

Bureaucracy, Blockocracy and Power

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Abstract

Algorithmic authority is a distinctive and novel mode of domination. Akin to other modes described by Weber, it has associated organisational forms. This paper identifies and analyses one such form, *blockocracy*, which occurs in the context of blockchain-based cryptocurrencies. Taking a processual approach, we describe how blockocracy emerged historically out of an anti-bureaucracy ideology, a control revolution, a recognition that computer code can regulate conduct, and the increasing adoption of algorithms. Taking a shorter time-horizon, we identify four layers of algorithmic authority, and, focusing on the blockchain layer, we distinguish between *off-chain* and *on-chain* governance, with the latter having two types of off-chain rules. While the fashionable rhetoric is that the blockchain is immutable, we see the blockchain as a dynamic quasi-object, defining and mutating identities and possibilities. We conclude the paper by comparing blockocracy with Weber's depiction of bureaucracy.

1. Introduction

In a foundational contribution to the power literature, Max Weber (1921/1978) presented three ideal types of domination or authority – traditional, charismatic and rational-legal – each of which fosters a different form of organisation. Traditional authority is a mode of domination based on tradition or custom and is manifest in patrimonialism, feudalism, monarchies and dynastic power structures. Charismatic authority is centred on the leader's charisma and is exemplified in autocracies, dictatorships, theocracies and religious cults. The prototypical case of rational-legal domination is the bureaucratic organisation. We can add to

Weber's original taxonomy by identifying a panoptic mode of domination wherein an array of surveillance complexes – such as CCTV, examinations, confessions, and the like – are employed (Foucault, 1977). In contrast to the other three modes, the panoptic mode is not associated with any particular organisational form, as in this mode power is anonymous, automatic, subtle, invisible, and pervasive. However, it is easy to find examples of panopticism, especially in the late 20th and early 21st centuries.

Each of these modes is an ideal type never to be found empirically in a pure form; thus, any setting is likely to manifest at least two of the ideal types. The modes can also be seen as emergent phenomena derived and yet distinct from prior modes of domination. For instance, the legal-rational mode of domination partly emerged out of a struggle against monarchical absolutism in Continental Europe, articulating a new 'rational' dispensation not based on social hierarchies of estate, honour, tradition, or charisma. A new mode of domination, *algorithmic authority*, has emerged in recent decades, which is the focus of our paper.

We begin the paper by tracing the emergence of algorithmic authority, which we see as linked to a long-standing hostility to bureaucracy, and we then briefly discuss the different empirical instances of this mode of domination. Our interest is in the organisational forms associated with the phenomenon and so we have focused on how cryptocurrencies are organised. We argue that cryptocurrencies are a particular and important instantiation of algorithmic authority and that this form of organising warrants a distinctive name. We have coined the term *blockocracy* since the blockchain is the basic technology underlying all cryptocurrencies. The paper's next section then describes blockocracy as an organising *process*. To deepen our understanding, we then compare and contrast blockocracy with our classical understanding of (Weberian) bureaucracy. We conclude the paper with our thoughts on how a processual approach helps illuminate the emergence and functioning of power in a context where algorithmic authority is pervasive.

2. The emergence of algorithmic authority

A processual perspective demands that we consider how things come to be, which, in our case, warrants describing how algorithmic authority emerged. And 'emerged' is the right word because just as the legal-rational mode of domination emerged out of a contest with prior modes, we see the emergence of algorithmic authority in the context of a long-standing hostility towards bureaucracies. This hostility goes right back to de Gournay, who coined the term in the 18th century and who saw *bureaucratie* as a 'form of governance by officials

which protected state interests, an “illness”, an impediment to the proper exercise of commercial freedoms’ (Parker, 2018: 42). This negative take on bureaucracy was evident in post-WWII research, by US sociologists and psychologists, of the Fascist and Communist versions of bureaucracy. Typical of the approach was Milgram’s famous study, conducted in 1961, on the dark side of obedience to authority (Milgram, 1974). The nascent field of organisation studies took a similarly negative stance; for instance, Burns and Stalker (1961) made an influential distinction between ‘organic’/flexible and the – implicitly inferior – ‘mechanistic’/bureaucratic forms of organising. Even more influential was Marcuse’s (1964) *One Dimensional Man*, which argued that people, both at work and leisure, were increasingly becoming instruments for the mechanical organisation of capitalism. Around the same time, Weberian rationality came to be associated with fashionable ideas about closed systems, and, according to Thompson, it was clear that those employing the ‘rational model have been primarily students of performance or efficiency, and only incidentally students of organization’ (Thompson, 1967: 6). By the 1970s, more dynamic conceptualisations were becoming popular: Weick (1969) was quick off the mark, advocating that we should use the verb ‘organizing’ rather than the noun ‘organization’, while Argyris and Schon (1978) posited and popularised the notion of ‘organisational learning’, which was implicitly alien to the notion of bureaucracy. Perrow (1979: 6), in his classic book, *Complex Organizations*, observed that bureaucracy was the organisational form that had most preoccupied students of organisation studies, and that these students invariably depicted bureaucracy negatively, presenting it as inflexible and inefficient, emphasising that it stifled creativity, spontaneity, self-realisation and freedom (though Perrow distanced himself from this view). By the 1980s the die was cast as bureaucracy was routinely seen as the dead weight inhibiting positive attempts to change or develop organisations, to create learning organisations, or to initiate innovation or ‘internal’ entrepreneurial activity. Typical of the time were hugely popular books like Peters’ (1989) *Thriving on Chaos*, and Kanter’s (1985; 1989) *The Change Masters* and *When Giants Learn to Dance* which promised to help managers of bureaucracies transform their organisation into a different, flexible form, more suited to the new dynamic environment. Likewise, the satirical British TV show, *Yes Minister* (1980–1988) fostered and reflected growing criticism of government and bureaucracy, a scepticism that also fed a vibrant cottage industry in management consulting. Not surprisingly, Gareth Morgan (1986), in his best-selling *Images of Organization*, associated Weberian bureaucracy with the most static of all his metaphors, the machine metaphor. As concepts like efficiency and

effectiveness became *démodé*, organisational scholars shifted their focus to meaning, sense-making, culture and interpretation (as did the management consultants). The first SCOS conference (Standing Conference on Organizational Symbolism) was held in 1982, followed two years later by the first EGOS conference. And as the community of organisational and management scholars grew, so did the intellectual horizons. Even though Morgan (1986) did include a metaphor of flux and transformation in his taxonomy, processual approaches – which are this sub-theme’s touchstone – only took root around the turn of the century (Tsoukas and Chia, 2002), with the first International Symposium on Process Organization Studies taking place in 2008.

Anti-bureaucratic rhetoric is still very much in evidence and undergirds talk about ‘disruption’, ‘lean’, ‘agile’, ‘dynamic capabilities’, ‘new public management’ and the like. It also provides the basis for articulations of ‘post-bureaucratic’ forms of organising that prioritize networks, project-based team-working, virtuality, and knowledge-workers (Heckscher and Donnellon, 1994; Castells, 1996; Courpasson and Reed, 2004; Reed, 2011). Of course, there are exceptions. Some, for instance, have argued against the rhetoric of change which requires and summons bureaucracy as a *bête noire* (Grey, 2003; Kavanagh et al., 2007). Others have defended government red tape, arguing that bureaucracy is necessary and inevitable as government faces an increasing multiplicity of demands from an array of interests, and that attempts to eliminate it are doomed to fail because ‘we would be appalled by the resurgence of evils and follies it currently prevents’ (Kaufman, 1977: 97). However, this sentiment has only occasional echoes in management and organisation studies – for example, Kallinikos (2004) – though Paul du Gay has consistently celebrated and advocated Weber’s depiction of bureaucracy (Du Gay, 2000; 2005; 2016).

But du Gay is a lone voice, and the dominant narrative for many decades is to decry bureaucracy. A Google Ngram search (figure 1) illustrates this well, showing that the word ‘bureaucracy’ has been in decline since the mid-1970s. In contrast, the word ‘algorithm’ has been on an upward curve since the late 1950s, and it is to this that we now turn.

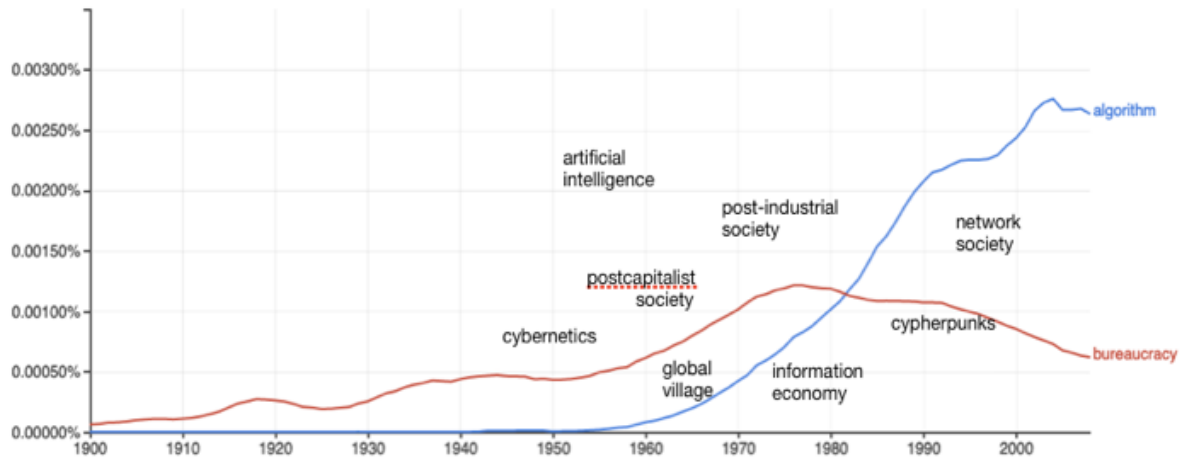


Figure 1: Google Ngram search plus popular terms from the zeitgeist

As figure 1 illustrates, the term algorithm began to emerge in the 1950s, though it was largely confined to the realm of computer science and the new field of cybernetics for many decades. However, the origins of the term go much further back as Beniger (1986) has cogently argued. Beniger's focus is on what he refers to as the 'control revolution,' whose origins he traces to the last decades of the nineteenth century. At heart an algorithm is about *control* – as is bureaucracy – and he traces the origins of what he refers to as 'the control revolution' to the last decades of the nineteenth century. Beniger sees society as a material processing system, and, for him, the biggest effect of the industrial revolution was that it radically increased the speed at which material was processed. Systems that processed material at a faster speed also required faster information and communication systems. Thus, his argument is that the contemporary form of bureaucracy emerged in the late 19th century as a major new technology of *control* as a corollary of the Industrial Revolution. Illustrative of this shift is the fact that, in 1831, President Jackson and 665 civilians ran the 3 branches of the US Federal Government, while 50 years later it had 13,000 civilian employees.

Computers increased the capability to process information and so, from the 1970s onwards, the notion of the 'information society' became part of the zeitgeist as the inherent power of computer code came to be increasingly recognised. Lessig's (1999) argument that computer code regulates conduct similar to legal code – or, more succinctly, 'code is law' – was, in our language, an assertion that algorithmic authority was now challenging and indeed replacing rational-legal authority. For the enthusiasts of this approach, code is incorruptible whereas humans are very much corruptible.

However, it was another ten years before the term ‘algorithmic authority’ appeared, in a *New York Times* article titled ‘The rise of algorithmic authority’ (Anonymous, 2009) that drew on a blog written by a professor of new media studies, Clay Shirky (2009). For Shirky, ‘Algorithmic authority is the decision to regard as authoritative an unmanaged process of extracting value from diverse, untrustworthy sources, without any human standing beside the result saying “Trust this because you trust me.”’ Some years later, Lustig and Nardi (2015) provide a shorter definition, defining algorithmic authority as ‘the trust in algorithms to direct human action and to verify information, in place of trusting or preferring human authority’ (p. 743). By the early 21st century this form of authority had become widely embedded in different industries and contexts.

This wide (and deep) embedding of algorithmic authority is closely linked to the field of artificial intelligence (AI) which has experienced several hype cycles since the 1940s. The last ‘AI winter’ was in the early 1990s and since then AI has attracted increased funding, resulting in the development and implementation of a variety of AI algorithms across different domains. AI algorithms are fundamental to facial recognition systems, communication protocols, video games, recommender systems, search engines, news feeds, high frequency stock trading, audio compression systems, autotuning devices, drones, self-driving cars, predictive analytics, language translation, etc. Indeed, such algorithms are now so pervasive – and often inconspicuous – that it would be impossible to list or classify them all here. This diversity is also why it is important to distinguish between the general phenomenon of algorithmic authority as a distinctive form of domination, and its particular instantiations. Since we are interested in organisational forms associated with algorithmic authority, we will focus on the form of organising associated with cryptocurrencies, which we call *blockocracy*. Before describing blockocracy in more detail, we will first provide a brief introduction to cryptocurrencies and how they represent a particular form of algorithmic authority.

3. Bitcoin - A brief description

Bitcoin can be described from a technical and social direction– and each has important implications for the other – but it is common to begin with a technical overview, and we will here follow convention. Imagine you wanted to create a digital money system, but with no central locus of authority, such as a bank or payment processor that might invade your financial privacy, censor transactions, or charge high fees. This decentralized digital money

system would face a major design problem: how to maintain consensus about the ownership of the units of the currency in the absence of a central authority. In traditional digital money systems, the central authority has unilateral control of a ledger and so it is difficult for users to ‘double-spend’ the currency, to spend more than they have and game the system (Dannen, 2017: 124). In Bitcoin the solution is for each member to have a copy of the ledger, meaning activity on the ledger is transparent to all users, at all times. When transactions are sent, a set of users, known as miners (originally all users, but now a specialist role), use specialised computing equipment to create a new page of the ledger, representing the emerging state of affairs, a process that happens every ten minutes. To select the next page, known as a block in Bitcoin, each miner races to find the solution to a cryptographic puzzle. The winner gets to publish the next page/block and is rewarded with bitcoins for their effort; this neatly doubles as the method of money issuance in the system. Each block builds on the last, forming a chain of blocks, known as the blockchain (see Figure 2). Once blocks are added they become computationally infeasible to alter, rendering the blockchain immutable, except under extreme circumstances (Drescher, 2017: 137). The system has functioned without major disruption to the blockchain itself since January, 2009.

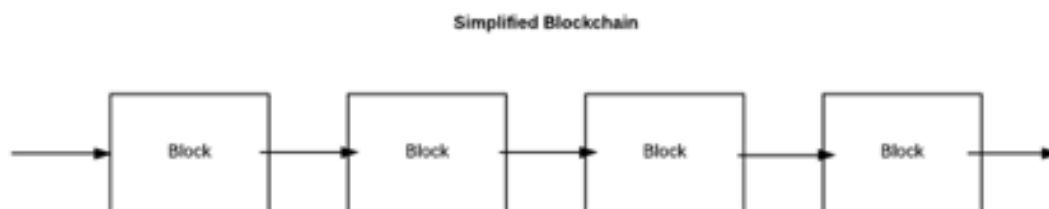


Figure 2. A Simplified Representation of the Blockchain

Bitcoin emerged out of the cypherpunk movement that was particularly active in the late 1980s and 1990s. The cypherpunks articulated a ‘crypto-libertarian’ ideology that advocated the use of cryptography to protect privacy, anonymity, individual liberty, and freedom of expression. Hostile to government interference in any form, they promoted new financial, economic, and money systems (Chaum, 1985; May, 1988; Hughes, 1993). One manifestation of this ideology is the remarkable fact that the person or group who wrote the foundational White Paper on Bitcoin, Satoshi Nakamoto, has never been identified.

4. Blockocracy as an organising process

Process organisation studies has a long tradition – and one that ironically hasn’t changed very much – of critiquing representationalist models of the world that foreground structure, presence, being and nouns. An alternative approach is to emphasise becoming, process, absence, withdrawal and the unrepresentable. Blockocracy provides an interesting site to explore these two traditions.

The critique of representationism requires that we pay particular attention to words and wording. For instance, the word ‘painting’ is a countable noun (as in, ‘six paintings’), a mass noun (as in, ‘she tried a new approach to painting’), or a verb (as in, ‘he is painting’). Likewise, with blockocracy. One approach is to invoke the old trope of verbing nouns, but we prefer to understand blockocracy as a signifier for a set of variable procedures, socio-material practices, movements and contestations, designed to achieve particular ends in particular contexts. Blockocracy is fundamentally process-based, continuously constructing artefacts, identities, relationships and materialities, though these are always unsettled as the process is infused with indeterminacy.

The blockchain is routinely identified as a ‘disruptive technology’, epitomising the fetish for innovation and change that animates so much public policy and corporate strategy. Yet, the blockchain is also at odds with this fetish in that it valorises stability, immutability, and permanence. Centrally, the blockchain’s unique selling proposition is that humans cannot disrupt or change either the history of the blockchain or the rules governing how it is maintained and extended. Thus, in a very real sense, the blockchain is a public ledger that represents a transparent and verifiable truth. In the Bitcoin project, the rhetoric used when engaging newcomers or outsiders is that of a purely algorithmic system that provides at each moment a snapshot of the public ledger, telling us who owns what bitcoins. The ledger, at its most rhetorically abstract, is a *synoptic picture*, capturing just the ‘accomplished event,’ the movement of bitcoins from one user to another. In this sense, it is a very real attempt to truly represent the world.

But being and becoming are always entwined (Helin et al., 2014), and a process approach exhorts us to look beyond representations to the processes by which things come to be. At one level, process is most visible in how Bitcoin emerged out of the anti-state, anti-bureaucratic logic that, as we have shown earlier, has a long history and was especially fashionable since the 1970s. Equally, it emerged out of the fetish for algorithms,

cryptography and the idea of replacing flawed human systems of authority with code-based systems, epitomised by Lessig's slogan that 'code is law' (Lessig, 1999). But process thinking also demands that we see the world in its multiplicity, which means we must shift from the macro to the micro, from broad discourses around bureaucracy and the nation-state to the intricacies of computer code.

At the level of code, algorithmic authority proves to be complex and multi-dimensional. To begin, the blockchain that is at the core of blockocracy, does not exist in a vacuum, but instead sits on a large ecosystem of internet applications, operating systems, protocols and rules. Blockchain-based networks operate on the Internet and ultimately depend on protocols like TCP/IP, DNS, EGP, BGP, and HTML, each of which effects its own form of control (Galloway, 2004). These protocols are distinct from the bitcoin protocols that miners follow in validating and recording transactions on the blockchain. Further layers also exist, such as the 'decentralised apps' (DApps) that run on top of, and integrate with, the blockchain. Bitcoin, in this sense, is a decentralised app that sits on the blockchain which in turn sits on Internet protocols (De Filippi, 2018). The Ethereum blockchain takes this a step further, as it is a blockchain with a built-in Turing-complete programming language that allows anyone to write decentralised applications with their own arbitrary rules for ownership, transaction formats and state transition functions. A DApp cryptographically stores all data in a publicly accessible decentralised blockchain; it offers a token or coin native to this blockchain; it is open source and operates autonomously, and uses a standard cryptographic algorithm to enable mining. Examples of DApps include Augur, Golem, Aragon, Sia, and DAOstack. In turn, a fourth infrastructural layer can be identified as an application (such as Sapien) that is deployed on top of a DApp (such as DAOstack) with its own distinct governance protocols.

Thus, at the level of code there are (at least) four layers of algorithmic authority sitting on top of, or embedded within, one another. Each of these layers creates order without law, implementing what is effectively a private regulatory framework, or what de Filippi and Wright (2018) refer to as *lex cryptographica*. The empirical investigation of the nature of power in this context, algorithmic authority, means we must focus on the *governance* of each layer. Here, we consider just the blockchain layer, but similar arguments also apply to the other three layers.

Following Reijers et al (2018), we distinguish two forms of governance. On the one hand, there is governance *by* the code – or *on-chain governance* – which refers to the rules and

protocols encoded directly into the blockchain's structure. On the other there is governance of the code – or *off-chain governance* – which refers to all other rules and decision-making processes that might affect the system .

In considering *on-chain governance*, theoretically there should be no need for a sovereign authority as long as the encoded process of rule-making and rule-enforcement – instantiated in the blockchain's consensus protocol – operates correctly. This is the strong rhetorical current in the Bitcoin culture which holds that human authorities, especially centralized ones, are untrustworthy and we should instead place our faith elsewhere. In such an approach, code is incorruptible whereas humans are very much corruptible. At heart, then, the Bitcoin project aims to replace 'social relations – the trust on which all forms of money depend – with machine code' (Dodd, 2018: 37). This viewpoint expresses a code-based materialism involving a 'potent discursive investment by Bitcoin users in the determinist mechanics of Bitcoin's code' (Maurer et al., 2013: 262). The algorithmic rules of Bitcoin are encoded in the software, which is open source and viewable to all users, and any attempts to manipulate the source code or the blockchain are transparent to vigilant users. In addition, the activity of the network is also visible on the blockchain, which is public. As Lessig puts it, 'The code in cyberspace – the software – can enforce its control directly' (Lessig, 1996: 899). Thus, the blockchain as code is neither a text, nor a metaphor, nor a representation of the truth, but is instead a material, active technology. It is both an ever-changing output *and* a structuring, animating protocol.

One way of understanding the blockchain's active nature is to see it as a *quasi-object*, in the sense described by Michel Serres (1982: 225). He takes a football as his paradigmatic example of a quasi-object. A football is not an object, because what it is and what it does depends on how and where it exists in the world. Stored in a locker before a game, it has neither meaning, function nor value, but in play it is a quasi-object, defining and mutating collective and individual identities, subject, objects and possibilities. Similarly, the blockchain is a quasi-object that designates individual and collective subjects who could not be what they are in its absence. Like a football, the blockchain must be in play, in action, enacting, making subjects and objects. It works to connect actors, but its designed volatility means that it, the actors, and the overall system are always *in play*. It is no coincidence, therefore, that Bitcoin is in many ways a game and is infused with concepts from game design (Kavanagh et al., 2019).

In considering *off-chain* governance, we draw on Reijers et al (2018) distinction between two different types of off-chain rules: *endogenous rules*, which are the rules adopted by the community to maintain and develop the blockocracy's functionality, and *exogenous rules*, which are rules imposed on the community by a third party (e.g. national laws, technology standards, etc.). We will discuss each of these in turn.

Looking first at *endogenous rules* highlights a paradox at the heart of Bitcoin. Bitcoin's explicit aim and design is to encode its mechanics as a set of on-chain, asocial rules; paradoxically, this image of algorithmic authority depends on a community, the social world of Bitcoin, to sustain itself. Bitcoin depends not just on the technical infrastructure – which is important, of course – but ultimately on the web of trust established by all the participants, the community (or society) of Bitcoin users. As Dodd stresses, 'Bitcoin is arguably a social movement as much as it is a currency' (p. 41). Indeed, Bitcoin's anti-politics *is* its politics, and the articulation of the values of algorithmic governance is the process through which the community bonds (Maurer et al., 2013; Kostakis and Giotitsas, 2014).

For the most part, the project is governed by a small set of core developers who gained their position through their coding contributions and have been informally habituated into leadership roles. They work in tandem with a powerful cohort of miners to oversee the maintenance of the network, under the watchful eye of the community, who engage in constant chatter about the direction of the project. This social world of Bitcoin is a varied world, consisting of gossip about community members, speculations about the price, or arguments over technical matters. This is the everyday world members will actually come to inhabit as they discuss a future that will come; it is also an on-ongoing community dialogue, with code proposals or current events resulting in users reassessing their beliefs and actions. While the technical rhetoric may claim Bitcoin is an attempt to replace the messiness of human interaction with a technical protocol, to organize human behaviour according to a codified set of rules, they are ultimately norms that the community can, if required, reshape. The codebase acts as a conceptual map, the 'institutionalized categories' (Tsoukas and Chia, 2002: 577) that the Bitcoin community draws upon to guide their actions, but they are not immutable; they are always potentially adaptable and can be altered in response to local concerns. Thus, blockocracy is routinely ironic and paradoxical, as, notwithstanding the rhetoric of immutability, as novices become exposed to and constituted by blockocracy, they

become attuned to the performative realities, to what occurs *between* the seemingly algorithmic relations.

Off-chain governance is a contested domain, animated by two main ideologies or ‘techno-imaginaries’ (Swartz, 2018). One group are the cypherpunks, who prefer to focus on digital privacy concerns, while the crypto-anarchists are more focused on libertarian, economic concerns. While these positions are essentially incommensurable, they are still loosely held together by a shared belief in decentralized algorithmic authority over central authority.

The contested nature of off-chain governance, and how it differs from on-chain governance, is well illustrated by the case of the DAO, or ‘decentralised autonomous organisation’. In essence, a DAO is a code-based system of ‘smart contracts’ operating autonomously on the (Ethereum) blockchain. A DAO can have an internal capital system, based on virtual tokens or coins, that allows investors to fund and manage new ventures on the Ethereum blockchain. In theory, complex business decision-making practices could be encoded in the smart contracts, obviating the need for off-chain governance, or conventional authority structures such as a management team or board of directors. The DAO was launched in April 2016 and, after the largest crowdfunding campaign in history, raised over US\$150 million. By June, the DAO code was attacked by an individual who exploited a flaw in the code to drain the fund of millions of dollars worth of tokens. Quickly, the community, the DAO, and indeed the wider Ethereum project, was in crisis. One solution was a ‘hard fork’ that would effectively erase the event from the ledger, though this would run completely counter to the idea of smart contracts and an immutable ledger. Others argued that the DAO was defined by its code and that, since ‘code is law’, any attempt to block the attacker would be unethical and contrary to the ideology of a decentralised autonomous organisation. Within a few weeks, the on-chain algorithmic authority was trumped by, not least, the charismatic authority of the Ethereum co-founder, Vitalik Buterin, who successfully advocated that a hard fork version of the Ethereum software be developed and released, effectively killing the DAO (DuPont, 2018).

We now turn to the governance of off-chain *exogenous rules*. These are rules that an external third party imposes on the community (the Bitcoin community in this case), which the community must abide by, even though its members are not involved in either formulating or implementing the rules. Examples of exogenous rules include national and supranational laws, statutory regulations, technical standards, legal contracts, and the like. In large part,

these rules are produced by rational-legal authority, which is why exogenous rules crystallise the moment where blockocracy meets bureaucracy. What we find is that the two forms of authority – algorithmic and rational-legal – make for uneasy bedfellows, as virtual currencies present major challenges to regulators (De Filippi, 2014; De Filippi, 2016), while the crypto-libertarians, for their part, are fundamentally hostile to government regulation.

This cumulative volatility – on-chain, off-chain endogenous, off-chain exogenous – has meant that Bitcoin as a digital currency has radically shifted in meaning since its launch in 2009. Initially, Bitcoin was framed around the idea that markets, rather than states, determine money's true value, based on the ideology that social phenomena are derived solely from the motivations and actions of individuals. However, as new actors from Silicon Valley and Wall Street forged alliances with regulators and politicians, Bitcoin came to be redefined as an asset rather than money, while the underlying technology, the blockchain, came to be decoupled from the digital currency (Lawrence and Mudge, 2019). Indeed Bitcoin, as a particular form of money, is a good illustration of a quasi-object, as money has no inherent social or political meaning, but is instead infused with different and variable meanings depending on the relational and historical context (Zelizer, 1997).

We conclude this discussion with some brief comments on blockocracy's temporality, since time is so integral to process thinking. What we find is that blockocracy contains and is constituted by multiple temporalities. 'On-chain', the blockchain encodes a distinct temporality – ledger time – as each block in the blockchain contains a timestamp, a cryptographically secure and indelible marking of the time (Narayanan et al., 2016: 31). Ledger time is a particular form of clock time, Unix time, which is the number of seconds elapsed since 00:00:00 Thursday, 1 January 1970, Coordinated Universal Time (UTC), minus leap seconds. Each transaction and each block are indexed in the order of the overall blockchain through cryptographic indices, which the chain uses to establish a relentlessly rigid chronological linearity. The cryptographic indices further chain the blocks to one another in reverse sequence, reaching all the way back to the original block, known as the Genesis block (Antonopoulos, 2014: 28). Just as clock time works to put a structured temporal form on human facticity, ledger time puts chronological form on the extraneous and messy interactions occurring 'off-chain.' Ledger time is the privileged time of a community intent on disintermediating corrupt human institutions from the money system and replacing

their messiness with an algorithmically pure ruleset. It is a time of linear cause and effect, a temporality that reduces complexity in the service of objective representation.

If time, on-chain, is best understood as ledger or clock time, off-chain is characterised by a very different temporality. Off-chain is a zone of contestation, ambiguity, and indeterminacy, full of the drama characteristic of human societies. And perhaps more so, as the world of cryptocurrencies and ICOs is riven with controversy, hype, gambling, argument, dissimulation, crises, success, failure, scams, illegality, risk-taking and radical innovation. Temporality in such a dramatic world is the antithesis of clock time. Here, we will just draw on Gurvitch's (1964) argument – based on Bergson's original ideas – that there are eight different varieties of social time: enduring, deceptive, erratic, cyclical, retarded, alternating, time pushing forward, and explosive time. Full of life, blockocracy is full of these forms of time.

5. Unpacking the differences

In this section we analyse how blockocracy and bureaucracy differ from one another. In *Economy and Society*, Weber (1921/1978: 956–1005) depicted an idealised form of bureaucracy, which, even though it is not found empirically, provides a useful comparator for analysing and understanding blockocracy (which is also an ideal type). Weber identified the following characteristics of modern bureaucracy.

First, bureaucracies are associated with 'official *jurisdictional areas*,' which are generally ordered by laws or administrative rules (p. 956). These rules 'are more or less stable, more or less exhaustive, and ... can be learned... The reduction of modern public administration to rules is deeply embedded in its very nature' (p. 958). Rules imply the authority to give the commands, which is 'distributed in a stable way and is strictly delimited by rules concerning the coercive means, physical, sacerdotal, or otherwise which may be place at the disposal of officials'. This official business is conducted on a continuous basis, and only qualified persons are employed to undertake these duties. Together, these elements constitute a *bureaucratic agency* in the public sector, or a *bureaucratic enterprise* in the private sector. Such agencies are permanent, with fixed jurisdiction.

Weber argued that bureaucracy is only fully developed in the modern state, while in the private economy it is only in the most advanced institutions of capitalism. While quasi-bureaucratic structures existed prior to modernity, in these cases the ruler typically executed

‘the most important measures through personal trustees, table-companions, or court servants. Their commissions and powers are not precisely delimited and are temporarily called into being for each case’ (p. 956).

Blockocracies share some of these characteristics. The notion of a ‘jurisdictional area’ seems to apply, if the mining network defines the blockocracy’s boundaries. Rules, especially those rules encoded into the blockchain’s structure and consensus mechanism are also fundamental to a blockocracy, which is also envisaged and designed to operate on a continuous basis and have the same permanence as a bureaucracy. However, activities are not ‘assigned as official duties’ – anyone with the right equipment and motivation can become a miner, for example – while the authority to give commands is not distributed in a stable way.

Second, Weber describes bureaucracy’s hierarchical structure, where there is a

clearly established system of super- and sub-ordination in which there is a supervision of the lower offices by the higher ones. Such a system offers the governed the possibility of appealing, in a precisely regulated manner, the decision of a lower office to the corresponding superior authority. With the full development of the bureaucratic type, the office hierarchy is *monocratically* organized (p. 957, original emphasis; the term ‘monocratically organized’ means that each individual is supervised by another individual of higher rank).

The nature of activities at each level is precisely delineated in a bureaucracy, and, by design, a ‘higher’ authority will not do tasks allocated to a ‘lower’ one. To ensure this, ‘once an office has been set up, a new incumbent will always be appointed if a vacancy occurs’ (p. 957). These notions are alien to blockocracy, where is no clearly established hierarchy, no monocratic supervision, no formal appeal system, and no stable hierarchical division of labour. Miners operate in a flat organizational structure where authority emerges through computing power, though a centralising logic is evident from the emergence of powerful mining pools.

Third, bureaucracies are centred on *written* documents and an office (the French word *bureau* means desk or office):

The management of the modern office is based upon written documents (the ‘files’), which are preserved in their original or draft form, and upon a staff of subaltern officials and scribes of all sorts. The body of officials working in an agency along with the respective apparatus of material implements and the files makes up a *bureau* (in private enterprises often called the ‘counting house,’ *Kontor*) (p. 957, original emphasis).

Writing is still important in a blockocracy, but it now takes a particular form as code. But the bureau – from the French word for desk or office – is no longer central, which is why blockocracy’s primary metaphor is the block (from the blockchain).

Fourth, Weber focuses on the bureaucratic official and how this person comes to ‘hold’ an office in a bureaucracy. He sees an office as a ‘vocation’, requiring a ‘prescribed course of training, which demands the entire working capacity for a long period of time, and in generally prescribed special examinations as prerequisites of employment’ (p. 958-9). A bureaucratic position is neither the property of the official nor a source of income ‘to be exploited for rents or emoluments in exchange for the rendering of certain services...Rather, entrance into an office, including one in the private economy, is considered an acceptance of a specific duty of fealty to the purpose of the office (*Amtstreue*) in return for the grant of a secure existence’ (p. 959). This means that the official should be ‘devoted to *impersonal* and *functional* purposes’ (ibid., original emphasis) rather than be personally loyal to an individual. Accordingly, official activity must be segregated from the sphere of private life – ‘Public monies and equipment are divorced from the private property of the official’ (p. 957) – which is why the bureau is separate from the official’s private domicile.

We find little of this in a blockocracy, where there is no sense that official activity and private life are – or should be – separated, or that the official should be devoted to the impersonal and functional purposes of the office, or that the bureau should be separate from the official’s private domicile. Neither are qualifications or a prescribed course of training of much importance in a blockocracy, and there is scant evidence of individuals seeing their position in a blockocracy as a ‘vocation’. That said, blockocracies are founded on the notion of impersonality, in that Bitcoin was designed to protect anonymity, while mining is based on impersonal protocols. Indeed this commitment to anonymity is why bitcoin has been an attractive currency for buying and selling illegal goods.

Fifth, the notion that an office might provide the official with a private source of income is especially anathema to the concept of modern bureaucracy. Instead, the bureaucratic official is destined for a career within the bureaucracy’s hierarchical order, moving progressively

from less important and less well-paid to higher positions. Thus, clear pay scales are important, with the official receiving a

monetary compensation in the form of a salary, normally fixed, and the old age security provided by a pension. The salary is not measured like a wage in terms of work done, but according to “status,” that is, according to the kind of function (the “rank”) and, possibly, according to the length of service (p. 963, original emphasis).

Thus, a modern bureaucracy presupposes a prior money economy, and indeed money economies and bureaucracies seem to have co-evolved: ‘without a money economy the bureaucratic structure can hardly avoid undergoing substantial internal changes, or indeed transformation into another structure’ (p. 964). Moreover, bureaucracy presupposes a continuous source of revenue to sustain it over the longer term.

These type of salaried, career-focused, permanent, bureaucratic officials do not feature in the various blockocracies that have emerged since Bitcoin was launched in 2009. Contrary to bureaucratic principles, but in line with Bitcoin’s libertarian belief in methodological individualism, miners are essentially free-market entrepreneurs whose income is based on how successful they are at the mining game. Bitcoin was very much dominated by individuals – and a belief in individualism – during its early years, but from about 2014 onwards corporations came to play an increasingly important role, and this led to an infusion of bureaucratic practices. First, mining pools – which are invariably corporations – emerged as miners began to cooperate. Second, existing corporations sought to apply the blockchain technology to effect intra- and inter-corporate process improvements, especially in financial services (Huillet, 2019). Unlike the public, open-source blockchains underpinning Bitcoin and other cryptocurrencies, these corporations focused on creating private or ‘permissioned’ blockchains, limited to a small number of identifiable corporate actors. These blockchains, which are embedded in bureaucratic private enterprises, are little more than extensions of a corporation’s Enterprise Resource Planning system, and so we can best see this as corporate bureaucracies working to maintain themselves through appropriating and ingesting some elements of blockocracies.

6. Conclusion

In this paper, we have argued that a new mode of domination, algorithmic authority, has emerged, and that, similar to Weber’s other modes, it is associated with distinctive organisational forms. We have identified and focused on the organisational form associated

with cryptocurrencies, which we have called blockocracy. In line with this sub-theme's call for papers, we have sought to understand the processual nature of power in this particular instantiation of algorithmic authority. Hence, our focus has been on the becoming of blockocracy. At one level, we have described how blockocracy emerged out of (a) a long-standing hostility to bureaucracy; (b) the control revolution that began in the late 19th century; (c) the recognition, in the late 20th century that computer code can regulate conduct similar to legal code; and (d) the increasing adoption of algorithms, and AI algorithms in particular, in many different contexts.

In the next part of the paper we shifted our level of analysis to the code that underpins blockocracy. We identified four layers of algorithmic authority, and, focusing on the governance of the blockchain layer, we distinguished between off-chain and on-chain governance. With respect to the latter, we further distinguished between two different types of off-chain rules: endogenous and exogenous rules. At one level, on-chain governance is an attempt to realise a representationalist ontology, as evidenced by the rhetoric of immutability that infuses cryptocurrencies. However, we argued that what the blockchain is and what it does depends on how and where it exists in the world. The blockchain, far from being immutable, is a dynamic quasi-object, defining and mutating collective and individual identities, subjects, objects and possibilities. Moreover, off-chain governance is largely a socio-political domain, where those beliefs that were instrumental in initiating Bitcoin have been progressively supplanted as new corporate actors commandeered elements of the technology.

Finally, we systematically compared Weber's seminal depiction of bureaucracy with our emerging understanding of blockocracy. What has become clear through this analysis is that blockocracy is indeed a distinctive organisational form, and one that warrants further study and critique by organisational scholars.

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