irresponsible choice, with detrimental effects on citizens' fundamental rights.

4.2 Advantages of permissioned, token-less blockchains for public sector.

If fully distributed, unpermissioned blockchains like Bitcoin have their own inherent limits, *permissioned* blockchains may represent instead a valid solution for governmental online services. Applications may include, for example: ID cards and driving licenses; land, school, medical records; certificates of birth, marriage, and death; tamper-proof and auditable e-vote systems; tax collection, etc.

Permissioned blockchains are replicated, shared ledgers (Gendal Brown, 2015), which can be administrated by one or more organizations – e.g. a government agency– in order to guarantee adequate levels of network coordination, reliability and security through human intervention, when necessary. These ledgers present advantages over both fully distributed blockchains and traditional databases.

Firstly, they are separated from speculative verification mechanisms, such as cryptocurrency or token rewards: they can therefore be used for services that are of general interests only, with data properly protected in the long term and no interference from cryptocurrency markets.

Secondly, they are distributed and synchronized, but their network is restricted to few trusted nodes and members, identifiable by controlled access permissions. Since nodes are very few, with no need for mining nor computationally intensive *proof- of-work*, validations and propagation of data are much faster than public blockchains (Buterin, 2015). Networks are also substantially free of scalability issues and may have "slight performance advantages over public blockchains because they are only dealing with the functionality required for that chain rather than all the functionality for all of the people for all of the time" (Kuhlman, 2015).

Permissioned blockchain-based architectures can be designed for specific purposes, with different consensus and verification systems, and with different levels of control, security, visibility and permissioning (Peters & Panayi, 2015).

Traditional databases[27] are overall inefficient, since they generally use a master-slave, centralized structure for data replication: the *master* database is the only original and authoritative source, and any change on data performed on the master is propagated to the *slave* databases, which are kept synchronized. This kind of architecture, however, may raise problems related to reliability, volume of traffic, and latency, since the master database performs all the writing operations. A more evolute system, called *multi-master replication*, allows any slave database to perform changes, sharing updates to each other to remain in sync: this entails, however, complex strategies to ensure data consistency, in order to prevent and solve possible conflicts between information.

Compared to master-slave databases, the distributed architecture of permissioned blockchains may bring significant advantages to public administration in terms of efficiency, data security, data integrity, availability, reduction of errors and infrastructural costs. Data integrity, in particular, consisting of "accuracy and consistency of data", includes "both the provenance of the data and the preservation of integrity through transformation" (Peters & Panayi, 2015). Along with security and availability, it is particularly important for government services and it can be significantly enhanced by the blockchain technology.

Although they are still at an early stage of development, the advantages of permissioned blockchains should be definitely discussed more, with a view to a possible application in the public sector.

Despite their potential benefits, however, permissioned blockchains are often the target of a great deal of criticisms, mostly because they are centralized, closed systems and they cannot provide censorship resistance. They can thus be resisted by those techno-libertarians "who see such developments as either compromising the whole point of decentralization or being a desperate act of dinosaurish middlemen trying to stay relevant" (Buterin, 2015).

We have already seen, however, that there are limits to what fully distributed ledgers are suited for, and such limits should be clearly recognized, in order to make reasoned choices.

In regard with security, although the dominant narrative tends to consider centralized institutions as incapable to rapidly react to sudden changes (Section II, point *b*), we argue that the opposite is the case: vertical centralization is definitely better suited to deal with rapid technical challenges, compared to horizontally-scaled structures. Scalability, for example, is a problematic factor. In a distributed architecture with thousands or millions of nodes on global scale, to modify a protocol may result in a complex and time-consuming procedure: it requires wide consensus of core developers, miners and nodes; consensus can be conditioned by reasons of economic expediency; and in the end, the ecosystem may fail to respond to unexpected challenges in a timely fashion.

For this very reason, we should conclude that "human use is probably our best chance for preserving complex systems of software" (DuPont & Maurer, 2015). When citizens rights are

---

27 See http://www.multichain.com/blog/2015/07/bitcoin-vs-blockchain-debate/

concerned, however, it is worth recalling that human agents cannot be hi-tech elites who proclaim themselves benevolent dictators: they must rather be public officers legitimated through formal, accountable and transparent procedures.

4.3   Government   services   and   the   technological   imperative   of decentralization.

The assumption that decentralization of services through a fully distributed blockchain represents an inescapable future or "a natural progression of humanity" (Section II, point *l)* is common between its advocates, albeit rather deterministic. Firstly, it is questionable that there is such a thing as *a natural progression of humanity*: rather, humanity sets priorities and makes choices among many possible options and scenarios, often in a conflicting way. It is even less acceptable the idea that individuals and societies can be forced by technology "to grow into a new level of maturity" (Section II, point *l*), since the success of a new technology depends much more on social factors and interactions than on the superiority of the technology itself, and in this regard every society has different social practice, with unpredictable dynamics (Boersma, Meijer & Wagenaar, 2009).

The idea that technological developments are inevitable, with fatal, unstoppable and irreversible consequences on society, is usually defined as "technological imperative" by scholars, and interestingly, it tends to grow "as technological systems become large, complex, interconnected and interdependent" (Chandler 1995, p. 7). When dealing with essential government services, however, determinism should never be the driving force behind decentralization. Indeed, the point is not to challenge the centralized model of governance at any cost: decentralization presents trade-offs and it "can be instrumental in promoting development and good governance but it is not an end in itself" (Shabbir, Cheema & Rondinelli 2007, p. 17). Hence, it should not be uncritically embraced in the name of anti-government feelings, technological imperative or wish for innovation at any cost.

In this regard, it also worths recalling that innovation is "the specific tool of entrepreneurs" (Drucker, 1985): as such, it generally belongs to a market-oriented vision of the world, which sets as priorities profit, competition and commercial interests, but it does not necessarily represent the most desirable characteristic for government services, which are connected to preservation of social, economical and political rights, and must rather prove security, reliability and long-term durability, in the face of societal evolution.

Decentralization through distributed blockchains mostly means privatization of public functions, with the transformation of government services and citizens rights into a new profitable private business. Since "the so-called freedoms often claimed by exuberant postmodern political thinkers have in fact become potent sources of insecurity" (Marden 2003, p. xi), we should recall the main reason why central coordination of public institutions was originally created – and why we should keep it: to protect common good and collective rights in the long term from transitory individual interests and from any reckless logic of profit. And in this regard, it cannot be ignored that permissioned, token-less blockchains hold a considerable advantage over fully distributed blockchains.

V.

BLOCKCHAIN TECHNOLOGY AND THE STATELESS GLOBAL GOVERNANCE

To which extent can we consider blockchains and decentralization platforms as *hyper-political tools*, capable to manage political interactions on large scale and dismiss any central authority, such as the State? Can we finally overcome traditional political institutions and make a new social contract only based on decentralized platforms, distributed consensus, and "authority floating freely" (Section II, point *j, l*)?

We will discuss reasons why such scenario is not only problematic, but also undesirable.

5.1   *Technocratic reasoning and the triumph of Homo Economicus.*

The first objection is that the role of governments, politics and representative democracy cannot be reduced to a web of instant atomic interactions, entirely executable by automated processes (If X, Then Y). This engineering approach to social dynamics promoted by technology vendors and decentralized platforms developers *(*Section II, points *d, h)* as a way to overcome traditional political institutions is a clear example of technocratic reasoning and determinism – which scholars claim to be deeply embedded in all Western modern societies and particularly in the American culture (Smith & Marx, 1994).

Admittedly, the blockchain technology can greatly improve structure, management and decision making process of specific realities, making them less dependable on top-down coordination. Yet, decentralization is not *always* the best choice for *all* organizations and there are limits to what blockchains are suited for. In particular, algorithms and binary codes are not meant for policy-making, since politics is an art that stems from the ethic sphere of human beings and it belongs to them exclusively, as creatures "endowed with reason and conscience" (Art.1 of the Universal Declaration of Human Rights).

Computer scientists tend to overemphasize the efficiency of encryption and codes as political tools, capable to verifying and aggregating individual decisions on large scale without intermediaries. But politics and governance, of course, are much more than aggregating votes, keeping databases in sync, or enforcing transactions through algorithms: the capacity to see the world in all its complexity is context-sensitive, and it must entail a strong ethic dimension, as well as a direct human participation. Code developers also tend to reduce any human organization to "a combination of two things: a set of property, and a protocol for a set of individuals" (Buterin, 2014a). This approach, however, may easily lead to social and organizational schizophrenia, if protocols – and not human development – will become the final goal of emerging technologies. We must not forget that empathy and conscience are irreplaceable components of any social and political interaction, and information efficiency and automation are not the ultimate purpose of human communities.

Far from any real political and ethic dimension, the regression of democracy to *governance-by-computation* or *Decentralized Autonomous Organizations* – namely large scale automated procedures devoid of life – would represent the ultimate triumph of *Homo Economicus:* an agent renowned for being "autonomous, instrumentally rational, psychologically self-sufficient, 'under socialized' and motivated into action by the utilitarian principle of maximizing pleasure" (Bourque, Harrisson & Széll 2009, p. 85). And with the bad reputation of "anthropological monster" (Bourdier, 1997).

5.2   The pre-political dimension of a blockchain-based society and the meaning of the State.

In order to better understand the possible dynamics of a stateless and algorithm-based society, we will now retread the logical process of creation of the State according to the natural law theorists, as outlined by Bobbio (1995).

In a hypothetical, fully decentralized society run through smart contracts, *Decentralized Autonomous Organizations* and market rules, individuals live in a kind of pre-sovereignty condition: on a case-by-case basis, they cluster around common needs and interests, which they try to administrate or secure through consensus- based automatized procedures, accepted by the parties involved. For example, they may use decentralization platforms to manage distribution of resources, run reputation-based systems or organize any kind of services through crowd-funding.

So why such a society is all but perfect? Simply because it is incomplete: it is still primitive or *pre-political*. Indeed, in this phase individuals are not *citizens* yet: in spite of the sophisticated technologies they may use to create contractual arrangements, they are still living in a state of nature, in which the law of might – or the laws of the market – prevails on common good. In this new-tribal scenario, frictions and conflicts will eventually rise between different networks and interest-bearers at local and global level, needing negotiation and compromise to reach a stable peace. If well-intentioned to avoid mutual abuse of power, groups may create a non-aggression pact to refrain from violence and seek peaceful solutions in case of conflict. This phase in which individuals reach consensus and set standards for a common, peaceful living is usually called *pactum societatis* by contractarian doctrines.

This non-aggression pact can be gained through consensus and represents a formal move from the state of nature towards the establishing of civil society. And nonetheless, as Bobbio recalled, reaching consensus is not sufficient and *it does not solve conflicts*: indeed, the observation of this pact is not ensured in any way and it is not protected from external, opposing forces. As a result, society is still quite unstable, dispersed and agonistic.

In the end, the natural need of security and the necessity to avoid fragmentation of social efforts lead individuals to establish a permanent point of control, a neutral Third Party to which delegate the responsibility of maintaining order, coordinate activities and resolve future conflicts in a legitimate way, through a *pactum subjectionis* (submission to organized coercion). That moment is crucial and marks the emergence of the idea of State, which can be

deemed as a product of logical thought – as also Kant claimed – rather than an historical event. Most importantly, the symbolic phase in which the general will is created marks the move of human communities to a real political dimension, in which a higher level of coordination between conflicting interests is recognized as fundamental, in order to protect consensus once reached.

It is this juridical and ethic process that transforms individuals into *citizens*.

Many techno-libertarians claim that central coordination and State are the products of a patriarchal, hierarchical and gerontocratic mindset, that we ought to overcome. In fact, the principles behind decentralization often echo the values of neo-liberal politics and social thought, such as "the ethos of individualism of choice, control's over one's fate, personal responsibility, self-promotion and self-government" (Marden 2003, p. 88), as opposed to top-down policies, paternalistic central institutions, and "faceless government bureaucrats". In this regard, however, it is worth recalling that central political institutions have emerged through a complex, historical process of emancipation from private powers and churches, setting legitimate procedures not only to overcome problems of scale or to coordinate distant groups (Section II, point *a*), but most of all to protect general consensus, execution of the laws and basic individual rights from the inevitable chaos of antagonistic interests.

It is therefore clear that the State, as a guarantor of fundamental rights, is not an unwieldy third party that can be by-passed through a technological disintermediation process: the State is *us*, as a result of the first and biggest crowd-funded project ever existed in history, and it should not be defined in opposition to civil society. Far from being over, this collective project is rooted in our Constitutions and it is connected to the concepts of public interest, citizens' rights, coordination and redistribution of resources, which cannot be entirely devolved to market laws or atomized algorithm-based interactions.

We certainly agree that human society at large must be creative, developing a diversified ecology through bottom-up governance models to better approach its problems. Nonetheless, we should also be aware of the pitfalls of a technicist attitude, recognizing that automation and decentralization have inherent limits and new forms of social and political fragility may stem from them.

In this regard, it is not clear, for example, how a fully distributed, blockchain-based society would regulate conflicts, mediate between opposite interests, or rectify social iniquities, other than through market adjustments, complex webs of smart contracts or other sophisticated, automated incentive mechanisms. Not only markets are proven to be incapable of creating social justice and redistribution – in spite of what techno-entrepreneurs may claim (Section II, point *j*) – but it is rather the subjugation of politics to "turbo-capitalism" and its financial dictates that bears most of the responsibility for the problems currently affecting our democracies – from long term unemployment, poverty, regulatory capture and erosion of social capital, to imperialist wars, diffused insecurity and fear (Luttwak, 1999; Ziegler, 2002).

In fact, it is with the increasing atomization of social life, the extreme individualism and the restless rationalization of economic structures that corporate power reinforces and reproduces itself, to the detriment of individual and collective rights (Boggs, 2000; Marden, 2003).

5.3 Stateless global society and "amoral antipolitics": the disempowerment of citizens.

The major problem of an hypothetical global society only run through organizational patterns based on individualism – namely *Decentralized Autonomous Organizations,* free market rules, and "authority floating freely" (Section II, point *l*) – is that it would essentially lack legitimate mechanisms to regulate the convergence of the particular into the general, which is the traditional role of centralized political institutions. Breaking the collective identity building, citizens may not see themselves anymore as a part of a whole, because the general will is replaced by a myriad of immediate acts of the individual will. This may entail a serious risk of regression of human communities into a pre-political condition, characterized by "Hobbesian deregulated landscapes and a retrieting State" (Marden 2003, p. 90). Individuals would not be citizens anymore, but mere service consumers and players, "independent interest-bearers ... with no agreed-upon norms to regulate their interactions as free and equal beings" (Urbinati 2006, p. 65); and society would be dominated by adversarial private interests and "franchulates" – as described by Stephenson in his novel (Section II*, point k).*

Such a scenario falls within the concept of *amoral antipolitics* (Schedler, 1997), namely politics reduced to a private, strategic power game.

> "This is the rational choice conception of politics and the home of *homo economicus* – utility-maximizing participants endowed with fixed and exogenous preferences engaging in quasi commercial exchanges of goods and services. [This] denies the boundaries between private and public action and sees the political realm as constituting private motives" (Marden 2005, p. 235).

Whether it is moved by misguided libertarian intentions, naive utopians or investors seeking for profit, the idea to create a *stateless global society* through an indiscriminate proliferation of decentralized platforms seems to be far from ideal: such a system would not go indeed beyond the primitive phase of *pactum societatis,* characterized by conflicts between many different consensus-based groups and oligarchies, in the general absence of mechanisms to enforce citizens' rights and freedom. Contrary to the claims of some blockchain advocates, the final outcome would be the general disempowerment of individuals, the "deification of the market and the triumph of antipolitics" (Marden, 2003, p. 185).

These conclusions, however, hardly come as a surprise: in discussing technological determinism and utopianism as peculiar historical traits of American society, Segal (1985) suggests that technological utopias generally lack effective solutions in terms of social cohesion and real social progress. And the deterministic applications of blockchain technology to politics appear to bear this out.

VI.
THE MYTH OF AN EGALITARIAN BLOCKCHAIN-BASED SOCIETY

Techno-libertarians usually place particular emphasis on blockchain capability to reach consensus between participants on large scale, considering centralized vertical authority detrimental to individual powers. They often advocate the wishful scenario of a flat, non-hierarchical and coercion-less society run through algorithm-based consensus, in which individuals can cooperate freely. This vision, however, seems to come in addition to the number of many others ICTs myths emerged in the last decades – including for instance "the myth of a new and better government", "the myth of technological progress", "the myth of rational information planning" and "the myth of the intelligent and empowered consumer" (Bekkers & Homburg, 2009).

We will briefly discuss reasons why the blockchain governance does not solve neither the political problem of coercion, nor the problem of hierarchic structures in society.

6.1   The issue of coercion.

In the rhetoric of decentralization, *consensus* and *coercion* have become concepts related to opposite models of social and political organization. By semantic association, the word *consensus* seems to evoke principles such us equality, fairness, agreement, brotherhood, cooperation. On the contrary, both the words *centralization* and *coercion* seem to be related to the idea of constrain, oppression, violence, lack of freedom, infringement of individual rights. This perspective, however, is quite objectionable. It does not take into account, for instance, that centralization and coercion are legal means originally designed to gain stability, protection of individual rights and long-term cohesion between groups. To see coercion solely as an instrument of oppression is another typical element of anarchic and Marxist doctrines: according to this view, the individual autonomy is to be considered a supreme value and there is no difference between force of authority based upon the law and mere violence.

At theoretical level, however, modern Western constitutions have already solved the problem of finding a balance between central power and individual rights, through the concept of *rule of law:* coercion based upon the law is thus source of rights for citizens, and not only of duties, and it constitutes the necessary common ground between liberalism and democracy.

Examining the fundamental assumptions of democratic theory, Robert Dahl explained that anarchists considers the coercive authority as an undesirable model, which should be "replaced *entirely* by voluntary associations based on continuing consent" (Dahl 1989, p. 38). Today, a strong anti-government feeling and technological determinism lead many crypto-anarchists and techno-libertarians to believe in the blockchain as a disruptive technology

capable to gain such "continuing consent", in order to create a society with horizontal structures and distributed authority.

Dahl, however, proposed many valid theoretical points which contradict these assumptions. Firstly, if we judge societies as "relatively good or bad according to the extent to which they maximize consent and minimize coercion" (Dahl 1989, p. 50), then we are dealing with *moral* doctrine and not with political philosophy. But most importantly, since coercion is indeed a moral problem, *it does not disappear with the demise of the State,* nor with an horizontal distribution of authority. Coercion is "very likely to exist even in the absence of the state" (Dahl 1989, p. 45), simply because recalcitrant wrongdoers will always exist. Since continuous consent is in practice impossible, all that remains is to decide "whether and in what circumstances it might be justifiable to use coercion" (Dahl 1989, p. 50).

Showing that the problem of coercion is all but solved, Dahl leads us back again to the inescapable problem of setting a higher level of political coordination, with legitimate procedures to achieve organized coercion – as discussed earlier. But this does not have to be a negative thing per se. Indeed, the philosopher asks himself: "Why is avoiding coercion a supreme end that dominates all other ends? What makes noncoercion superior to justice, equality, freedom, security, happiness, and other values?" (Dahl 1989, p. 45).

It is clear that noncoercion, like decentralization, cannot be regarded as an end in itself.

6.2   *The emerging of new hierarchies: the blockchain governance oligarchy.*

A part from the issue of coercion, the blockchain-based governance is not likely to solve the problem of social hierarchical structures either.

Despite the open source nature of protocols and the much-vaunted egalitarianism of peer-to-peer networks, a massive adoption of blockchain services would most probably end up creating new oligarchies and a strong polarization in society. In virtue of their technical skills, code developers, miners, fintech professionals and technopreneurs would easily have a privileged position in society, becoming the new policy makers to detriment of a big mass of computer illiterate or low skilled individuals, reduced to mere passive recipients of services. Elites can assume many forms according to the social and political context, and we are in a phase of human development where the power to develop codes and select algorithms has – and it will increasingly have – major implications in contemporary society: this power entails assertion of authority and it constitutes "politics pursued by other means" (Latour 1988, p. 229; Musiani, 2013), calling into question the egalitarian nature of technology and networks. Regrettably, indeed, *open source* does not automatically mean neither equal opportunity, nor inclusiveness. Since open source networks present major cognitive entry barriers, "discussions about the formation of new global cosmopolitan democracies need to be measured against the whole issue of access and regulation" (Marden 2003, p. 243).

According to many observers, a tendency to elitism and centralization is already observable in the current state of Bitcoin network, as well as in decentralized platforms.

In theory, the open source protocol is designed to foster cooperation on global scale and anyone can contribute to code development through the GitHub forum[28]. In practice, however,

> "decisions are made—or executed at least—by a team of core developers because only they have the technical permissions to accept submissions. Those core developers form, at least at first sight, Bitcoin's governance group in a narrower sense. Every adjustment to Bitcoin's governance structure must pass through the bottleneck of this small group of people" (Gasser, Budish & West 2015, p. 8).

Even Gervais, Karame, Capkun and Capkun (2013) have exposed the lack of transparent decision making in Bitcoin and its centralized nature, due to the privileged position of developers in conflict resolution and to the emergence of many profitable businesses, mostly related to mining operations, which control the market.

> "These entities altogether can decide the fate of the entire Bitcoin system, thus bypassing the will, rights, and computing power of the multitude of users that populate the network … On the one hand, the Bitcoin ecosystem is far from being decentralized; on the other hand, the increasing centralization of the system does not abide by any transparent regulations/legislations. This could, in turn, lead to severe consequences on the fate and reputation of the system" (Gervais, Karame, Capkun & Capkun 2013, p. 10).

> "Given the huge computing power harnessed in the Bitcoin system ... users believe that it is unlikely for any entity to acquire such power alone. However, even a quick look at the distribution of computing power in Bitcoin reveals that the power of dedicated 'miners' far exceeds the power that individual users dedicate to mining, allowing few parties to effectively control the currency" (Gervais, Karame, Capkun & Capkun 2013, p. 1).

Curtois (2014) warned about the existing imbalances in the Bitcoin ecosystem, both from a technical and economic point of view. Bitcoin stakeholders – to name but one example – generally lack essential information about security issues, because there is a strong asymmetry in information between core developers, pool managers and users. Further, Curtois confirmed that the design of the entire Bitcoin architecture always gives mining pool operators a greater strategical power in decision making, compared to nodes. But most importantly, Curtois stressed that open communities tend to aggregate into clusters: sub-communities of Bitcoin enthusiasts, well-established service providers and other influential stakeholders interested in promoting their brand name and their business interests, for instance, tend to set up an authoritative power, especially if there are major economic interests at stake.

The most compelling evidence of this is perhaps *Bitcoin XT,* a much criticized hard fork launched in August 2015, for which the Bitcoin Foundation took upon itself the power of decision over global policy strategies[29]. Albeit not formally vested with centralized decisional

---

28 See https://github.com
29 See http://www.coindesk.com/why-we-should-care-about-bitcoin-governance/

powers, Bitcoin Foundation is endowed with a formal structure and legal obligations, and according to global governance researchers, this has led to "an increased significance of voting" in the decisional process (Gasser, Budish & West 2015, p. 20).

Foundations or similar institutions may achieve a significant and unaccountable *soft power* in decentralized ecosystems, but there is also a number of prominent individuals in the Bitcoin and blockchain industry, which have a strong influence on the community and its discussions[30]. This elite group may consist of startup founders, key executives, chief scientists and evangelists, who easily make headlines for their leading role in technical debate. These celebrities generally gain charismatic power through a strong visibility in international conferences and media, by virtue of their technical and rhetoric skills, or because of their reputation as big private investors. In this global *theathrocracy* grounded on online and stage presence, by acting as industry thought leaders, they become leaders *de facto*, promoting their ideas on how the industry should move forward, and using financial power, technical skills and persuasion – namely "influence over beliefs" (Dahl 1989, p. 274) – as means of hegemony. This *Steve Job-style* charismatic power can strategically use information to steer network policy or shape users consensus at global level.

While the good faith of these public figures is generally taken for granted, it is significant that they may have previously had high-rank careers in IT or financial giants, such as Google or JP Morgan. Is the global financial techno-elite exploring new profitable geographies of capital, jumping on the bandwagon of decentralization? And if so, with what political aim in view? Whatever the answer is, the *revolving door* issue may raise legitimate concerns, being potentially harmful to the public interest, especially in case of massive adoption of the new technologies at stake.

Considerations made so far may as well apply for crowd-funded decentralized platforms like Ethereum, a token-based service from which depends the execution of smart contracts and other applications[31]. Ethereum is developed by a worldwide team of contributors called ETHDEV, through GitHub platform. The platform is run on behalf of the Ethereum Foundation, a non-profit organization registered in Switzerland, and its centralized structure consists of a Board of Directors and an Executive Chief[32]. Albeit functional to the development of the platform, Ethereum model of governance is founded on ownership and vertically structured power: this inevitably raises the issue of legitimacy, integrity of the management team and adequate transparency in the mechanisms for reviewing development proposals, especially when dealing with citizens' essential services. In a world increasingly reliant on technology and ruled by networks, whoever owns and controls these platforms will always have a significant power over civil society on a global scale.

---

30 See for example http://www.coindesk.com/coindesk-most-influential-bitcoin-blockchain-2015/

31 See https://www.ethereum.org ("Ethereum is a decentralized platform that runs smart contracts: applications that run exactly as programmed without any possibility of downtime, censorship, fraud or third party interference") and Swan (2015), p. 21 ("Ethereum is a platform and a programming language for building and publishing distributed applications". It works as " a fundamental underlying infrastructure platform that can run all the blockchains and protocols, rather like a unified universal development platform").

32 See https://blog.ethereum.org/2015/07/30/announcing-new-foundation-board-executive-director/

Elitist theorists like Gaetano Mosca claimed that any socio-political regime is always ruled by an organized minority[33]. The examples discussed so far confirm that even cyberspace and open networks have an inherent elitist nature, in which debate and decisions still tend to be dominated by few. Indeed, networks based on distributed consensus are far from having an homogeneous and egalitarian structure: despite the incorruptible nature of algorithms, individuals are inclined to form clusters based on similar interests and networks are thus likely to present subtle or hidden points of control, other directly managed by core developers or indirectly shaped by diffused, charismatic powers.

All these elements confirm that the revolutionary potential of *governance- by- network* as an absolute, horizontal mode of political and social organization is often overstated and unrealistic – as van Dick and Winters-van Beek (2009) already pointed out. In particular, the case studies provided by these authors show that "networks are not a mode of organization based on pure cooperation" (van Dick & Winters-van Beek 2009, p. 242): indeed, networks also have "centers and central modes of steering and governance, without which they easily fall apart" (van Dick & Winters-van Beek 2009, p. 242).

Despite any utopian vision about a blockchain-based, horizontal distribution of authority in society, there is empirical evidence that no technology can turn "vertical relationship of governance into horizontal" (van Dick & Winters-van Beek 2009, p. 253). Hierarchies, markets and networks constitute the three main components of any society and they will always exist, restlessly competing against each other for power – as Aron (1965) also claimed. In the end, according to the researchers, these very dynamics prevent both utopias and dystopias to become real.

But since a mix of centralization, decentralization and competition for power appears to be inevitable in society, in spite of any disruptive information technology, we are back again to the problem of selecting leaders through legitimate procedures, defining transparent and accountable mechanisms to limit their power. An issue that the blockchain governance leaves unresolved, promising instead an utopian and universal social levelling.

---

33 Mosca developed his theory in two main writings: *Sulla teorica dei governi e sul governo parlamentare* (1884) and *Elementi di scienza politica* (1896).

VII.

THE BLOCKCHAIN-BASED GOVERNANCE AS AN ORGANIZATIONAL THEORY.
CONCLUSIONS

The blockchain is a disruptive technology with a tremendous transformative potential for our societies. Risks and benefits related to its possible applications, however, must be carefully weighted, avoiding utopian expectations, as well as the pitfalls of technocratic reasoning and determinism.

If properly managed, decentralization of government services through permissioned blockchains is possible and desirable, since it can increase public administration functionality. Decentralization of governance through open, distributed blockchains like Bitcoin, however, presents serious risks and drawbacks, which offset the benefits.

Although originally designed as disintermediation tools, the ecosystems of fully distributed blockchains are characterized by a great amount of third parties and profitable businesses offering intermediation services, with strong asymmetries of information and power between developers and users. Trend towards centralization, digital divide, lack of transparency in decision making process, and unaccountable power of core developers – all these factors call into question the egalitarian nature of current distributed networks, making some blockchain advocates' expectations overestimated and unrealistic. In particular, the idea of a blockchain-based authority "floating freely" (Section II, point *l*) turns out to be deceptive, since authority is in fact proven to morph into more subtle or hidden centralized forms.

There are hence reasons to question the role of the blockchain-based governance as a great facilitator of individual power, in an absolute sense. On one hand, the promise of empowering individuals is likely to remain unfulfilled, because of the dominant role of markets and the speculative verification systems of fully distributed blockchains. On the other hand, the process of downplaying public institutions, the primacy of economics over politics, and the transformation of citizens into costumers with the promise of more freedom, efficiency, and equality may hide yet another insidious process of corporatization of politics, which invariably empowers markets to the detriment of citizens. Far from being new, such shift of power from public to private sector has been ongoing in various forms for decades, with huge social and economic costs.

Insofar as:

the State is not recognized as a necessary collective body, it is weakened or mostly dissolved in economy; a new elite of code developers with unaccountable power reduces politics to electronic service delivery; citizens are mere consumers of services provided by private platforms; collective rights "float freely", treated like any other commodity; and betting digital tokens on public policies with a "beggar-thy-neighbour" mindset is extolled as "a quintessential example of the potential transformative power of blockchain technology" (see *futarchy*, Section II, point *h*); then all the libertarian rhetoric against political hierarchies and the narrative constructed around blockchain decentralization risk to come down to a hi-tech, anarcho-capitalist paradigm, namely "a cynical euphemism for the gradual dismantling of the welfare state" (Marden 2003, pp. 90-91).

A reasonable conclusion is that the blockchain-based governance should be seen as an *organizational theory* – with significant technical and managerial advantages for markets, private services, communities – while it is not meant to be a stand-alone *political theory.* Likewise*,* blockchain technology and decentralized platforms are not *hyper-political*, but rather *pre-political* tools. If not balanced out by the functions of centralized, political institutions, the blockchain-based governance risk to fall within the concept of *amoral antipolitics,* "dressed up in the language of inevitability concerning the working of globalization and the free-market" (Marden 2003, p. xi). And these antipolitical forces are able to disrupt those very democratic values that today many libertarians strive to defend.

When assessing risks and benefits of blockchain applications, we cannot overlook the fact that to overthrow the State and to absorb its functions is a profitable business: while the blockchain was originally created to eliminate the need of a third party in transactions, the paradox is that stakeholders now involved in blockchain governance play the classical role of *tertius gaudens* (Simmel 1908; Portinaro, 1986), a "rejoicing third" that attains economic benefits by replacing the State in some or all its functions; even worse, these agents may also intentionally pursue a strategy of *divide et impera* (divide and rule) between civil society and State, aimed to undermine the traditional democratic order, modify the existing balance of power and achieve a dominant position in society. Dahl warned that in the absence of the State, "some associates might in any case acquire sufficient resources to create a highly oppressive state" (Dahl 1989, p. 47). If it is true that "the neo-liberal ascendancy and its corporate agenda are producing its own version of democracy" (Marden 2003, p. xiv), it is not unreasonable to assume that this will take on the features of an algorithm-based decentralized society.

In such scenario, to advocate the idea of State means to reaffirm the primacy of politics over economics and to recognize the need for a coordination point in society, in which the tensions between individual interests and common good find a constructive, political compromise. Needless to say, this in no way means to defend the current deplorable degeneration of public institutions into mass surveillance systems, nor to justify the reduction of politics to a "culture of security", which is increasingly transforming citizens into public enemies. On the contrary, it means to revert to the original spirit of our Constitutions and to their genuine democratic principles, so often perceived as an encumbrance by political practice.

It is the conscientious application of principles and rights enshrined in law that can really empower individuals – rather than the privatization of government services through market-driven decentralized platforms. Indeed, "if we wish to maximize autonomy our only reasonable and responsible choice is to seek the best possible state" (Dahl 1989, p. 49).

While the strong public dissent of techno-libertarians and cypherpunks is honorable, for it brings the issue of civil rights into focus, now more than ever the theoretical principles of the State should not be confused with bad governance or corrupted politicians; in other words, the

State and the constitutional provisions "should be carefully disassociated from the long history of the arbitrary use of force and the law that have been perpetrated by state rulers throughout the centuries" (Urbinati, 2003).

The major challenge for global civil society will soon be to explore new political and social dimensions, with the aim of integrating the applications of disruptive technologies such as the blockchain with citizens' rights, equality, social cohesion, inclusiveness, and protection of public sector.

Such integration is vital and cannot be left to the (anti-) political engineering of IT experts, financial investors, and code developers: it requires indeed a mature and interdisciplinary effort by all the fields of human knowledge, with particular regard to political theory, humanities and social sciences, to best assess risks, benefits and outcomes of the new technologies.

In the very next future, this integration might be the only safeguard left against many possible technological dystopias.

References

Abbott, F. (2000). Distributed Governance at the WTO-WIPO: An Evolving Model For Open-Architecture Integrated Governance. *Journal Of International Economic Law*, *3*(1), 63-81. http://dx.doi.org/10.1093/jiel/3.1.63

Almeida, V., Getschko, D., & Afonso, C. (2015). The Origin and Evolution of Multistakeholder Models. *IEEE Internet Computing*, *19*(1), 74-79. http://dx.doi.org/10.1109/mic.2015.15

Antonopoulos, A. (2014). Bitcoin Security Model: Trust by Computation. *O'Reilly- Radar.* Retrieved from http://radar.oreilly.com/2014/02/bitcoin-security-model-trust-by-computation.html
_____ (2015). *Mastering Bitcoin*. Sebastopol: O'Reilly Media

Aron, R. (1965). *Démocratie et totalitarisme*. Paris: Gallimard

Bekkers, V., & Homburg, V. (2009). The Myths and Cerimonies of E-Government: Beyond the Hype of a New and Better Government?. In A. Meijer & al. (Eds.), *ICTs, Citizens and Governance: After the Hype!* (1st ed., p. 217-234). IOS Press.

Benkler, Y. (2006). *The Wealth of Networks: How Social Production Transforms Markets and Freedom.* CT: Yale University Press

Besset, J. (1980). Deliberative Democracy: The Majority Principle in Republican Government. In R. Goldwin & W. Schambra, *How Democratic Is the Constitution?* (1st ed., pp. 102-116). Washinghton: American Enterprise Institute

Bitnation-blog.com. (2015). *Totalitarian Cyber State vs Freedom Unbound: Interview with Fabricio & Susanne Part 2*. Retrieved from http://www.bitnation-blog.com/totalitarian-cyber-state-vs-freedom-unbound-interview-with-fabricio-susanne-part-2/

Bobbio, N. (1995). *Democracy and the International System.* In Archibugi, D., & Held, D. *Cosmopolitan democracy* (1st ed. pp. 17- 41). Cambridge (UK): Polity Press

Boersma, K., Meijer, A., & Wagenaar, P. (2009). Unraveling and Understanding the e-Government Hype. In A. Meijer & al., *ICTs, Citizens and Governance: After the Hype!* (1st ed., pp. 256-265). IOS Press

Boggs, C. (2000). *The End of Politics: Corporate Power and the Decline of the Public Sphere.* New York: Guilford Press

Bohman, J., & Rehg, W. (1997). Introduction. In *Deliberative Democracy: Essays on Reason and Politics* (1st ed., p. ix-xxx). Cambridge, Massachusetts: The MIT Press

Bos, J., Halderman, J. A., Heninger, N., Moore, J., Naehrig, M., Wustrow, E.,(2014). Elliptic Curve Cryptography in Practice. In Nicolas Christin & Reihanen Savafi- Naini, (Eds.), *Financial Cryptography and Data Security. 18th International Conference, FC 2014, Christ Church, Barbados, March 3-7, 2014, Revised Selected Papers* (1st ed., pp. 157-175)

Bourdieu, P. (1997). Le champ économique. *Actes De La Recherche En Sciences Sociales*, *119* (1), 48-66. http://dx.doi.org/10.3406/arss.1997.3229

Bourque, R., Harrisson, D., & Széll, G. (2009). *Social Innovation, The Social Economy, and World Economic Development*. Frankfurt am Main: Lang

Buterin, V. (2013). Bitcoin Is Not Quantum-Safe, And How We Can Fix It When Needed. *Bitcoin Magazine*. Retrieved from https://bitcoinmagazine.com/articles/bitcoin-is-not-quantum-safe-and-how-we-can-fix-1375242150

_____ (2014 a). DAOs, DACs, DAs and More: An Incomplete Terminology Guide. *Ethereum Blog*. Retrieved from https://blog.ethereum.org/2014/05/06/daos-dacs-das-and-more-an-incomplete-terminology-guide/

_____ (2014b). An Introduction to Futarchy. *Ethereum Blog*. Retrieved from https://blog.ethereum.org/2014/08/21/introduction-futarchy/

_____ (2015). On Public and Private Blockchains. *Ethereum Blog*. Retrieved from https://blog.ethereum.org/2015/08/07/on-public-and-private-blockchains/

Chandler, D. (1995). Technological or Media Determinism. Retrieved from http://www. aber. ac. uk/media/Documents/tecdet/tecdet. Html.

Curtois, N. (2014). On The Longest Chain Rule and Programmed Self-Destruction of Crypto Currencies. http://arxiv.org/abs/1405.0534

Dahl, R. (1989). *Democracy and Its Critics*. New Haven: Yale University Press

de Bruijn, A., & ten Heuvelhof, E. (1997). Instrument of Network Management. In W. Kickert, E. Klijn & J. Koppenian (Eds.), *Managing Complex Networks* (1st ed., pp. 119- 136). London: Sage

Donahue, J. (2004). On Collaborative Governance. Corporate Social Responsibility Initiative Working Papers, No. 2 (March 2004). Retrieved from http://www.hks.harvard.edu/m-rcbg/CSRI/publications/workingpaper_2_donahue.pdf

Drucker, P. (1985). *Innovation and Entrepreneurship*. New York: Harper & Row

DuPont, Q. & B. Maurer, (2015). Ledgers and Law in the Blockchain. *KR*. Retrieved from http://kingsreview.co.uk/magazine/blog/2015/06/23/ledgers-and-law-in-the-blockchain/

Engels, F. (1884). *Origins of the Family, Private Property and the State*. Retrieved from https://www.marxists.org/archive/marx/works/1884/origin-family/

Farmer, J. (2003). The Spector of Crypto-anarchy: Regulating Anonymity-Protecting Peer-To-Peer Networks. *Fordham Law Review, 72*(3). Retrieved from http://ir.lawnet.fordham.edu/flr/vol72/iss3/5

Freeman, R. E. (1984). *Strategic Management: A Stakeholder Approach*. Boston: Pitman

Gasser, U., Budish, R., West, S. M., Multistakeholder as Governance Groups: Observations from Case Studies. January 14, 2015. *Berkman Center Research Publication No. 2015-1*. Retrieved from http://ssrn.com/abstract=2549270

Gendal Brown, R. (2015). How to Explain the Value of Replicated, Shared Ledgers from First Principles. Retrieved from http://gendal.me/2015/04/27/how-to-explain-the-value-of-replicated-shared-ledgers-from-first-principles/

Gervais, A., Karame, G., Capkun, S., and Capkun, V. (2013). Is Bitcoin a Decentralized Currency? *IACR Cryptology ePrint Archive*, *2013*, 829

Hughes, E. (1993). The Cypherpunk Manifesto. Retrieved from http://www.activism.net/cypherpunk/manifesto.html

Ittay E., & Gün Sirer. E., (2014). Majority is not Enough: Bitcoin Mining is Vulnerable. In Nicolas Christin & Reihanen Savafi- Naini (Eds.), *Financial Cryptography and Data Security. 18th International Conference, FC 2014, Christ Church, Barbados, March 3-7, 2014, Revised Selected Papers* (1st ed., pp. 436-454). Retrieved from http://www.cs.cornell.edu/~ie53/publications/btcProcArXiv.pdf

Kooiman, J. (1993). Social-Political Governance: Introduction. In J. Kooiman, *Modern Governance: New Government- Society Interactions* (1st ed.). Newbury Park: Sage

Kuhlman, C. (2015). How I (currently) Explain The State of Blockchains To Executives and Researchers. *Erisindustries.com*. Retrieved from https://db.erisindustries.com/strategy/2015/08/10/how-i-current-explain-blockchains/

Latour, B. (1988). *The Pasteurization of France.* Cambridge, MA: Harvard University Press

Lenin, V. (1917). *The State and Revolution*. Retrieved from http://marx.be/sites/default/files/documents/EN/texts/sr_and_sq.PDF

Lessig, L. (1999). *Code and Other Laws of Cyberspace*. New York: Basic Books

Luttwak, E. (1999). *Turbo-Capitalism*. *Winners and Losers In the Global Economy.* New York: HarperCollinsPublishers

Marden, P. (2003). *The Decline of Politics*. Aldershot, Hants, England: Ashgate

Marsch, D., & Rhodes, R. (1992), eds. *Policy Networks in British Government* (1st ed.). Oxford: Clarendon Press

May, T. (1988). *The Crypto Anarchist Manifesto*. Retrieved from http://www.activism.net/cypherpunk/crypto-anarchy.html

Musiani, F. (2013). Governance By Algorithms. *Internet Policy Review*, 2(3). DOI: 10.14763/2013.3.188

Osborne, D., & Gaebler, T. (1992). *Reinventing Government*. Reading, Mass.: Addison-Wesley Pub. Co.

Paquet, G. (2000). *The New Governance, Subsidiarity and the Strategic State.* OECD Forum for Future Conference, Governance in the 21st Century, (Spring, 2000). Retrieved from http://www.gouvernance.ca/publications/00-60.pdf

Paquet, G. & Wilson, C. (2015). Governance Failure and Antigovernment Phenomena. CoG Working Paper, June 2015. Retrieved from http://www.patheory.net/conference2015/papers/antigovernment-as-governance-failure-ver-12.pdf

Peters, G. W., & Panayi, E. (2015). Understanding Modern Banking Ledgers through Blockchain Technologies: Future of Transaction Processing and Smart Contracts on the Internet of Money. *arXiv preprint arXiv:1511.05740*

Portinaro, P. (1986). *Il terzo. Una figura del politico*. Milano: Franco Angeli

Rhodes, R. (1997). *Understanding Governance: Policy Networks, Governance, Reflexivity and Accountability,*. Buckingham: Open University Press

Schedler, A. (1997). Introduction: Antipolitics – Closing and Colonizing the Public Sphere. In A. Schledler (ed.), *The End of Politics? Explorations Into Modern Antipolitics* (pp. 1-20). New York: Macmillan

Segal, H. (2005). *Technological Utopianism in American Culture*. Syracuse, New York: Syracuse University Press. (1st edition 1985, University of Chicago Press)

Shabbir Cheema, G., & Rondinelli, D. (2007). From Government Decentralization to Decentralized Governance. In G. Shabbir Cheema & D. Rondinelli, *Decentralizing Governance: Emerging Concepts and Practices* (1st ed.). Washington, DC: Brookings Institution Press

Simmel, G. (1908). Die quantitative Bestimmheit der Gruppe. In G. Simmel, *Soziologie, Untersuchungen über die Formen der Vergesellschaftung* (1st ed.). Leipzig: Duncker & Humblot. Retrieved from https://archive.org/details/soziologieunters00simmrich

Smith, M., & Marx, L. (1994). *Does Technology Drive History? The Dilemma of Technological Determinism*. Cambridge, Mass.: MIT Press

Sparkes, M. (2014). The Coming Digital Anarchy. *Telegraph.co.uk*. Retrieved from http://www.telegraph.co.uk/technology/news/10881213/The-coming-digital-anarchy.html

Swan, M. (2015). *Blockchain. Blueprint For a New Economy*. Sebastopol, CA: O'Reilly

Taleb, N. N. (2007). *The Black Swan*. New York: Random House

Urbinati, N. (2003). Can Cosmopolitical Democracy Be Democratic? *Political Theory Daily Review.* Retrieved from http://www.politicaltheory.info/essays/urbinati.htm
_____ (2006). *Representative Democracy: Principles and Genealogy.* Chicago: University of Chicago Press

van Dick, J., & Winters-van Beek, A. (2009). The Perspective of Network Government: The Struggle Between Hierarchies, Markets and Networks As Model of Governance In Contemporary Government. In A. Meijer & al., *ICTs, Citizens and Governance: After the Hype!* (1st ed., pp. 235-255). IOS Press

Ziegler, J. (2002). *Les nouveaux maîtres du monde et ceux qui leur résistent*. Paris: Fayard