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**Title:** Blockchain as a Medium for Transindividual Collective

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**Abstract**
Today, digitalisation is penetrating every corner of our mundane life, thus affecting our being in manifold ways. In spite of this, digital technologies provide us with paths towards advancing humanity. One way to model the possibilities of the new technologies in a sustainable way is to frame them in light of Gilbert Simondon's philosophy and especially his understanding of 'transindividuality', which is the foundation for a robust, evolving collective. The transindividual relation, mediated by technical objects, is the possibility of a concurrent problem-solving at the collective and individual level. One of these new technologies, blockchain, a decentralised peer-to-peer database, practically demonstrates a complex system that can cultivate this transindividuality. Although not without its flaws, blockchain nonetheless presents a serious innovation for collective being.

## Introduction

Work on Gilbert Simondon's ontology, especially his philosophy of technics, has undergone significant growth in the past decade (e.g. Bardin 2015; Combes 2013; De Boever et al 2012; Guchet 2010; Mills 2016; Scott 2014; also, Ash 2018; Gabrys 2016; Kitchin & Dodge 2011; Mackenzie 2002). His account of the nature of technical objects and their intertwining with the human, although written between 1950 and 1980, has been revitalised for the purpose of understanding the ontology of digital technologies (Hui 2016). However, there is still little research on recent, practical technological systems in light of Simondon's thinking. This article contributes to this seldom-ventured domain by considering the possibilities of the one of the most hyped digital technologies in recent years (see e.g. OECD 2017): blockchain. Blockchain is, in short, a peer-to-peer decentralised database with a highly original system for organising information and human action. This article considers the ability of blockchain to function as a technical medium for what Simondon calls transindividuality, a collective relation that leads to the realisation of the potentials of the individuals involved as well as those of the collective (e.g. Simondon 2013: 29; Combes 2013: 26). I will be proposing that the connection between transindividuality and blockchain lies in the latter's ability to provide ways of decentralised organisation – that is, transindividuality is connected to decentralisation. I focus on the first and most famous of the blockchain systems, Bitcoin. Although there are newer systems, which I will only touch on in this article, most of their functionality is currently at a theoretical or developmental level.

The structure of the paper is as follows. First, I begin with a short and condensed introduction to Simondon's philosophy by moving from his ontology of individuation, to technical objects, and to the transindividual, as they all are interconnected. The section makes extensive use of insights from excellent studies by Muriel Combes (2013), Andrea Bardin (2015) and Simon Mills (2016). Technical objects are described, first, in relation with individuation and, secondly, in relation with the transindividual. Next, I will describe the basic functions of blockchain by using mainly Bitcoin as an example. The last section presents some considerations of how blockchain could mediate transindividuality. In addition, in the latter sections we will briefly reflect on some of the problems plaguing blockchains.

**Simondon and individuation**

Simondon provides an ontological account of the formation of the individual being from the heterogenous matter of reality. This ontogenetical process is called *individuation,* which strives to understand the individual *through individuation* (Combes 2013: 2). To Simondon, reality is in a state of constant becoming and is divided between the individuated being and pre-individual being, which are like the two sides of the same coin. The individual, which is *a system* to be preserved through becoming, is never by itself: it is in constant interaction and structural communication or resonance with its milieu. Thus, Simondon proposes that individuation always presupposes two systems that are in relation with each other, and this process of reciprocal relating and structuring Simondon calls *transduction*. In transduction, which can describe physical, biological, mental or social processes, 'activity propagates gradually within a domain, by founding this propagation on a structuration of the domain that is realized from one place to the next' (Simondon 2013: 32; Combes 2013: 6). Transduction leads to a resolution and stabilisation of these systems: it resolves the tensions presented to it by the environment or other systems by modifying its internal relations and structures (Simondon 2013: 29–30; Mills 2016: 59).

There are three types of individuation: physical, vital (living being) and psychic *and* collective (Scott 2014: 33; Mills 2016: 73). There are differences between the individuation of a physical being and a living being: the former resolves the metastable state (a diamond can harden), and the latter is constantly trying to *preserve* its metastability. Though both physical and living beings are connected to the aforementioned pre-individual, only living beings constantly re-individuate through this domain. The individual is thus always only a 'phase' in its becoming. The pre-individual precedes the individual and is carried by it (Simondon 2013: 23–36; Toscano 2006: 138–139; Combes 2013: 3–5; Bardin 2015: 36). The constant metastability of the individual is rendered possible by the unexhausted pre-individual potentials. These potentials create tensions (problematics) which the individual must resolve by individuating further. The individual thus has a certain degree of 'indetermination' or openness ('non-determinacy') to the effects and information of the outside. Individuation as a transductive process of the exchange of information de- and re-structures the individual, as well as the milieu *and their relations* (Simondon 2013: 27–28, 31; Toscano 2006: 145; Bardin 2015: 38). As the living being strives to resolve the problematics positioned by the milieu (or physical domain in general), it confronts the problems that require more than its individual inner and outer structures can handle. This leads the individual to continue vital (biological) individuation with psychic *and* collective individuation – that is, through the transindividual relation. However, before moving on to the transindividual, we must briefly outline Simondon's understanding of technical objects.

For Simondon, a technical object can be considered at three levels: element, individual and ensemble (2017: 20). Simondon points out that the *technical individual* could be understood before the Industrial Revolution as a human being using a tool. After the revolution, especially in the twentieth century, the human transformed into an organiser or interpreter of machines (2017: 77–81). *Technical elements*, on the other hand, are smaller gadgets that do not function by themselves: they must function as parts of the object as a whole (2017: 59–60, 66). In addition, there are also technical ensembles (industrial network-structures that produce new elements) and external milieus, such as a factory, laboratory (2017: 21, 38, 50, 228) or today a coding collective. The technical individual is thus a system that, although requiring human organisation, has some degree of autonomy and is an assemblage of technical elements, the object and a milieu. As an example, Simondon offers the diesel motor (2017: 79; Combes 2013: 58). The technical object requires certain degree of 'openness' (indetermination) to allow technical ensembles or networks of machines to form – they are 'open' ('sensitive') to outside information (Simondon 2017: 17–20). Technical objects, or their elements (parts), evolve through lineage from abstract to concrete. For example, a simple gasoline motor is an abstract in the sense that it can be transferred from one milieu to another, from a car to a boat. The technical object that has achieved concreteness has naturalised certain elements from the milieu as a part of its inner coherence – it has *an associated milieu* (Simondon 2017: 49–51, 59). Now we can summarise, with the help of Yuk Hui, how a concrete 'technical individual has a complete set of functions as well as a mechanism that allows it to maintain the internal stability in response to specific external disturbances' (2016: 56). To use an example favoured by Simondon, the Guimbal turbine has the river as its 'associated milieu of the engine': 'the river drives the turbine […] while at the same time it takes away the heat' (Hui 2016: 249; Simondon 2017: 57). The technical individual is thus a functional whole that exceeds the technical object itself.

In addition to this, Simondon describes two types of statuses of connection between man and technical object: minor and major. The minor status is a connection in which the technical object functions firstly ‘as an object of utility’ and can be considered ‘necessary for everyday life’ (Simondon 2017: 103). The major status, on the other hand, can correspond ‘to an operation of reflection and self-awareness’ by a person ‘who has at his disposal the means of rational knowledge, elaborated through sciences’ (Simondon 2017: 103). We will return to Simondon’s notion of technics and technical objects after we have first elaborated on the question of transindividual in general.

**From individuation and transindividuality to technical object**

As stated earlier, the individual, by having confronted insurmountable problematics and tensions, continues its individuation with psychic *and* collective individuation (Simondon 2013: 166; Barthélémy 2005: 196; Bardin 2015: 37, 70). These two seemingly different individuations are simultaneous: with the psychic emerges the collective (Combes 2013: 25). The psychic and collective reality is already partially contained in the individual as a form of pre-individual reality. Therefore, in a sense, the individual is always already both collective *and* individual (Simondon 2013: 29–30, 46, 167; Combes 2013: 297).

At the level of this ‘second phase’, the milieu of the individual breaks into two: the internal (psychic) and the external (the collective) (Bardin 2015: 77). The living being itself is ‘a perpetual putting into relation of these two domains’ (Combes 2013: 23). The subject can be located as a zone of internal milieu, though it does not represent the whole individual. This zone relates the pre-individual potentials of all individuals that take part in the collective. It structures collectively the potentials through production and exchange of, for example, significations, and furthermore, it ‘assures the relation to self and to world’ (Combes 2013: 30; Simondon 2013: 252–253). (Also, Bardin 2015: 83–86.) The transindividual is the systematic unity of internal and external, psychic and collective. The collective can be understood as a system of relations and processes. It emerges, on the one hand, from ‘the exchange of significations between’ individuating subjects; that is, the subjects also re-individuate by creating norms, beliefs, words and concepts (Bardin 2015: 87). On the other hand, the emergence of collective is a transindividual operation that gathers together living beings as psychic-collective subject.

The transindividual corresponds to that part of the group which houses an individual’s closest identities, and makes individuals coincide and communicate through significations. However, transindividual significations, as they are also products of individuation, ‘emerge from the crisis of group identities’ (Bardin 2015: 96). Thus, Simondon brings forth also the *basic mode* of collective being, the inter-individual relations, which does not require a new individuation, only simple exchange and analogue between individuals: the individuals cannot resolve their individual problematics. The individual that 'enters into relation with others appears to itself in its own eyes as a sum of total of social images' – that is, as a 'functional representation that others make of it' (Combes 2013: 37; Simondon 2013: 167, 273, 290; also, Mills 2016: 83–84). Simondon underlines the novelty of true transindividuality: the cemented group identities shared by the individuals are *not yet* transindividual. The transindividual requires, slightly simplifying Simondon, self-reflection on relations with others and on the aspects of the present inter-individual situation (e.g. identities, functions, networks of human commerce) that 'prevent the perception of the existence of pre-individual' (Combes 2013: 38; also, Guchet 2010: 205).

In a transindividual relation, the subjects engaged in a transformative relation reunite the pre-individual shares in them. Thus, individuals can give birth to a new reality and move towards true collective. The seed of transindividuality is already at the first phase, carried by the individual, as a form of pre-individual, as an 'unstructured background' from which a new individuation can emerge (Simondon 2013: 295–297; also, Barthélémy 2012: 230–231; Combes 2013: 47). Through transindividual action, the individuals 'as the elements of a system' discover 'a structure and functional organization that integrates and resolves' the problematic exceeding of their own capacity (Simondon 2013: 294; also, David Scott 2014: 138; Mills 2016: 85). At the collective level, the individuals pose their 'particular problems according to normativity already elaborated by other individuals' (Simondon 2013: 273; Mills 2016: 83). This problem could be, for example, a disparity in the environment or in the other physical individuals. To summarise, transindividual processes 'are neither independent of, nor entirely determined by, individual agency' (Bardin 2018: 6). Thus, the transindividuality is also a solution to problems or challenges (disparities) at the collective level (for example, the problems of perception and affectivity) (Barthélémy 2005: 208).

The technical object, as Simondon writes, 'insofar as it has been invented, thought and willed, and taken up by a human subject, becomes the medium [*le support*] and symbol of […] [a] relationship, which we would like to name transindividual' (2017: 252). The technical object is a crystallisation of human activity (or gesture) (Schick 2017: 55). However, this crystallisation remains in technical objects even after the work is accomplished. The object is created through an act of thinking or invention that transfers a thinking process as an analogy from one structure to another (Bardin 2015: 58). Humans individuate, that is, they 'search relations that are similar to their own mental functioning and realize them within nature', thus creating 'analogies' (or crystallisations) 'of an operational schema and of a thought that has resolved a problem' (Schick 2017: 55, 66; Simondon 2017: 252–253). Today, digital technologies and especially algorithms are transductively transforming structure to operation and back again, thus creating analogies but also transferring the stereotypes and prejudices possessed by the developers and coders (see e.g. Eubanks 2017; Noble 2018).

Simondon moves to differentiate three types of invention, which mirror the beforementioned technical evolution from abstract to concrete. First is the invention of a technical essence (e.g. 'internal combustion engine') that is also the start of a lineage (2017: 29–30). The second type is 'continuous' invention that focuses on minor optimisations which lead the technical essence to progressively realise itself (2017: 40–43). The third concerns 'discontinuous' invention which results from the second invention. The system becomes saturated, which will lead to concretisation and a kind of paradigmatic change inside the technical essence (2017: 43). In the third case, Simondon's example is a turn from 'internal combustion engine' to 'diesel engine' through 'additional concretization of its functioning' (2017: 46–47). In the end, 'a perfected technical object is an individualized technical object in which each structure is pluri-functional' and 'each element fulfils not only a function in the whole [ensemble] but a function of the whole' (2017: xv). Above all, the object as 'an invented analogy' bears information and assembles together the 'inventive and organizational capacities' of the subjects (Simondon 2017: 258; Combes 2013: 77), thus leading the way to the transindividual.

**Blockchain technology: a lineage from Bitcoin to Ethereum**

Since *Du mode*'s publication in 1958, technologies have advanced and expanded tremendously. The globalised world is almost completely penetrated with the vast network of communication and data-collection. Blockchain was introduced in the 'white paper' of open-source cryptocurrency Bitcoin (Nakamoto 2008). Although the underlying blockchain in Bitcoin is limited, it provides simple way to understand the basic mechanisms of blockchain. After outlining Bitcoin, we will briefly map out a newer blockchain system, Ethereum. To summarise, blockchain is a decentralised database (or protocol) for organising information, relations and activity. Although there are private and centralised blockchains, we are focusing on the decentralised ones as they prove the greatest promise for the transindividual.

One of the key elements behind Bitcoin, as reflected in Satoshi Nakamoto's white paper (2008), was a dream of erasing the third party (institution, government) from commerce and financial transactions, which would, in turn, lead to a greater liberty and equality (Swan 2015a: 27). Thus, the idea was to completely remove trust from the equation, be it trust in a third party or in 'the other' of the transaction (Hayes 2019: 51–52). The new technology sat well at the end of a long ideological and political history of libertarianism (see Golumbia 2016; Karlstrøm 2014). Although its historical lineage can be connected to the history of internet and the ideals of distributed communication, from a technological point of view, the technical elements of blockchain are closely connected to the recent development of distributed architectures and peer-to-peer networks (where the user functions as a client and server). The important elements were David Chaum's early cryptographic digital currencies (Bambara and Allen 2018: 15), Cynthia Dwork and Moni Naori's email proofing to prevent spam (Hayes 2019: 60), digital currency HashCash's computational mechanisms to create a break-proof system as well as Stuart Haber and W. Scott Stornetta's time-stamping of digital documents (Narayanan et al. 2016: 16–17). Time-stamping created, with the help of a central server, a reliable method to freely share documents without fear of falsification. Haber and Stornetta thus erased the need for a 'third party' and thrusted the security aspect onto the shoulders of technology. Time-stamping was probably the most important actor in defeating the feared double-spend problem (currency could be spent twice; like any digital file, it could be copied) of the early digital currencies.

The Bitcoin blockchain, running since 2009, is a decentralised and transparent database that consists of the data of all transactions made in the history of Bitcoin. The transactions are stored 'in linear, chronological order reproduced across many computers such that records cannot be altered or deleted retroactively without the collusion of most nodes in the network' (Hayes 2019: 59). The transactions are also transparent: anyone can see the number of Bitcoins transferred and the public identifier (hash) of the transaction. The users can be identified having two roles: as users of the currency or as miners (or both). The user focuses mostly on exchanging Bitcoins. The transaction process in itself is a rather simple operation: a user decides an address (usually the e-wallet of a recipient) to which to send desired number of Bitcoins. In addition, user can (and has to) add some extra value, which will work as a transaction fee for the miners.

The miners distribute their computing power to the use of the system. This is called mining (proof-of-work), which is a method of verification and proofing of the validity of performed transactions by computation. Mining, a process at the heart of Bitcoin blockchain, is, in a Simondonian sense, pluri-functional. First, computer power is used to calculate predestined mathematical problems that will lead to securing the network and distributing new Bitcoins to the fastest one(s) whose computer took part in the calculations. The mathematical problems are constantly modified by automatic algorithms as the number of miners increases (or decreases), thus keeping the system stable. The creation of new Bitcoins is also algorithmic, and the number created decreases over time, ending when the maximum of 21 million is distributed. In addition, mining connects valid transactions (as 'blocks' of 1 megabyte's worth of transactions) to the blockchain.

However, Bitcoin has limits that resist technical progress and further concretisation. This is partly due to the mining and partly to its decentralised structure, which has no responsible central authority. By utilising its open-source foundations to concretise further, Bitcoin's concretisation has to be ‘discontinuous’ in nature. The modification of its structures and principles of operation require that a majority of the globally distributed miners agree on the changes. This is how the mining process will verify transactions. One part of the mathematical problems to be calculated is a *nonce*, an arbitrary number used only once, that will be hashed along with the transaction block. The block also includes a reference to an earlier block, thus connecting it to a prior blockchain state. After a miner has successfully mined the block – i.e. solved the problems and discovered that the nonce is a match – the result (verified transaction) is sent to the whole network. Next, over 50 per cent of the miners have to agree on the block’s validity; otherwise, it will be ignored. To proof the validity of a mined block is simple, but generating it is extremely time-consuming. Bitcoin has achieved some centralisation through the evolution of mining. At first, home computers could be used for mining, but as the number of users grew, mining became much more difficult and competitive. Nowadays, miners will use special equipment, such as application-specific integrated circuits (ASIC), and usually belong to some mining pool, which combines the computing power of all participating miners. This pooling can also culminate to the one of the most problematic technical flaws of the system: the so-called ‘51 per cent attack’. This attack can be realised if one node (a miner or mining pool) is controlling over 50 per cent of the mining power. When one has control of the majority of the mining, it is theoretically possible to mine tempered blocks as a part of the blockchain, thereby making possible, for example, double-spending. Although highly difficult to achieve in a dispersed global Bitcoin network, in 2016, circa 70 per cent of global mining was controlled by four big Chinese mining pools (Dallyn 2017). In addition to the mining pools, e-wallets, exchange services and asset managements has brought centralised points, thus further *endangering* the decentralised nature of the blockchain. Bitcoin quickly drifted from a digital currency for everyone to a classical deflationary currency, which favours those who already have wealth. (See more, e.g. Bambara and Allen 2018: De Filippi and Wright 2018; Dodd 2017; Golumbia 2016; Narayanan et al. 2016; Swan 2015a.)

One of the most important development points, a discontinuous one, to use Simondon’s vocabulary, was the introduction of Ethereum blockchain. Based on the design of Bitcoin’s blockchain, Ethereum introduced a new, decentralised ‘Turing-complete virtual machine’ that uses *smart contracts* (Swan 2015a: 21). As Bitcoin can be reduced to a platform that provides decentralised digital currency, Ethereum-based blockchain spreads out to digitalise other social activities. As its main developer, Vitalik Buterin, (2013) claims that Ethereum provides a platform for token systems, financial derivatives and stable-value currencies, identity and reputation systems, decentralised file storage or cloud computing, savings e-wallets, commodity (e.g. crop) insurances, decentralised autonomous organisations and on-chain decentralised marketplaces.

A smart contract is basically similar to a transaction in Bitcoin: users can decide (code) the rules for the contract, which are automatically enforced by the blockchain. In their simplicity, smart contracts can automatise simple contractual relations, such as leasing a car. Above all, smart contracts enable the Ethereum platform to run code inside its own blockchain, thus expanding the theoretical horizon of possible applications, as indicated in Buterin's paper (2013). Smart contracts also automatise many simple functions of organisations, thus reducing the work of individuals spent on recurring bureaucratic tasks – 'they decrease the need for human involvement' (De Filippi and Wright 2018: 133). For example, smart contracts can 'manage economic rights, distribute dividends, allocate profits or losses' and store property rights in a secure database (blockchain) (De Filippi and Wright 2018: 133). Through smart contracts, a decentralised organisation (such as in-development Otonomos or BoardRoom) can elect for example organisation's board of directors, and digitally signed votes would be saved in a secure and transparent system. The individuals 'gain the ability to cooperate and collaborate on a peer-to-peer basis' (De Filippi and Wright 2018: 136). This is implemented through smart contracts or tokens (e.g. cryptocurrency of the system). The tokens can be programmed with special rights and can be received as a purchase or as a reward. With tokens, individuals can gain, for example, the right to a proportion of profits or the right to access or transfer resources or services. In addition, tokens can grant the right to take a part in a particular decision, such as hiring an employee (De Filippi and Wright 2018: 136–137). Primavera De Filippi and Aaron Wright underline that these elements can reduce the possibility of fraud and miscalculation (2018: 134). Mirroring this idea through the example of a platform economy and focusing on Uber, De Filippi and Wright propose that, unlike in Uber, 'drivers could directly own and control decentralised organisation, and if each driver has voting rights, the decentralised organisation could presumably operate in a way that is more favourable to drivers' interests' (2018: 139).

**Blockchain as a medium for transindividual relation?**

Blockchain is a technical individual that creates a complex network consisting of elements made of software (algorithm, data) and hardware, which drives reciprocal causality between different elements, zones and processes of a blockchain platform as well as engagement with human action (Hui 2016: 56). We can now move to identify at least three types of blockchain mediation of mostly economic activities that can lead to transindividual relation. Each of these types has its strengths and weaknesses and they do not completely exhaust the possibilities of present (let alone imagined) blockchain applications, but they do describe some key functions of the technical essence of an invention called blockchain. The ability to bring forth the transindividual relation depends on which side is cultivated through future innovations. However, it is worth noting that, following Simondon's ideas on technological evolution and invention, this cultivation is always a heterogeneous process.

First, blockchains such as Bitcoin can create access to basic financial services for people who do not have one. As Melanie Swan argues, about 53 per cent of the world population is without a bank account, while they do have a mobile phone. Blockchain could provide these people with a peer-to-peer protocol for transferring money or even with a credit system (2015a: 36). This gives them the opportunity to take part in the local or global economy or create new economic environments and cryptocurrencies. Even the funding of an organisation can be implemented outside of traditional financial systems through an 'initial coin offering' (ICO) – that is, when a blockchain platform's own currency or token is distributed to or bought by the users. As many of the early developers of Bitcoin fantasised, cryptocurrencies enable a way, at least in theory, to oppose the power of central and private banks by completely erasing the need for financial institutions – or even governments. In addition, mining is a method for grounding currency in something other than the debt economy: in the work of computers. These elements, the power of financial institutions and debt economy, precondition present-day life and limit our agency (Blyth 2013). However, Adam Hayes describes Bitcoin as a collectible or commodity, not as money (2019: 61–62). In this account, the idea of new financial services for those in need seems far-fetched, providing only a barter economy carried though digital commodities, as Bitcoin appears to lack *two of the three* attributes (store of value, unit of account, a medium of exchange) of money (Guadamuz and Marsden 2015; Papadopoulos 2015). It can work as a medium of exchange (as virtually anything can), but it does not store value or work as a unit of account because of its high volatility and as its price is (still) measured in currencies like dollars or euros. Hayes nevertheless underlines that Bitcoin is not worthless, as miners mine because they receive in return newly created coins that have 'some expected economic value': 'value appears to stem from the price paid for (the ongoing) disintermediation of trusted third parties, related to a Bitcoin's marginal cost of production' (2019: 61). Thus, Bitcoin has been occasionally seen as 'a digital gold' to invest in – and therefore an investment in the whole community and perhaps even in 'the coming of the new social order' (Dodd 2017: 42).

Secondly, one of the key elements of blockchain is organisation of information. This, the production and distribution of information, is also one of the most important and valued service of a market (Steidlmayer and Koy 1986: 20). Information has been elevated to the heart of the economy: the global financial markets are saturated with data and algorithms (for example Finn 2017; Zuboff 2019; Cockshott et al. 2009). Most of this financial information travels through centralised points or hubs (social media services, stock exchange, hedge funds), where the firms 'reap the benefits of the human cooperation at the heart of the commons production' (Bauwens and Kostakis 2018: 311; also, Bauwens 2006: 134). One way to free this information is to think of a *non-territorial information commons organised through decentralised platforms*. Thus, as Michael Bauwens and Vasili Kostakis write, peer production organises 'the creative energy of autonomous individuals' in decentralised peer-to-peer networks at the local and global level (2018: 310–311). Although Bitcoin collects only information about transactions, advanced blockchains like Ethereum can work as automatised structures for assembling dispersed information by transforming the essential blockchain structure to be more open to outside information. As De Filippi and Wright underline, blockchain can coordinate and organise information and social activity by providing a platform or 'shared, decentralised repository of information' (De Filippi and Wright 2018: 42–43, 136–137, 148–149, 151). This leads to the possibility for a certain degree of economic planning for a particular community or a limited market (cf. Cockshott et al. 2009: 338–340). Blockchain is thus a structure that 'knows all the information', and with smart contracts, which could be defined by votes from the users, the rules for economic calculation could be enforced. Theoretically, blockchain would work in this case as a simple form of what Fausto Giunchiglian and Dave Robertson call a 'social computer' (2010). This 'computer' utilises humans and their environment's ability to collect and create information. A theoretical example is a smart city (Speed et al. 2018) build upon Ethereum-like blockchain. Filtering Giunchiglian and Robertson's ideas through Simondon, the function of a 'social computer' is to create *conditions* for further collective individuation to react to or to prevent vast local or even global threats (such as a tsunami, a flood, or financial crisis) by harnessing 'the innate problem solving, action and information gathering powers of humans and the environments in which they live' (Giunchiglian and Robertson 2010: 1–2). Thus, in this theoretical example, blockchain would work as computable decentralised commons tended by the users.

Thirdly, blockchain challenges the idea of traditional, hierarchical models of organisations and institutions (Davidson et al. 2018: 641). Outlining the foundation of a firm 'on a nexus of interrelated contracts that exists within and between firm boundaries', Hayes writes that the 'blockchains can systematically decompose firms into a pairwise matrix of peer-to-peer smart-contracts' (2019: 64). Noting that institutions are 'broadly defined as systems of established and prevalent rules that structure social interactions and expectations – that both constrain and enable certain behavior', he moves to adjust this idea by concluding that institutions 'allow credible commitments that enforce property rights' and 'extend beyond a rigid set of rules to include informal social devices' (2019: 65). In light of these descriptions, blockchain can be understood as an institution. Hayes continues that 'Bitcoin […] structures the 'policy' affecting the socio-economic system of its blockchain as well as shaping the micro-structures, norms, and interactions of the actors partaking in it' (2019: 65). Because of the open-source nature of blockchains, 'they are indeed sandboxes for institution creation and experimentation' (Hayes 2019: 66). However, as is natural in a capitalistic market economy, this has led to the traditional organisations using them primarily to experiment with means of increasing their efficiency and productivity (Davidson et al. 2018). Hayes points out that the restructuring of institutions easily leads to 'a free market for institutions […] with one competing against another for adherents' (2019: 66), thus providing 'crypto-anarchic-Hobbesian techno-leviathan' which underlines only protected property rights (enforced automatically) without political interference (Davidson et al. 2018; also, Dodd 2018).

As elaborated earlier, Simondon differentiates between two types of connection between man and technical object: minor and major. Most users of Bitcoin use the cryptocurrency as minor status, that is, using it as a medium of exchange or commodity to invest in. Following Simondon, it is easy to see that this relation is an element in collective individuation. The developers, on the other hand, can be seen executing the major status. For 'major status users', blockchain technology cultivates self-awareness and reflexivity, for example, through minor improvements introduced to the system, or even major ones through the construction of a completely new blockchain system. However, major status also requires a dimension of communication carried out in the blockchain community. Minor status can change to major when the individual carries psychic and collective individuation further by, for example, integrating deeper into the community by learning to code. However, this change is in no way easy, thus undermining the ideal of blockchain as a system promoting equality.

The ideals of blockchain and of Bitcoin are obviously ideological and political. Some of the theories behind these ideals, as for example game theory, which is easy to translate to as machine readable and is widely used among the blockchain developers, understand human reality in a simplified form (DuPont 2017: 172; Reijers et al. 2016). Consequently, Kieron O'Hara points out that smart contracts are founded on a misinformed idea of contract law, as they do not account for the complex social dimension of contracts (2017). In addition, smart contracts are in their execution final, as is the saved outcome in blockchain. This would reduce *a priori* the possibility of choosing whether or not to follow the contract or create perpetual markings on the record (database). Thus, the finality of executed code reduces the agency of the individuals involved. This also brings into question the paradox of erasing the need to trust. By erasing the element of trust, the system reduces the agency of the individuals and thus reduces the possibility for transindividual relation. As O'Hara writes, 'trust both depends on, and helps to strengthen, other bonds in society' (2004: 276; Bus 2012). Trust is a 'glue' that keeps together individuals engaged in real collective and psychic individuation; in other words, trust is a foundation for further individuations to emerge.

To consider blockchain as a pool of pre-individual potentials (transindividual) is to conceptualise it as a platform that works as a 'zone of participation' (Swan 2015b: 52–53; also

Simondon 2013, 287). The pre-individual is already 'with individuals', and blockchain is a protocol through which individuals can share this potential and continue the initial individuation. However, if this platform *were* centralised, it *would not cultivate* the differences of the individuals and, consequently, could not provide a frame of pre-individual potentiality. Thus, there would not be as many possibilities to individuate. As David Weinbaum and Viktoras Veitas have shown, 'a distributed population of interacting heterogeneous agents achieves progressively higher levels of coordination' (2017: 29). The centralised platform is a closed community usually aimed at a predefined goal connecting individuals on inter-individual level. True transindividuality is not goal-oriented but rather opens up the field of pre-individual that is, in a way, already within each individual, and reveals different possibilities – represented by different individuals – of being and of life to each involved individual (Guchet 2010: 205). Thus, transindividuality is connected to decentralisation. This is the strength, or the promise, of blockchain: to create a truly decentralised system, to crystallise human potential and activity into organisation and organising. In other words, blockchain can be seen as *a crystallisation of the power to create methods and processes of decentralised organisation,* which can lead to further individuations by individuals themselves. In addition, blockchain is a model (technical essence) that leads to further individuations by freely organising individuals through constantly re-invention of new digital spaces and platforms, that is, practical blockchain applications. This is a constant concretisation of the mental and the operational and, thus, the foundation of a continuity of the transindividual. Thus, as stated above, the individuals act as the elements of a system and discover a structure and functional organisation, blockchain, that resolves the problematic that exceeds their own capacity. However, every practical application *in itself* delimits the relation to the domain of the pre-individual, that is, the application can present to the individual only a certain spectrum of potentialities thus requiring new individuations.

## Conclusion

As the prior points have shown, blockchain could be considered an abstract technical essence that has many concretised technical individuals. This technical essence can be defined as a method of organising information and human action in a decentralised way. The essence is a gateway to transindividuality, but in an actualised or concretised form, as a practical application such as Bitcoin. Thus, like every 'phase' of individuation, it has its limits or flaws, some of which this article has presented, but Bitcoin has at least shown that blockchain system, even in its simple form, can work in practice. One of the problems that we have managed to evade, is sheer amount of energy that the mining requires (see Mora et al. 2018). In the light of the global ecological crisis, this is hardly desirable. In addition, Simondon's thinking has obviously also received criticism – for example, from its lack of consideration of the political dimension of human reality or environmental issues. Some critics have underlined his human-centric and technology-oriented view of the world or of the 'repairing of the dangerous technogeographical situations' (Lindberg 2019) as well as lack of empirical grounding on some of his historical and anthropological claims (Letiche and Moriceau 2017: 8).

Overall, blockchain can be thought of as an idea, a technical essence, that has already a few working applications. The idea and the applications, if not yet able to provide completely new and innovative ways of connecting and sharing, are at least stirring debate on the nature of the present model of organisations and their functions. Some of the research even reflects on ideas concerning human nature, technology, sociality, economy and trust. Although this is already a matter of transindividuality, blockchain can also provide a platform, or medium, for transindividual relation by bringing people together and organise them as a decentralised collective, thus creating possibilities of further individuations. One of the most interesting openings provided by the discussion of blockchains is the transition of trust from institutions and social interactions to semi-automatic and semi-autonomous technological systems. What this then does for social organisation in general is a complex question that requires further research.

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