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The Dissensus Protocol: Governing Differences in Online Peer Communities

Jaya Klara Brekke[1]*, *Kate Beecroft*[2] *and Francesca Pick*[3]

[1]Durham University, Durham, United Kingdom, [2]Greaterthan Collective Ltd., Network, Italy, [3]Greaterthan Collective Ltd., Network, Spain

Peer-to-peer networks and protocols have inspired new ideas and ideologies about governance, with the aim of using technology to enable horizontal and decentralized decision-making at scale. This article introduces the concept of "dissensus" from political theory to debates about peer governance in online communities. Dissensus describes the emergence of incompatible differences. Among peer-to-peer technologies, blockchain stands out as a set of ideas that explicitly seek to resolve dissensus through consensus protocols. In this article, we propose dissensus as a "protocol" for foregrounding the often sidelined yet productive aspects of incompatible differences. The concept highlights that there might not always be consensus about a consensus algorithm, and that indeed, dissensus is the precondition for new possibilities and perspectives to emerge. We discuss the concept in relation to the histories of governance ideas in blockchain, namely, a "materialist," "design," and "emergent" approach. We then describe moments of dissensus in practice through two cases of online communities, Genesis DAO and Ouishare, discussing their different ways of recognizing and navigating dissensus. Finally, we give a critical overview of consensus algorithms, voting, staking, and forking as the mechanisms that make out blockchain governance ideologies. In conclusion, we argue that dissensus can serve as a useful concept for pointing attention to governance as it is conducted in practice, as historically and culturally specific practices, rather than as a problem to be solved through supposedly universal mechanisms.

Keywords: dissensus, peer-to-peer governance, blockchain, DAO, political theory, horizontal decision-making, decentralisation

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Nathan Schneider, the University of Colorado Boulder, United States
Wessel Reijers, European University Institute (EUI), Italy

***Correspondence:**
Jaya Klara Brekke
jaya@magmacollective.org

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INTRODUCTION

This article introduces the concept of "dissensus" drawing on the political theories of Rancière (2015) and Mouffe (2005) proposing it as an analytical "protocol" for foregrounding how incompatible differences are negotiated in peer-to-peer online communities. Dissensus describes a rupture to consensus (Rancière, 2004; Rancière, 2015). It therefore points to the possibility that incompatible positions might arise, forcing either significant negotiation and transformation in order to accommodate for these, or a split and exclusion. In the context of technology, dissensus, for example, entails foregrounding the conflicting possibilities in the context of algorithmic decisions (Crawford, 2016), or, as we discuss in this article, the possibility of many different and conflicting development pathways. The concept also points to the limits of formalized governance (whether algorithmic or parliamentary) as the established means to negotiate disputes and conflict, because

governance methods and mechanisms might themselves become a site of dissensus, forcing significant negotiation and transformation of the given project, or a "fork." Rather than a problem to be solved, the potential for dissensus to arise is better understood as an inevitable and necessary precondition for different perspectives and possibilities to emerge, and therefore for transformation, growth, and change. In the work of political theorist Mouffe, it is nothing less than the necessary preconditions for a free society (Mouffe and Laclau, 1998). The concept thereby also points to the precise limits of efforts that approach governance as a problem to be solved in any final manner through mechanisms, incentives, and algorithms.

Network technologies, peer-to-peer and latest blockchain, have inspired and been inspired by the possibility that such technologies might do away with the need for hierarchical forms of governance and enable new forms of horizontal self-organizing at scale (Oram, 2001; Atzori, 2017; Bauwens et al., 2019). Instead of an authority determining the rules of engagement, this would be done by and through the network itself. Arguably, the communities forming around peer-to-peer technologies have positioned themselves as an answer to a question recently posed by Gorwa (2019), 855, namely, "How should platforms be governed?" Instead of a corporation running, owning, and controlling network infrastructures and applications, these represent efforts toward defining new types of network-enabled self-governance. These experiments therefore sit within a broader field of online communities explicitly engaging with questions of governance, ownership, and value, including the sharing economy and platform cooperativism (Scholz, 2016; Scholz and Schneider, 2016; Pazaitis et al., 2017), and indeed in a longer history of decentralized, horizontal, and network forms of organizing that can be fruitfully traced to social movements (Maeckelbergh, 2012).

Prevalent among communities forming around blockchain technology more specifically is an emphasis on relegating governance to automated enforcement by a protocol, coordinating the otherwise free actions of actors in the network. More than a technology, blockchain has come to represent a powerful narrative and governance ideology (Reijers and Coeckelbergh, 2016), promising the possibility of automating governance, understood as the coordination of individual actions at aggregate scales. This idea has manifested in different approaches to governance in blockchain communities, which we discuss in part one of this article as *materialist*, *designer*, and *emergent* ideas, and approaches to governance relating these to three evolutions of governance theory (Mayntz 2003). Blockchain is a particularly fruitful context for discussing dissensus as it is navigated by online communities because, as an ideology, it so explicitly seeks to achieve consensus through technological arrangements. Automating certain governance processes can be a welcome relief, minimizing the need for repeated actions. But when it is understood as neutral mechanisms for resolving dissensus and solving governance once and for all, it causes significant problems in theory and practice: in theory, it causes an issue of infinite regression, whereby dissensus about a consensus algorithm, for instance, then can only be solved through another neutral consensus algorithm, which might in turn again give rise to dissensus about this new consensus algorithm, and so on. In practice, when protocols and algorithms are considered neutral, this leads to efforts to coordinate and resolve an increasing spectrum of activities through these. Because the protocols, mechanisms, and algorithms are considered neutral, activities beyond the scope of such forms of automated governance tend to be either invisible or rendered undesirable, leading to the need to further expand the remit of the same protocol and market-based approaches. This has led curiously to groups forming around governance for governance sake, and "governance maximization," rather than purported aims of "governance minimization" (Ehrsam, 2020).

Part two comprises a discussion of dissensus in relation to two cases of peer-to-peer online communities, Genesis DAO and Ouishare, who each has formed around the possibility of technology to scale nonhierarchical forms of governance and organizing. Governance technologies are iterative efforts, evolving in relation to and alongside communities of people using and developing technologies, and thus occasionally facing dissensus and requiring the negotiation of incompatible differences. This part comprises reflections on the concept of dissensus in relation to experiences of the two authors, Pick and Beecroft, as participants in the Genesis DAO from early in the project, and Pick's role as a core organizer in Ouishare. Both held part-time paid roles with DAOstack as facilitators of the community at the time, and as a result hold GEN tokens, but neither work with DAOstack or hold positions at Ouishare any longer.

In part three, we introduce some of the main mechanisms that make up the approaches to governance in blockchain communities, namely, consensus algorithms, voting, staking, and forking, and what has become the dissensus protocol *par excellence*, namely, the "hard fork." We conclude with a broader discussion of the concept and its relevance for online communities. The concept of *dissensus* points to the continued possibility that there might not always be consensus about the consensus mechanism itself. There are therefore limits to solving governance through technical means. First, because governance entails more than mere coordination and resolution to conflict between predetermined individual behaviors and preferences—it also involves deliberation, negotiation, and transformation, and the formation of norms, cultures, and understandings that are often better navigated "off-chain," so to speak. And second, because governance processes and technologies themselves might become the site of conflict. Dissensus as a concept therefore serves to place governance tools back into their social and historical contexts, as particular, not universal forms of negotiating difference. The aim of introducing dissensus then is to make evident the cultures, group processes, vocabularies, and dynamics that give rise to governance forms and to foreground the ever-present possibility for things to be different.

PART ONE: INTRODUCING DISSENSUS

For political theorist Chantal Mouffe, it is essential to not assume consensus as the basis of a functioning society: "if we want people

to be free, we must always allow for the possibility that conflict may appear and to provide an arena where differences can be confronted" (Mouffe and Laclau 1998). Mouffe refers to this as "agonism" (Mouffe 2005, 19–21), which we for the sake of neat articulation in this article call "dissensus," drawing on another political theorist Rancière (2004), Rancière (2015). Rancière describes dissensus as forcing a "redistribution of the sensible" (2004). The "sensible" refers both to what can be sensed and what is broadly perceived as sensible ways of doing things: who can go where at what times, or speak in which kinds of forums, what kinds of activities should happen at which times, and so on. *Dissensus* is a rupture or challenge to consensus: a differing perspective or way of doing things emerges that is incompatible with existing arrangements to such a degree that arrangements have to be renegotiated in order to accommodate for the difference. If such renegotiation is not possible, the incompatible difference will have to be rejected, excluded, or "forked" in the case of code.

In the work of both Mouffe and Rancière, agonism and moments of dissensus are considered properly *political*, which they contrast with *politics*: a professionalized discussion of known differences within accepted frameworks and languages such as parliaments (Mouffe, 2005; Rancière, 2015). This distinction between *politics* and *the political* points to the difference between the management of disagreements that are already comprehensible and the emergence of differences that do not fit within existing terms of negotiation. Related, Mouffe therefore takes issue with the thinking on democratic governance of both Rawls and Habermas, for their assumption of a rational agent able to argue its case in the proper manner of politics (Mouffe and Laclau 1998). Distinguishing between *politics* and *the political* means that there will always be a limit to what can be "solved" and encoded in advance. The always present possibility that incompatible differences might emerge means that governance cannot be reduced to a minimum set of known axioms as a final resolution—because the axioms themselves might turn out to be contentious. To put it in blockchain terms, there might not always be consensus about the consensus algorithm.

Drawing so explicitly from political theory in order to make sense of technological dynamics is not without precedent. Kate Crawford, a theorist of machine learning and artificial intelligence, draws on Mouffe's notion of agonism in a discussion of the operations of algorithms. "Algorithms may be rule-based mechanisms that fulfill requests, but they are also governing agents that are choosing between competing, and sometimes conflicting, data objects" (Crawford, 2016, 86). In Crawford's work, the intention is to foreground the aspects of algorithmic operations which are not entirely predetermined but that are contentious and therefore entail openings and decisions where things might take a different turn. Crawford thereby points to where agonism can also take place, in the context of a purely technical arrangement without explicit human decision. Here, we discuss how dissensus is navigated in relation to protocols that were designed to resolve it through the technical means of algorithms, assuming these to be beyond the political. A focus on dissensus thereby offers openings into what could, might have been, or might be different, also about and by protocols and algorithms.

In the context of governance discussions in the digital realm, Lessig (1999) described four forces that regulate individuals' actions, namely: 1) law, 2) social norms, 3) markets, and 4) architecture/technology—in the case of the Internet, code. This led to Lessig's famous maxim "code is law," taken to heart by many digital communities, and, in particular, by those attracted to blockchain-based online communities (De Filippi and Wright, 2018). The attraction was that anyone who could code would essentially be able to write their own governance rules for their own digital spaces. Digital networks and the idea of direct, unmediated interactions are contrasted with forms of governance imposed by a third party, including an authority or government, to impose sanctions, and block or manipulate communications. Instead, networks were understood to enable forms of self-governance. 'Self-governance' in the context of network communities in the meantime has come to signify several different things. At times, it refers to the ability of online communities to determine and enact their own rules and processes according to their own priorities. At other times, it refers to self-regulating systems whereby networks, protocols, and applications are understood to coordinate actions between otherwise distributed and isolated actors, facilitating emergent forms of systemic organization. In practice, oftentimes, both of these understandings are at play, even in the same projects. In both, the idea is that simple network protocols will minimize the need for governance as imposed rules by a third party, instead enabling intrinsic forms of organization.

Dissensus and the Evolutions of Governance Ideas and Ideologies in Blockchain

The histories and ideas of governance forming through blockchain technology are particularly powerful for discussing the relevance of dissensus as a concept, because blockchain so explicitly came to be understood as a technology for resolving dissensus and settling differences by technical means—initially as a functional necessity of ensuring coherence in Bitcoin transactions, but then also expanded as an ideology to many other realms (Atzori 2017; Reijers et al., 2018). Blockchain emerged out of a longer history of peer-to-peer technologies with the promise of disintermediating digital payment networks and applications. Rather than having to rely on financial institutions and major platform providers who could control the conditions of interactions, the intention was that these could be replaced by horizontal peer-to-peer networks, governed through consensus algorithms. A decentralized network topology would ensure that no one entity can control the network; incentives would organize and secure the system by rewarding those who contribute and making attacks expensive; and cryptography would be used to secure, organize, and enforce consensus across the network. Such networks could then be self-governed by those operating them, with overall coordination achieved by adhering to simple protocols, encoding and

automating rules, and the arrangement of consensus between nodes.

Governance more broadly is defined and discussed in governance theory as having three evolutions (Mayntz, 2003; Klijn and Koppenjan, 2012). These evolutions describe different ideological perspectives on the scope and remit of governance, which to a large degree are reflected in the ideas and ideologies around blockchain. Governance was initially considered the process of deciding which rules and regulations will be enacted by a sanctioned authority in a top-down manner: usually the state to the people (Mayntz, 2003; Kim, 2006). This resembles early governance ideas in Bitcoin, now referred to as "bitcoin maximalism," where the absolute sovereignty of a state would be replaced by the absolute sovereignty of a neutral technical architecture of consensus algorithms and code. A second evolution of governance theory in the 1970s emerged as a critique of the steering actions by political authorities shaping socioeconomic processes and structures (Mayntz, 2003). And so today, governance theory is primarily concerned with how actors organize and decide about what they do in a *politic* (Stoker, 2019). Governance is considered a feature of any group or organization who have something in common that they need to govern, referring to the development of various governing styles in which *boundaries between* and *within public life* and *business* have become blurred (Rosenau and Czempiel, 1992; Stoker, 2019). This second evolution is characterized by the idea of markets influencing and directing social and political life. It points to the creation of a structure which cannot be imposed but which is the result of the interactions of a multiplicity of governing and influencing actors (Kooiman and Van Vliet in Stoker 2018). This resembles a second stage in Bitcoin governance ideologies, following a number of forks in the Bitcoin and Ethereum protocols. Rather than a Consensus protocols became a socio-technical design space expanding into experimental fields of cryptoeconomics, token design, mechanism design and more, in contrast to Bitcoin maximalism, where the consensus protocol is assumed as absolute universal sovereign. A third evolution of governance theory is looking at the horizontal, self-organizing aspects of networks, gaining increasing prominence in the wake of the many reports of government and market failures (Torfing, 2005; Kreutler, 2018). Here, governance is being analyzed and developed in the context of horizontal and reciprocative means of coordination where people participate in networks or groups to decide about what to do and how to do it (Kim 2006). It incorporates the impacts of networks and insights from network theory (Klijn and Koppenjan 2012), referring to what happens when groups of all kinds seek to achieve something together through networks of interdependent actors. In blockchain governance, this relates to practices where networks, protocols, and markets have emergent properties, and are part of and affected by forms of social consensus arising from interactions between different stakeholders. Below, we discuss these different stages as a *materialist*, an *emergent* and a *design* understanding of technologically mediated forms of governance.

Materialist Governance

Philosopher Grosz discusses the long-standing philosophical debates about the relationship between matter and the immaterial and immanent realm: "Materialism holds that everything is matter, commonly considered inert, passive, regulated by mechanical principles" (Grosz, 2018, 15). Blockchain, especially in the Bitcoin context, represents a *materialist* solution to governance, with matter understood as an objectively known condition in contrast to unknown subjective interests; by shaping an external material reality, a given process is no longer set in motion through a person's decision, but rather has been engineered, encoded, and inscribed to take place independently of active subjective consideration. It happens "automatically" as a material fact. Maurer et al. have noted, "[d]espite the supposed immateriality of digital bits of information [Blanchette 2011], matter itself is very much at issue with Bitcoin, both in how it is conceptualized and in how individual Bitcoins are 'mined'" (2013). The materialism that is evoked in the concept of mining has both monetary and organizational aims. The monetary ideas that liken Bitcoin to gold have been discussed and critiqued at length elsewhere (Maurer et al., 2013; Bjerg, 2016; Golumbia, 2016; Brunton, 2019). Here, we want to highlight how gold is also understood in governance terms as a form of material disintermediation of authority. In what Maurer et al. critique as "digital metallism," gold is assumed to have an intrinsic value, with the idea that it thereby can "disintermediate" who gets to determine value from an institution to the inherent material qualities of the metal itself (2013). As Musiani et al. also note, in Bitcoin, governance itself was considered resolved through the material facts of a purely technical arrangement (Musiani et al., 2017), and in the process, conveniently sidelining the decisions involved in constructing and running the infrastructure.

The extent to which material artifacts, infrastructures, and matter can be considered independently of social, political, or economic processes comprises longer standing debates in philosophy, dealt with most effectively in Science and Technology Studies (STS). In answer to technological determinism, Langdon Winner, in a famous 1980s paper, wrote "[T]hose who have not recognised the ways in which technologies are shaped by social and economic forces have not gotten very far" (Winner, 1980, 122), and in the very next paragraph conversely also takes issue with anyone assuming that material things are solely determined through social processes. Instead, both the social and the technical are implicated in one another, although to varying manners and degrees depending on the given situation. Technological algorithms, considered as a material arrangement, can in this sense be considered processes that have already been socially assumed or agreed upon as necessary and legitimate and therefore made to happen "automatically." And such settled arrangements might in unpredictable and unknown ways erupt again as a political question—when something breaks down or the environment and context shift in ways that might benefit some actors over others (Edwards, 2003). Indeed, for all the technological and material determinism that is mobilized for the ideological project of Bitcoin, "the social dynamics of community and trust—evident in the prose and poetry produced by Bitcoin users—can still be heard through this practical materialism" (Maurer et al., 2013, 3).

Drawing exactly on such a nuanced approach offered by the field of STS, Musiani et al. foreground the "sociotechnical controversies" of Bitcoin (2017), highlighting how technical developments become politicized in ways that are hard to predict both the scope and scale of beforehand: "one can find in the short yet charged history of Bitcoin manifold such debates, where what seemed to be a technical issue ends up as a political problem" (ibid. 2017, 134). This was most evident in the much discussed Bitcoin scaling conflict and the Ethereum DAO hack between 2016 and 17 (DuPont, 2018; Reijers et al., 2018; Azouvi et al., 2019). The DAO was an attempt at creating a venture fund organization, governed entirely by code. In June 2016, 3.7 m Ethereum tokens, or $60 million USD equivalent, were stolen when an unknown person exploited a bug in the DAO code. Two groups emerged with dissenting views: what came to be called "DAO maximalists" strongly argued that "code is law" (in a misconstrued reference to Lessig (2000)) insisting that whatever was written should stand as unaltered, inalienable law, as had been promised. A second group sought to recover the funds, arguing that lessons should be learned and social consensus matters for how and whether the law of code should be changed. Following this event, the Ethereum community became intensely focused on the "governance problem." This combined with huge budgets that emerged from the initial coin offering (ICO) boom brought an explosion of "governance tech" companies such as DAOstack, Colony, and Aragon, with renewed intent on using blockchain for solving governance problems.

Design Governance

The Bitcoin scaling conflict and the Ethereum DAO exploit events caused blockchain communities to shift focus from assuming blockchain as having solved the need for governance to instead be considered a governance technology *par excellence*, a set of protocols and techniques that could be used for designing different types of governance systems. A "second wave" of DAOs continued to work on governance, now as a problem of incentive design. Incentives would be used as a design option for creating bespoke forms of social and economic organization. Drawing on game theory, incentives would be arranged, assuming people would respond in predictable ways, making individual behaviors align with an overall design objective (c.f. Titcomb, 2019). According to Thorpe, the cofounder of blockchain project Citizen Code, collaboration on this new free Internet would be "enforced by a consensus-based cryptographic protocol that ensures our aligned incentivization toward the expression of our personal and collective purposes" (Swartz 2018, 88). The design approach often draws on Austrian school economics, in which economic signals are considered neutral and nonhierarchical forms of governance (Brekke, 2020). (The market will do the work of coordination, as long as actors make sure to act in such a way to maximize financial rewards, and markets in the meantime can be designed to serve social purposes.) It is therefore also an approach that repeats many of the oft-criticized assumptions, not least that people are (or have to perform as) isolated economically rational actors who react to incentives in a predictable manner, that there are no market failures, and that external circumstances have no effects on the claims made about market operations. However, the design approach, rather than assuming a universal ideal form market, instead seeks to employ market dynamics as a set of design options for addressing various behavioral coordination aims. A well-designed market, or in this case cryptoeconomic system, would arrange the overall behaviors within a given network toward some outcome, for example, the continued funding of collective goods (Titcomb, 2019). The premise in short is that imposed rules can to a large degree be replaced with incentive designs that will produce predictable behavioral outcomes.

Nevertheless, code was considered the only neutral form of coordination, which motivated encoding an increasing amount of processes into such neutral coordination mechanisms. Debates, in particular in the Ethereum community, centered around what came to be known as "on-chain" or "off-chain" governance processes (Reijers et al., 2018). On-chain governance sought to resolve and enforce consensus by solving the problem again using blockchain, and entailed staking a certain amount of crypto-tokens as votes. These stakes would be formalized in a smart contract on a permissionless blockchain, which, if successful, would be automatically executed. In other words, governance continued to be approached as a problem needing a technical resolution, with the idea that code would automate and therefore minimize it. But if indeed code is law, then governance is not necessarily minimized by its inscription into code and algorithms; it has merely changed form. And indeed, we can see a mushrooming of code, algorithms and mechanisms as governance is increasingly translated into a new form rather than minimized. Off-chain governance, in contrast, emphasized the importance and inevitability of discussions and social norms beyond on-chain mechanisms as part of the governance process (Zamfir, 2017).

Emergent Governance

The design understanding of how protocols might solve governance often came hand in hand with the emergent approach. Here too, incentives feature as the main design strategy for adjusting and coordinating people's behaviors. Rather than top-down rule structures, incentives would enable social coordination, acting as distributed signals which would prompt emergent aggregate behaviors. Ehrsam (2020), one of the founders of the crypto-exchange Coinbase, argued for "governance minimization" through the use of protocols. Simple rules could be encoded into a protocol, for which governance would only be necessary for its upkeep. Ehrsam, expressing a general sentiment, critiqued governance as the unnecessary bureaucratization of processes through the imposition of rules from an authority or authoritative body. Instead, such governance could be minimized by establishing a core set of rules, encoded into protocols and incentives, around which people and processes would otherwise be free to do as they pleased. Such simple rules were also understood to give rise to complex aggregate behaviors and be a vehicle for coordinating forms of distributed intelligence.

Experiments with the adoption and encoding of concepts such as "stigmergy," a term that describes types of behavioral coordination in the natural world, most notably took place in the blockchain project Backfeed (Davidson et al., 2016; Pazaitis

et al., 2017). Termites, ants, and other insects leave traces in the environment that operate as signals for others that come along, passing on information that will encourage different actions. In the words of Bauwens and Manski, "ledgers, which account for transactions, are signals for material production; hence, through collaborative ledgers, we can also coordinate physical production and transactions" (Bauwens and Manski, 2020). Instead of being fully resolved, governance would instead be a matter of coordination, technologically solved through elaborate systems of incentives, signals, and protocols.

Approaches to social organization seeking to coordinate behavior *via* notions of objective mechanisms have longer and intertwined histories with branches of market economics (Scott 2014; O'Dwyer 2015; Campbell-Verduyn and Hütten, 2019). These therefore also often repeat a major contradiction in Austrian school economics: that a blockchain system (or perfect market) can produce predictable outcomes, while also arguing that these are self-organizing and have emergent or evolutionary traits. Both of these contradicting statements can be considered as design options rather than as truth statements, and constructed as true for specific limited circumstances and scales. However, this, in the meantime, is a very good argument for introducing an awareness of how dissensus arises and is negotiated. In brief, specific code, formulas, and techniques might produce predictable and repeated outcomes within a bounded context. But the effects of these predictable outcomes in different environments, and technical and social contexts are much less predictable, will vary, and might take on what some would want to call "emergent" or even "evolutionary" traits. This makes it paramount that such otherwise predictable techniques can be modified in response to contexts where they no longer have a desired outcome.

Following the events of The DAO, perspectives on governance in blockchain have become more nuanced. Rather than efforts being driven by an ideology of governance seeking a resolution to governance through automation, the focus has shifted toward protocols and automation being able to produce specific, dependable processes, what De Filippi, et al., 2019 call "confidence machine." As systems evolve, they evolve in relation to and through iterative processes, with those who build and use them. It is this iterative process that we would like to draw attention to as a question that does indeed, at various times, erupt into dissensus and require renewed negotiation of incompatible differences. What constitutes a desired outcome of a system, and how such an outcome should be achieved and at whose cost, can be highly contested matters, where the negotiations and the form they take are important in and of themselves.

PART TWO: DISSENSUS IN PRACTICE

The idea of simple network protocols enabling forms of self-governance has given rise to efforts to develop this approach for addressing problems of horizontal governance at scale. At times, the problem of scale is understood in terms of how to connect up communities and people across vast distances, enabling them to communicate, develop, and organize around issues—and to self-govern this process—seen in, for example, open-source software development (Fuster Morell, 2014) and platform cooperativism (Scholz, 2016). At other times, the issue of governance at scale is understood as an abstract coordination problem to be solved in and of itself, with attempts at designing aggregate behavioral patterns. Similarly, in the context of blockchain communities, DAOs are on the one hand a set of organizational tools that can be used by communities in order to more effectively organize, raise funds, and distribute resources across networks (Catlow, 2019). And on the other, for many DAO enthusiasts, automated network governance enables "hyper scalability" (Kreutler, 2020): large numbers of people who do not know and thus cannot trust each other modeled as rational agents coalescing around a shared mission to govern shared resources without a centralized authority (Honigman, 2019; Field, 2020).

We now turn to a discussion of two cases of online communities that have formed around what is perceived to be the unique capacities of networks to enable nonhierarchical forms of governance and coordination at scale. The cases discuss and reflect on specific events that took place within the *Genesis DAO* and *OuiShare*, two projects that have sought to use network technologies to scale horizontal and decentralized self-governance beyond an immediate locality. The discussion of these highlights a number of differences in the role of protocols and algorithms in governance and handling dissensus. Both projects have sought to use network platforms and protocols to establish forms of working consensus with the aim of enabling horizontal participation and decision-making at scale. And both of these online communities have developed extensive new terminology and cultures around ideas about governance and online behavior. Dissensus is dealt with very differently in each case, however. Genesis DAO emphasized on-chain processes, because blockchain is considered the technique for ensuring that horizontal decision-making processes can happen securely at scale. This meant that voting as an on-chain process became the primary means for expressing an opinion, while more granular and additional important information about disagreements and differences was sidelined. In the Ouishare example, dissensus gave rise to ongoing deliberation and discussion both on- and offline. The main organizing principles of the organization emphasized local autonomy which allowed broad differences to coexist, with the downside that it became increasingly hard to maintain coherence and alignment between different parts of the organization.

The reflections and insights on the Genesis DAO stem from authors Beecroft and Pick's two-year experience working in the community, both as active participants and contractors hired by DAOstack for their expertise in community building, collaborative fund allocation, and participatory group processes. The reflections and observations about Ouishare stem from Pick's involvement as a core member of Ouishare since 2012, through which she contributed to growing the global community and led many experiments around Ouishare's governance. She no longer holds a core role in the organization.

Genesis DAO

The Genesis DAO was one of the first decentralized autonomous organizations created after the DAO incident. It was formed by a

startup called *DAOstack* who raised $30 million equivalent in an ICO in May 2018. Its objective was to run experiments using their decentralized apps (Alchemy), protocol (Genesis Protocol), and crypto token (GEN) with a real community and real funds, and to finance the development of this technology ecosystem. DAOstack's governance mechanism, described in detail in their whitepaper (DAOstack, 2018), is called "Holographic Consensus" and combines voting, staking, and reputation. The ideal DAO is defined as "an entity that not only lives on the Internet and exists autonomously but also heavily relies on hiring individuals to perform certain tasks that the automaton itself cannot do" (Buterin, 2014). Humans are on the outside, with coordination taking place automatically from the inside by an algorithm. The essential concept is to program the required rules and decision-making of an organization into code on a blockchain, with the idea that it will minimize the need for governing roles (Mehar et al., 2019).

The Genesis DAO is a good example of a unique trait common to many DAOs, namely, that they comprise highly motivated groups that have formed around a set of ideas about governance, rather than governance being a means in order to achieve some shared mission. In other words, it was tool-centric and focused on one main action: allocating funds to proposals. It is unusual for people who are strangers to start making financial decisions together immediately without having time to develop coherence and trust. And this was in fact the very promise of projects like the Genesis DAO: that the technology would bypass the need to develop trusted relationships, meaning thousands of people would be able to coalesce around objectives, take actions, and even spend money together as a group.

As the centerpiece of the community, the design of the Alchemy app had a strong impact on how the group culture developed. Alchemy is an app for decentralized resource allocation through voting. In the case of the Genesis DAO, this tool-centeredness however created a self-referential dynamic: many people who joined were already convinced that DAOs were a solution to governance problems, and wanted to have a live experience of one. Having a simple concrete task—voting on fund allocation—was on the one hand catalyzing, because it encouraged clear lines of engagement; at the same time, the group seemed constrained by a focus on the functionalities, limiting the capacity for off-chain discussion and healthy dissensus. This manifested in an inability to "think outside the tool," resulting in the group having to relearn and establish norms for many things that might seem obvious in other contexts. For instance, the first version of Alchemy did not have a comment feature for proposals. This meant that participants simply went straight to putting up proposals (an irreversible action that you pay for in Ethereum gas cost) as well as voting, without any conversation or deliberation beforehand. This was often frustrating for proposers if their proposal did not pass, because they had no way of knowing why it was not accepted, had already paid, and had to repeat the process if they wanted to improve on it. One might expect that in such a situation people would start talking to each other about their proposals off-chain; this however did not happen naturally. Instead, it had to be proposed as an explicit, recommended norm that participants should have conversations about their proposals outside of Alchemy before submitting them. This development was at odds with a recurring debate raised by "DAO maximalists" in the group, who repeatedly advocated for interactions outside Alchemy to be minimized for the majority of interactions to take place on-chain. In other group contexts, the idea that one would vote on something without having ever talked about it as a group is quite unusual. Indeed, voting tends to be a last resort if agreement cannot be reached otherwise.

Norms and new product features were developed to support higher group coherence, but the Genesis DAO continued to be unconducive for surfacing nuances and disagreements. Although the experiment generated valuable insights about DAO implementation, it also lacked a clear purpose and objectives that might otherwise have motivated participants to work through disagreements, beyond "Supporting a healthy GEN-Economy."[1] Since many voters remained anonymous, proposers often did not know who voted against their proposal, creating an additional barrier to engaging in a discussion. The fact that decisions are executed automatically, no matter whether conversation takes place or not, generally had the effect of discouraging it. Instead, it was all too easy to disengage or disappear when dissensus arose. Low proportional voter participation led to much speculation about what a "no vote" meant. Were those not voting abstaining because they had no opinion or no time? Had they registered, left, and never come back? Were they silently disagreeing, or already left because of a diverging opinion? Apart from engaging with the group on other communication channels, there was no way of knowing whether silence meant silent agreement or silent dissent. This dynamic led to a stagnant feeling in the group, hindering it from collectively learning and working through issues as they arose.

One example of this lack of collective learning was a proposal created to slash the reputation of DAO members who had not participated in voting for more than six months, to avoid reputation being locked up by inactive members. In its first attempt,[2] this proposal, which had not been discussed on community channels prior to being posted, was rejected "without much conversation."[3] Subsequently, the proposer asked for feedback on the online forum and created an improved second proposal, which was unanimously passed.[4] However, when we take a closer look, we can see that all the members who voted against the first proposal did not vote on the second one. This leaves open questions: Do they now agree with this modified proposal? Or have they disengaged because they disagree? If the proposal in question pertained to financial allocations, changes to users' reputation, or protocol changes, the answer to these questions would not matter, since the decision

[1]https://medium.com/daostack/q1-2019-genesis-dao-update-fcb793577f2f.

[2]https://alchemy.daostack.io/dao/0x294f999356ed03347c7a23bcbcf8d33fa41dc830/proposal/0xbdcc9cb6282d7b01005b146e1cb4934eefb415ce45e9323c7a5cfe03c2d63939.

[3]274.

[4]Genesis DAO Proposal, https://alchemy.daostack.io/dao/0x294f999356ed03347c7a23bcbcf8d33fa41dc830/proposal/0xfc4eabed72a7130f07f620ada38ce64d41a0737add272495ccad1bbf54a6f512.

would be automatically enforceable. However, this was not the case, because in order to implement the reputation slashing proposal, it would require submitting and passing additional proposals to slash the reputation of each inactive member. Therefore, the passed proposal is no more than a "temperature check" to gauge people's level of support, a practice often used in the Genesis DAO for agreeing norms or strategic objectives. As this particular case illustrates, the GenesisDAO ledger does not give us a realistic understanding of what happened. It shows that the second proposal was passed, but that as of yet, the proposers have not gone through with executing its content. It does not show *why*—whether the proposers do not see enough support for it to feel legitimate or whether they have disengaged themselves or just changed their mind.

In conclusion, the Genesis DAO is significant in that it attempted to realise many of the ideas of what might become possible with DAOs. But the experiment led to disengagement and important information about disagreements being lost rather than feeding into discussions that might lead to organisational development and growth.

Ouishare

Ouishare is a globally distributed community of approximately two hundred members started in 2012 as part of the "sharing economy" movement. Connected through shared values,[5] Ouishare is a community with a highly relational on-and-offline culture, experimenting with new ways of organizing. Ouishare runs on "do-ocratic" principles, meaning that individuals choose their own roles, and authority lies with those who take action, rather than elected persons. Although this way of organizing was regarded as a highly unusual and innovative at the time, horizontal and network forms of organizing principles have a long history that can be traced back to the alterglobalization movement, its inspiration from the Zapatistas in the 1990s, and through to Occupy Wall street, the Arab spring, and May 15th movement in Spain (Maeckelbergh, 2012). Inspired by the practices developed in these social movements, former activists, such as the founders of the software tool Loomio from New Zealand, began to transfer lessons learned from participating in them and encode these into software. The "Occupy-Inspired App" (Rushkoff, 2014) that turned Occupy's consent decision-making practice into a scalable, online process was adopted by Ouishare in 2014, to make its participatory decision-making more explicit. We can see that through these inspirations and influences, Ouishare both explicitly and implicitly adopted successful practices from these movements described by Maeckelbergh, such as holding meetings in a circle, the use of hand signs, embracing conflict as energizing, and the heavy use of facilitation. At the same time, Ouishare's governance was intended to help overcome limitations of horizontal organizing that social movements often faced. As identified by Maeckelbergh (2012) with the example of the May 15th movement, these limitations are a focus on unanimity leading to drawn out decision-making processes, and general assemblies becoming a "higher" authority, creating bottlenecks and stifling creativity and autonomy.

During Ouishare's first two years, it had been difficult to make collaborative decisions outside of the biannual community gatherings (Ouishare summits), and even then, time was always lacking for thorough discussions with the large group. Due to Ouishare's distributed nature, it was impossible to know what everyone was doing throughout the year. This combined with a culturally diverse composition of members resulted in an organizational culture with a high tolerance for ambiguity and contradicting opinions. This was embedded in various governance elements as Ouishare matured. For example, in 2014, two principles that are borrowed from the Swedish Pirate Party (Falkvinge, 2013) were institutionalized on Ouishare's wiki: voting as a last resort and the "three Connector rule,"[6] which states that all day-to-day decisions without significant budget or brand impact can be taken by any three "Connectors" (Ouishare's most active members). To overcome the above-mentioned efficiency and autonomy problem of consensus with large groups, "lazy consent" decision-making became the default, which is a voting mechanism that allows groups to move forward despite disagreement, and does not require a minimum participation. To ensure that people anywhere in the world could participate easily, Loomio quickly became the primary place for structured discussions and consent decisions. Following the principle of voting as a last resort, Loomio threads are not expected to end with voting, as Ouishare's Loomio group history clearly shows, with only one-third of threads including a consent vote (total of 869 threads, 7354 comments, and 252 votes)[7]. For all the benefits of this form of distributed governance, it is important to note that it comes with many challenges which Ouishare as an organization continues to face, such as a lack of alignment between its many projects and local communities. Interestingly, this challenge of creating alignment between actors is one that many DAO projects aim to solve through various experiments with incentive designs, which as of yet have not achieved broader use.

To further illustrate the ways that dissensus has been navigated in the context of Ouishare, we focus on a discussion from 2017 about Ouishare partnerships, a historically contentious topic in the community as an example of a negotiation of incompatible positions, which created a collective transformative process. Participant and company names have been anonymized, and quotes are taken directly from the Loomio transcript.

In this case, a Ouishare member raised a Loomio post about partnership guidelines. The intention was to gather "opinions and feelings" about working with organizations such as corporations from the oil and gas industry, after having already delivered a workshop to the innovation department of such an organization (referred to here as The Company). It was also emphasized that this discussion was not about whether to publicly associate the

[5]Ouishare Website, 2020, https://www.ouishare.net/manifesto#our-values.

[6]Ouishare Handbook, 2020, https://handbook.ouishare.net/governance-and-decision-making/decision-making.

[7]Loomio Group Statistics (visible when logged in to group).

Ouishare brand with such a company, which was considered out of the question. As for many organizations working on systemic change, partnerships are a complex and often emotional topic. There are manifold assessment criteria, including ones that can have significant financial consequences, making it difficult to determine when a red line has been crossed and a partner is not sufficiently aligned with the organization's values.

The group was asked whether, or under which conditions, it would be acceptable to work with an organization in the oil and gas industry. What unfolded was an intense, argumentative, and at times philosophical debate that carried on asynchronously for three weeks. A broad range of community members contributed to the conversation, many with long, structured, and reflected opinions, and others with short messages of agreement, acknowledgment of how challenging this topic is, and admitting to not knowing what is right or wrong. After initial supportive and thankful messages from participants, seven days later, strong dissenting opinions began to be shared. "Working with The Company seems to me a 'lost cause,' and really off my limits, both for ethical reasons, and because I think energy can be better invested working with other corporations." And, "I am even more AMAZED that 'John'[8] and whoever else you are working with thought this was 'ok.' The naive excitement of working with a name outside of our echo chamber of OuiShare Fest Buddies will not change the world."

This encouraged others to follow with their own comments or emoji reactions of agreement with the disagreement. Some individuals who had expressed indifference before shared that they had been holding back their disagreement. "I [previously] didn't take a stronger position against, as I feel I should after having read 'John's' and 'Anna's' brilliant, elaborate, well-considered, and thoroughly researched statements [...], I agree with 'John' and 'Anna' to abstain from working with The Company." Over the course of the discussion, many varying perspectives on the issue surfaced, making its complexity very tangible and revealing how differently each person weighed the various factors at play. Despite the highly opposing opinions, the group reached the conclusion that what was needed was continuous dialogue on the question to foster critical perspectives. Those working with such companies would share what they were learning and tell the story of this case, which became a common reference that could be built upon in future partnership discussions. Two months later, the insights from the discussion informed a proposal by the same person for Ouishare's first partnership guidelines, giving mandate to members to make their own decisions on who to work with, considering a list of criteria that had resulted from this debate and the willingness to document the process openly.

In conclusion, dealing with the issue of partnerships through asynchronous dialogue enabled new and wider understandings to be adopted in the group. Dissensus took place in the form of dialogue only, and there was no voting. This debate and its outcome are an example of dissensus leading to group transformation, rather than reinforcing division. It shows that the community's ability to collectively embrace the uncomfortable, ambiguous, and contradictory opinions enabled a high level of collective learning and group development that was only possible by working through the dissensus as a group. This outcome could not have been achieved through voting, which may have even hindered a discussion of this quality from unfolding and forced the group to split, rather than accept and work with their differences.

PART THREE: GOVERNANCE MECHANISMS OR IDEOLOGY?

In this part, we will delve into some of the main "mechanisms" that make out blockchain and ideas for how to achieve working consensus in a horizontal network without resorting to authority. Consensus algorithms, voting, staking, and forking are broadly understood to be the way governance is actualized in and enabled by blockchain technology (Pelt et al., 2021). These point to a general understanding that governance occurs in an "official capacity"—that is, governance is actions that can be recorded, and that once enacted, are what drives change in the system (Zwitter and Hazenberg, 2020; Pelt et al., 2021). These mechanisms largely work "on-chain," which means that their actions take place on the given blockchain, and what is decided as a consequence of these actions is immutable (or at least until the next governance action overrules it).

Consensus algorithms, voting, staking, and forking are the primary ways in which dissensus is resolved in the ideas and ideologies of blockchain governance. These are some of the formal elements of how blockchain governance systems are modeled and designed, but represent a limited view of how governance actually is practiced in many blockchain projects and peer-to-peer online communities. Numerous scholars supporting the latter evolutions of governance theory have argued that governance does not just occur in an official or top-down capacity (Kooiman and Van Vliet in Stoker 2018; Mayntz, 2003; Castells, 2009), that in keeping with the governing of a politic, it includes "unofficial" actions, like talking in small groups and digital channels, discussion on forums, the creation of memes, and posting on social media. These activities create the social norms of the group, that is, beliefs shared by members of groups about what constitutes acceptable behavior (Allison 2018), and many of these activities have effects which are arguably more influential on what the community does than formalized, official, on-chain governance. Narayanan et al. (2016) offered a broader definition of blockchain governance whereby it is about "determining who has authority (internal and external actors); how these actors are endowed (e.g., ownership rights vs. decision authority), in what form (formal and informal governance forms/structures), and at which level governance takes place."

The major governance mechanisms used in blockchain based communities seek to address disagreements by achieving an operational consensus. We argue that these are understood primarily as 'mechanisms'. Mouffe critiqued Rawls and Habermans for placing consensus as the foundation of a

[8]All participant names in this case study have been anonymized.

functioning democratic society. Similarly, we too suggest that focusing on establishing consensus through immediate and automated forms of resolution rarely recognises or facilitates dissensus as an important process of adopting new and wider understandings of perspectives and possible pathways.

Consensus Algorithms

Consensus algorithms, such as proof-of-work (PoW) and proof-of-stake (PoS), ensure that the network collectively agrees on contents stored and executed in the blockchain ledger (Nakamoto 2008; Wang et al., 2019; Zhang et al., 2019). PoW organizes consensus about what are considered valid transactions in the network by assigning turns to mining nodes based on their ability to mine. PoS on the other hand organizes consensus and validation of transactions by "staking" (locking) tokens to a protocol so they can be randomly selected by the protocol at specific intervals to create a block.

The intention with consensus algorithms is to ensure that entries to the blockchain cannot be forced or determined by those running the infrastructure. By distributing its operations, the idea is that no single actor will have full control. Any actor in the network can submit a proposal that will be automatically executed if the consensus mechanism is triggered by nodes approving the proposal. This is what inspired the early suggestion that such protocols might do away with issues of coercion. The networks would be open (since renamed permissionless), with the idea that anyone would be able to join as a node or to use the given network, without fear of manipulation or coercion. The fascination with these consensus algorithms and their ability to organize, secure, and enforce consensus across a distributed network meant that governance and security were considered solved. However, in practice, it turned out that there were other aspects to such distributed consensus algorithms that might enable new forms of manipulation, including market manipulation, and new types of economic scams (Gerard, 2017). Furthermore, the very consensus algorithms themselves became sites of conflict, shifting some focus toward who controls and maintains these and through which processes.

The most broadly used consensus algorithms, Bitcoin and Ethereum proof-of-work algorithms, are maintained through reference clients that are updated by core developers that have what are called "commit access." These are then adopted (or not) by miners and validators running the network. Processes such as BIP (Bitcoin Improvement Proposals) where people can suggest patches and changes to the protocol, as well as open developers' mailing lists and dev cons (developers conferences), are some of the many mediums through which the reference client governance arrangements take place in practice. But rarely are such nonmarket and off-chain governance processes explicitly considered in discussions and designs of new governance experiments. This lack of interest in some of the actual practical day-to-day governance infrastructure, including email lists and github, is perhaps due to the fact that they do not represent technical *solutions* to governance, but merely its actual mundane operation.

Voting

Network technologies have been considered by social movements and digital entrepreneurs alike to enable large-scale direct democratic participation on issues, rather than merely voting for representatives in elections every few years. But such networks and new technologies that enable direct democratic participation and everyone potentially able to participate in ongoing decision making led to concerns about 'voter fatigue' (meaning non participation). Liquid democracy was an idea to address this by delegating votes on certain matters to people that the voter would trust, with the power to take back their vote at any time. A member of a community would assign a proxy vote to any other member, thereby assigning a personal delegate. Liquid democracy is now often referenced in blockchain settings but precedes blockchain as a voting mechanism, coming from earlier network cultures seeking to use digital network technology to "upgrade democracy" (Ramos 2015). Blockchain added the idea of incorporating "economic incentives" as an additional design strategy to address perceived problems in voting processes including voter apathy.

In blockchain-based online groups, voting (sometimes called "coin holder voting"; Buterin (2019)) is often the proxy for decision-making under the mantle of "on-chain governance" (Lucsok 2018) and thus constitutes a large part of the focus of groups experimenting with and building governance frameworks, tools, and protocols. This implies the use of voting in order to decide on what should happen in a group and what a group should do. Beyond technical decisions, online communities vote about actions that community members want to pursue, including who can join the group, who gets what resource to build or work on what, how fees and returns are distributed, rules for dealing with bad actors, how to evolve the governance protocol itself, and forks.

Access to voting is predicated on first holding "governance tokens" that act as a right to vote, and then, second, "locking" or "staking" these tokens. Quadratic voting is designed so that people can attach a cost to their vote, with the intention that people will express the degree of their preferences rather than just the direction (Posner and Weyl 2018). The DAOstack project developed a voting system called holographic consensus solution that aims to "allow for decisions in a DAO to be made locally—that is, with limited attention and voting power, as long as these decisions are ensured to be in line with the global opinion of the DAO" (Field 2018). Voters "upstake," betting that the proposal will be supported by voters, or "downstake" to bet that will fail. The mechanism behind holographic consensus requires a relative majority approval and the use of staked tokens to predict if a proposal will pass, which proposes a "signal" to the rest of the group (Santander, 2019).

Because there is no way to limit the addresses that hold and stake tokens, there have been long-standing claims of "plutocracy," and the danger of systems designs leading to governing by the wealthy. In order to solve this, reputation systems have been developed; actors earn nontransferable "reputation" based on their activities, which enables them to have more influence in voting. So instead of those with the most economic influence becoming the most powerful actors, power also accrues to individuals that "make good decisions." Zamfir (2017) argued that plutocracy only happens in "societies," and

blockchains are not societies; thus, there has been an overreaction to these fears. Yet, the growth of reputation systems to token-based governance as a way to try and limit plutocracy indicates that many projects seek to yet again solve a potential issue "on-chain" (Red, 2018).

Formalized, on-chain voting is thus conceived as the mechanism through which individuals can express preferences and disagreements. Yet where such preferences come from, how they were formed, and other ways of communicating intentions and preferences are deliberately sidelined. Differences are understood as ahistorical individual preferences that can be expressed through a mechanism and then computed and dealt with through the protocol. As a result, the day-to-day deliberation, forming of group preferences, network cultures, and off-chain conflicts are either ignored or formalized and codified by moving more of these into online on-chain contexts for resolution through incentives and other mechanisms. In some cases, this has the effect that an increasing amount of such interactions are sought to be formalized into the "legitimate" form of decision-making, namely, on-chain voting, leading curiously to governance maximization rather than minimization.

Staking

Staking is an attempt at automating the deliberation process by sending out economic signals to nudge the direction of a governance process or outcome. It is a key part of "emergent" ideas around governance: staking is considered a mechanism to communicate the intensity of preference, or conviction about the success of a certain path of action. In practice, it is a process of holding and locking funds in a cryptocurrency wallet, giving currency holders some decision power in the system. Typically just holding coins is not enough to entitle voting; users must take some action to stake their coins, usually locking it to a smart contract as a vote or as a bet on an outcome.

An increasing trend is to place predictions (like bets) about whether a proposal being voted on will pass or fail and to stake tokens to back predictions up. These have given rise to prediction markets, where successful predictors who have staked for proposals that "pass" or attract the requisite votes are compensated, while unsuccessful ones lose their stake. Similarly, actors might be compensated for staking against proposals that "lose" (Field 2018). Staking is intended to enable actors to gain access to a governance process, to signal preference for and against proposals, and to have the potential to influence the outcome of a vote or decision, as well as to financially benefit from it. In this sense, deliberation is to some degree considered in the design of staking processes in blockchain governance. But yet, again it is sought to be formalized and automated into signals that can be registered in a blockchain system, through what are considered a more neutral and legitimate forms of coordinating differences, namely, protocols and market mechanisms.

A cursory reading of research on blockchain governance shows that there is a bias toward determining who has authority and how they are endowed to influence a "consensus" in the form of token economics. Rarely are actual moments of dissensus considered necessary and productive aspects of dissensus, which will usually unfold through other channels, in chats, repositories, email lists at conferences, and in informal discussion and interactions. The ideological hangovers in blockchain governance, in particular the idea that blockchains represent neutral objective technical solutions to otherwise messy, subjective human relations, have given rise to a peculiar dynamic: the need to encode more and more interactions to take place on-chain *via* the protocol. The ideological project that this represents in the meantime also means that groups form around the very idea of blockchain governance. In other words, governance for governance sake rather than as a means to achieve something together, which entails that often the only thing at stake, so to speak, are the tokens themselves.

Forking

Forking is a concept and process that originally comes from the version control tool git, popularized through the Github and Gitlab collaborative coding platforms, but became an explicit governance mechanism in blockchain. Initially, "forking" was a technique to allow software developers to take a copy of code from one software package and use it to begin independent development work that is maintained separately from its origin (Nyman and Mikkonen, 2011). The early blockchain projects Bitcoin and Ethereum were intended to be governed through and by their code alone. A key aspect of the decentralized decision structures proposed through these projects is their open and permissionless characteristics, where all network "decisions" are transparently viewable and where joining is open. By downloading and running a client using the code from a given reference client, people would signal their adoption of a vision for these projects (Islam et al., 2019). This meant that a fork in the reference client would require people to decide whether they would adopt the fork or not. And so, in the early blockchain projects, forking took on a more explicit governance function as an expression of contention and divergence in visions for the direction of a project.

There are two types of forks, soft and hard forks, that can happen either at the level of the chain or software version. These imply a split of the blockchain on either a temporary or permanent basis (Islam et al., 2019). Importantly, in terms of governance, a soft fork is still compatible with the rest of the network, usually entailing a software upgrade that splits the blockchain temporarily. Typical soft forks include, for instance, block and data authenticity, upgrades and additions to the protocol in question, and system architecture and integration developments (depending on whether it is a fork in the chain or software). Hard forks imply changes that are not compatible and often involve changing the consensus rules (i.e., block size, mining algorithm, and consensus protocol) in a way that makes previous versions of the software incompatible. After a hard fork, both chains run in parallel but with different sets of rules. Executing a blockchain fork successfully requires attracting miners to ensure sufficient computing power in order to make the forked blockchain viable (Ziolkowski et al., 2019). Soft forks require a majority of the miners to upgrade to enforce

the new rules, as opposed to a hard fork that requires all nodes to upgrade and agree on the new version.

The Hard Fork as a "Dissensus Protocol"

Technically speaking, a hard fork is a change to the code in a given system that makes the new version incompatible with previous versions. In governance terms, what are typically called "contentious hard forks" are the result of large and intractable disagreements within blockchain communities that lead to a technical divergence of a blockchain into two or more potential paths and see the community and developers split and a new token formed. Contentious hard forks are of key interest as they indicate the strongest dissensus process in blockchain-based online communities at the governance level, and there are numerous cases of them. A well-known example was the appearance of Bitcoin Cash as an alternative to Bitcoin, after a dispute over a change to the block sizes specified in the original protocol. Bitcoin Cash was the result of a multiyear debate regarding the best way to increase the number of transactions within the Bitcoin network (Wirdum 2016). Although several solutions were proposed, none received overwhelming adoption, and the reference client with the original protocol rules remains the largest network. This schism led to the presence of two completely different cryptocurrency networks.

Forks are the most explicit proposal for addressing dissensus in blockchain communities. Through forking, incompatible differences are resolved in a manner that is unique to the digital and open-source software culture, namely, by copying and tweaking code. Forking is thereby understood to resolve dissensus, while still adhering to basic principles of openness, decentralization, and noncoercion. The idea is that anyone might join a project and run a node, and if they stop agreeing with the project, they are free to leave, or fork the project in a different direction, allowing groups to continue to work on their vision of the protocol or project regardless of intractable differences (Kim and Zetlin-Jones, 2019). However, a fork comes with high costs; forking does not require the permission of the original creators of the new version, but it competes with and heavily splits the attention of developers and nodes (as well as the community and token holders who purchase, stake, and participate in governance). Furthermore, research so far has shown that forks are rarely successful in the long run (Balakrishnan, 2020), not least because of network effects and the scale needed in order for distributed networks and associated tokens to be successful, but because existing core developers will generally have built substantial off-chain reputation.

Because blockchain projects tend to include a token, economic dynamics also enter into the question of forks. In the sphere known as decentralized finance (DeFi), this has added a strong element of speculation into the dissensus process in which actors are becoming incentivized to leverage the possibility of forking for short-term gain, as evidenced by the several noteworthy contentious hard forks that have occurred in 2020 (Kelly and Balakrishnan, 2020). A notable contentious hard fork took place in August 2020 in the Uniswap community—the most popular decentralized exchange automated liquidity provision on *Ethereum*. The forked project was able to attract 14 M equivalent of funds to the new protocol. A commentary in the Ethereum community described this fork as "terrible" as this could be a precedent for infinite forks (Warren in Khatri 2020). The contention was that with the hard fork, SushiSwap appropriated three years of hard work, added a token, and made millions within a week. On the other side, there is a growing expectation that protocols are expected to share governance and revenue with users, who do not adapt, and are likely to be forked.

CONCLUSION

Political theorist Rancière, as well as Mouffe and her collaborator Laclau, begin from "the presence of two worlds in one" (Rancière 2015, 37), as a universe that is fundamentally divided "where the primary ontological terrain is one of division, of failed unicity" (Mouffe 2012, 29; Laclau and Mouffe 2001). They critique perspectives that are based on the notion, metaphysically or otherwise, of a unified whole, because any attempted articulation of such a whole always entails exclusions of those not included in the description. There is therefore always the possibility of excluded positions to make themselves felt, forcing either negotiation or suppression of these. In some senses, blockchain, as a technology and ideology, might in fact be said to take difference, conflict, and dissensus as its very starting point and reason for operation: the assumed environment of its technical and ideological operation is "trustless," the networks are supposedly open for anyone to join regardless of their differences, and blockchain protocols were invented as a means to establish a working consensus as and when differences arise. However, where Mouffe highlights the necessity of providing an arena to confront and negotiate unforeseen differences, blockchain was initially (and still now in the emphasis on "on-chain" processes) a promise of its resolution by technical means. Such technological "solution" to differences in fact made out a governance ideology: mathematical axioms would arrange a neutral consensus, "solving" the governance of differences. However, it turned out that such supposedly neutral mathematical arrangements can themselves become contentious, as experienced in the famous Bitcoin scaling conflict and Ethereum DAO exploit (DuPont, 2018; Mehar et al., 2019). Rather than a "solution," the aim of efforts to use blockchain for governance has since shifted toward "governance minimization" (Ehrsam, 2020).

On a conceptual level, the idea that governance can be "solved"—algorithmic or otherwise—leads to a curious infinite regression: when the very protocols for establishing consensus become the point of disagreement, another consensus algorithm is required to solve this newfound disagreement, prompting Kreutler to ask "Who is responsible for making the decision on how to make decisions" (2018) or how to solve the governance of the governance protocols themselves? Delving further into the concept, dissensus offers a backstop to such infinite regression and the impetus toward governance maximization. Dissensus is a reminder of the ongoing potential for differences to arise, which also means it is not a problem

to be solved in any general sense, but rather an opening to new possibilities. Furthermore, the possibility that there might not always be consensus about the consensus algorithm, so to speak, also foregrounds that the very ways we go about resolving differences are themselves particular and not universally given, also when in the form of algorithms. Consensus algorithms, token voting, staking, and forking are highly eccentric and particular ways of going about governing a group or an organization. In short, what is important is not only that dissensus is resolved but also *how* it is resolved. The concept of dissensus allows for governance to be considered less an abstract universal problem to be solved by technical means, and rather a contextually situated means to achieve a particular set of shared aims.

In this article, we introduced the concept of "dissensus" from political theory (Rancière, 2004; Rancière, 2015) in order to open a discussion about the limits to approaching (self)governance as a problem to be solved through technical means. We discussed techniques and cases from the histories and communities that have formed around blockchain in particular, because these communities so explicitly seek to resolve governance through various algorithmic and market mechanisms, coordinating consensus across and between otherwise disparate actors and interests. This has largely been understood as an effort and means to "minimize governance". But drawing on political and governance theory and insights from STS, we argue that inscribing governance into protocols and algorithms does not necessarily minimize governance, it merely takes a different form, through new vocabularies and terrains of negotiation. This entails a different reading of the famous quote from Lessig that "code is law" (1999) that is often referred to in blockchain contexts as meaning code replacing law. Rather than code replacing or resolving the need for law, it is a different *form* of law which in turn means that code, protocols, and algorithms, rather than necessarily minimizing governance, might rather maximize governance in such new coded forms, especially when these begin to be assumed as the only legitimate, neutral means to make decisions and settle disputes.

Understanding dissensus (*the political*) as a potential rupture to established forms of governance (*politics*) points to the necessary particularity of any governance arrangement. This allows for a study of blockchain governance not as a potentially universal solution, but instead as a specific set of practices for negotiating differences that suit and encourage a specific type of actor. Fruitful areas for future research would therefore be to look into the specific cultures and languages that are emerging from these ideas about governance, for example, drawing on qualitative methodologies of anthropology. Fruitful areas for future research might therefore draw on qualitative and anthropological methods to look at the cultures and terminology that is rapidly emerging around these governance experiments. These might also reveal more about the governance ideologies at play, and how the more mundane actual practice of governance are often sidelined from official governance narratives, diagrams and whitepapers – such as merging pull-requests, email list discussions, chats, conferences and company structures. Further research might also look into the gendered aspects of such blind spots, and how and whether the roles of "community building" in the developer communities are considered or sidelined in the ideological narratives about governance. And finally, further studies that draw explicitly on political theory, as we have done, might also open up for more rigorous comparisons between "legacy systems" and online governance systems.

What blockchain does, as a technology and ideology, is to reconfigure governance and the political as a technical problem. In this sense, it is less a *resolution* of the political (as some might fear and others celebrate), but rather a shift in the terrain and languages through which differences are negotiated. In the case of blockchain, at a protocol level, this has meant that politics is played out and negotiated in the terrain and languages of information security metrics, optimal coordination, or other technical and economic notions. Forking code repositories, for example, has been articulated as the means through which these systems would manage and accommodate incompatible differences, and has in many ways become *the* dissensus protocol in the blockchain community. The territory and medium through which *the political* is worked out makes a difference; it is not neutral. Indeed, the attempts to reconfigure code into law and governance as a technical question is explicitly an attempt to shift the terrain of the political from parliaments, institutions, laws, and bylaws into repositories, blockchains, and code—a different terrain and a different language which a different set of actors will be more versed at.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, with names of individuals anonymised, but otherwise without undue reservation.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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KB and FP, as part of GreaterThan, were hired by DAOStack for the Genesis DAO, a project which features as a case in the paper.

The paper draws on their experiences in the organisation in a transparent and reflexive manner. Both held part time paid roles with DAOstack as facilitators of the community at the time, and as a result hold GEN tokens. Neither currently hold positions with the company, and it is not expected that this paper will have any direct impact on the value of GEN tokens.

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