Freedom to Contract and Democracy in the Age of Blockchain and Smart Contracts

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Abstract

Blockchain is a disruptive technology whose impact can be felt within the international community and national societies. According to some scholars, blockchain technology will soon substitute or compete with the law of sovereign states. Within the said framework, our chapter aims to scrutinize whether and how blockchain technology can truly democratize relationships for private users. Reference will be made to the new blockchain-based platforms, such as the CmaaS, and the case of smart contracts. The aim is to understand whether the said tools, will enhance exercising contractual freedom and the democratic processes within the blockchain.

1. Introduction

Blockchain is a fairly new technology, a *species* of the distributed ledger (DLT) *genus* which is the result of the combination of previously existing technologies: the internet and peer-to-peer (P2P) applications. Blockchain made its first public appearance in 2009. At the beginning, it was only a cryptocurrency, and states showed a kind of indifference towards it. In fact, it could have easily been a bubble unworthy of attracting legislators' attention. However, within a decade, blockchain has proved differently, becoming a fairly widespread technology with a disruptive effect within society.[1] It now plays a role in a number of sectors including payment, decentralised finance (DeFi), food tracking, and the health sector. Given such a strong impact, blockchain is a technology which may, more than any other technology before, have a significant impact on our current way of living. In fact, the rationale of the first blockchain developers was to erode society as it is, to "democratize" it, thus depriving states and institutions of their traditional role. As a result, in the last couple of years,

[1] See Bower et al. (1995).

states, at all levels, have started to seriously and rigorously tackle the status quo with this new technology.[2]

With this context in mind, this chapter aims to investigate the impact of technology on freedom of contract and democratic processes by studying the case of blockchain and smart contracts. In particular, we argue that smart contracts are contributing to exercising contractual freedom and also to managing democratic processes within the blockchain.[3] From this, we question whether the rule of law and the role of legislators, as traditionally conceived, has been put at stake by "other regulators" including programmers (i.e. coders) and the industry.

This chapter is structured as follows: the following section two provides a general understanding of what blockchain is and how it works. Rather than providing a mere technological analysis, it questions whether blockchain can guarantee a more democratic society. Section three focuses on the most recent platform developed with blockchain – so called cloud-management-as-a-service platforms (CMaaS) and fetch.ai.[4] These promise a truly democratic application of blockchain technology. They are made to create a distributed market where demand and supply (buyers and sellers) are put in contact through their digital twin which is able to conclude transactions through smart contracts. Section four then focusses on freedom of contract with regard to smart contracts:[5] these are the "tools" which enable each and every transaction occurring within a blockchain. Their legal nature is still debated. What is certain is the urgency to have them regulated. In section four we point out the absence of a clear normative framework at both national and supranational level. Given this absence, we suggest that the weakest link in a contractual relationship, often consumers should be protected by mandatory provisions. Sections five and six scrutinize the most recent trends to be observed at supranational level, aimed at filling legislative gaps. In the absence of a legal framework at international and national levels, coders and economic or financial operators are significantly contributing to drafting, managing and executing cross-border smart contracts. They rely on both technology and industry self-regulation in developing standardized models of smart contracts at international level. Examples are the International Chamber of Commerce's (ICC) "Incoterms 2020"[6] on the blockchain and the International Swaps and Derivatives Association's (ISDA) smart contracts. Our conclusion summarises our understanding of the impact of technology in redesigning the concept of freedom of contract and democracy and in reshaping the role of legislators and the rule of law.

2. Blockchain: a general a-technical understanding

[2] See Hacker et al. (2019).

[3] About democracy and contract law, see Hesselink (2015).

[4] "An artificial intelligence and machine learning based blockchain platform populated with your digital twins - intelligent digital twins who learn and deliver solutions to make your life easier.", https://fetch.ai landing page. (Accessed 9 Feb 2022).

[5] See Poncibò (2020a).

[6] ICC (2020).

Technology and law have always had an *odi et amo* relationship: they seem to follow opposite paths, but they cannot exist without each other. In 1996, John Perry Barlow published his "Declaration of the Independence of Cyberspace."[7] The idea was to make clear that the internet was a "place" of freedom where states could not impose rules. Those endorsing such an approach were of the opinion that states represented an obstacle to people's self-determination. Democracies were not really democratic at all because the majority of people were not in the position to raise their voice and be part of a decision making process. States versus the freedom of people – this was the credo in a nutshell. From a technological perspective, this movement took advantage of a "disruptive" innovation: the world wide web was breaking the geographical limitations of states and was traditionally conceived to allow people to reach a place while staying at home. This practically meant that anyone with an internet connection could get in touch with anyone else and carry out transactions.[8] "Globalization" became the lemma better representing what the world was experiencing: connections and transactions in no time and no space.[9]

From a legal perspective, the world wide web was lying in a normative vacuum: allocation of responsibility, legitimacy of transaction, enjoyment of fundamental rights these were some of the issues raised by the use of the web. In the mid-1990s, Lawrence Lessig highlighted that cyberspace had become a new target for those stressing the need for a space of freedom from states.[10] However, Lessig himself was of the opinion that cyberspace would sooner or later being subject to regulation and controlled, but not necessarily by governments. In fact, private 'authorities' started to appear in the form of entities who, while exercising a huge amount of power within the web, were *de facto* becoming immune to the application and enforcement of mandatory rules. To counteract this effect, legislators at both national and supranational level started to regulate what was occurring in the world wide web.

All this being said, it seems fair to state that the advent of the world wide web meant something more than just the advent of a new technology. Internet developers meant to erode the role of states, while filling up the *vacuum* left through people's self-regulation. From a more general perspective, the question was to define the role of state in the face of the new technology. Two options seemed available: applying indifference, because of the difficulties of the states to "enter" the technologies, or devising regulation. Following on from this second option, two more options arise: states could opt for the technological neutrality approach or frame new *ad hoc* provisions. It took some time, but in the end legislators at all levels found the way to

[7] To be read on the webpage of the Electronic Frontier Foundation https://www.eff.org/cyberspace-independence (9 Feb 2022).

[8] See Weiser (2009)

[9] See Eriksen (2014).

[10] See Lessig (1999).

regulate internet development and deployment mostly following the neutrality approach.[11]

Today, states are still struggling with the advent of new technologies. In this chapter, we focus on distributed ledger technologies (DLTs), thus leaving aside artificial intelligence.

Blockchain is an example of DLT. It is not new, because it relies on already existing technologies: it can be said to be the integration of internet and peer-to-peer technologies. The first blockchain ever published was Bitcoin in 2009.[12]. At the beginning only a small number of people used it, then it expanded to a mass level, and now most people have at the very least heard about Bitcoin.[13] However, blockchain is more than just a type or a number of cryptocurrencies. Blockchain is a technology for a different and (allegedly) more democratic society; as such, blockchain raises a number of questions with regards to the conventional governance mechanism.[14]

In a nutshell, there are two kinds of blockchain: public and private. Public blockchains are controlled by rules enacted within the chain, by developers and, also, miners. Thus, rules are 'enacted' as codes developed by a network of peers. Conversely, private blockchains are ultimately controlled by and subjected to a private company, which is the owner of the chain. As such, these chains are controlled by and subjected to so called off-chain rules, which are instruments of private law, binding the company and, *a cascade,* the tool the company itself exploits.

Only public blockchains are truly distributed, thus mirroring the ideology behind distributed ledger technologies.

Leaving aside technological peculiarities, we stress the need to understand what public blockchain really means and what the repercussions of its growth in society entail. Distribution is the concept underlying blockchain technologies.

From a technological perspective, distribution means that every participant in the chain is constantly aware of what is occurring within the chain: each transaction is published on the chain and secured because of the use of cryptography. Through the use of public and private keys, distributed technologies ensure that transactions are tamper proof, transparent and pseudo anonymous. This in turn prevents double spending while ensuring trust in technologies.[15] Blockchain technology has introduced the concept of scarcity of digital goods (a prerogative that was lost with the internet).

Accordingly, from a sociological perspective, blockchain was meant to be disruptive: once again, the rationale was to put users in the position of closing transactions without relying on third parties, be these states, institutions, banks. Blockchain developers are of the opinion that states have failed. In fact, while willing to get rid of so called big powers, they were pushing on ideas already raised by the time the internet appeared: cyber space freedom where people are free to act within rules made

11 See Segura-Serrano (2006)

12 See Nakamoto (2009)

13 See Lehmann (2019)

14 See Poblet et al. (2020)

15 See Werbach (2018)

by codes, not by law. The aim is to frame a truly democratic society where one counts as one and all can join. There is no role left for states: the technology can in fact act as a legislator and exercise monetary sovereignty.

This said, how disruptive blockchain is remains an open question which deserves some clarification.[16] Also, it is questionable whether blockchain technology is as democratic as is claimed by some. Doubt arises because, despite the suggestions, it seems that users are not truly part of the decision making process; they are part of the chain but they do not decide how it works or how it should be changed to work better. Each and every blockchain is developed according to the rules enacted by blockchain developers and summarized within the "blockchain white paper" which has similar function as the statute of a company. Rules are written in code, hence the expression "code is law"[17]. Developers represent the legislative power of the chain: they are those in charge of settling provisions. Beneath, miners exercise the executive power: miners are in fact those who make the chain function.[18] They validate each and every transaction, solving the so-called cryptographic puzzle. Interestingly, miners are in the position to decide which transaction to mine, in other words, which one to validate first.

Miners can act individually but, most of the time, they are part of a "mining factory" which may control fifty percent of the chain.

In practice, the validation process entails solving a cryptographic puzzle which corresponds to all transactions occurring within the chain. The validation process is the core of blockchain because it is the process guaranteeing that a valid transaction (no double spending) has occurred. A validation process can be carried out in different technical ways; however, a closer analysis of the two most common types will make the process appear less democratic than is claimed. If validation depends on the proof of the work process, this requires that 50% plus one of the nodes agree on the solution proposed. This being said, chains in which 50% of the miners are part of the same mining factory means that the decision is not taken so democratically.[19] Analogous perplexities arise if blockchain transactions are validated through the proof of stake proceeding. This allows miners holding higher stakes to reach the required majority to validate a transaction. Given that stakes equate to number of chain-tokens, the more a miner spent to buy token, the more power they can exploit in using it.

Users who enter the chain decide to abide by the rules governing its functions. There seem to be only two situations in which users can express their vote, indirectly or directly. The former happens once users decide to exit the chain selling their token, deciding not to be abide by the rule of the chain any longer. Conversely, users express a direct vote when a change in code is suggested by developers and miners. These changes, referred to as 'forks', can be soft or hard, depending on how drastic the change to the protocol is. In both scenarios, users can express their vote, embracing or

16 See De Filippi and Wright (2018); Mäntymäki (2020).

17 Lessig (2000).

18 See Zuboff (2006); Cappiello (2020).

19 See Berg et al. (2020).

refusing the proposed fork; once again, a way to refuse the change at stake, is to quit the chain. All of the above lead us to a preliminary evaluation: public blockchains are open to all, but they are "decided upon by few". They work as an order, be it a social or a legal one, where each participant plays a distinctive role. Participants are thus part of a system and abide by its rules; this being true, it does not seem that blockchain guarantees a system which is more democratic than the legal system we are used to. If for democracy one refers to the fact that the public blockchain as described is open to *n'importe quoi*, then they are democratic.[20] However, if one follows the traditional definition of what makes a system democratic, then we should conclude that a public blockchain resembles more an oligopoly or a plutocratic system. Moreover, the system does not foster values such as sustainable development as each blockchain requires a very high amount of energy.

3. Blockchain: the smart contract and the democratic process

So far, based on the section above, we cannot see how public blockchains are *per se* more democratic than traditional legal systems.

However, when cryptocurrencies first appeared, they were presented as a truly democratic currency – they could have potentially been used by all, without the need to own a bank account. Often cryptocurrency projects reflect an "anarcho-libertarian" philosophy of decentralization. Cryptocurrency applications have already been the subject of a number of studies; therefore, in this chapter, we want to scrutinize different applications.

Specifically, our aim is to focus on two applications which, thanks to the use of smart contracts, seem to favour a blockchain with a truly democratic approach.

Based on the *if-then* formula, smart contract programmes ensure that, given a certain input, a predetermined output will ensue.[21] Smart contracts are immutable. That means in case of a technical error or 'bug' external remedies must be sought. Trust is not invested into parties anymore but in technology. Smart contracts are deterministic computer-based contracts ensuring self-execution and self-enforcement of the (basic) obligations therein specified.[22] As McKinney at al. point out, 'smart' is probably not the correct term to define contracts: the "smart" part of the contract concerns only the performance.[23] Self-executing means that breach or modification of the contractual terms of a smart contract is impossible. Self-enforcing smart contracts are therefore expected to avoid the need for courts and litigation. Smart contracts themselves contain all useful elements to self-enforce the obligations for example by escrowing and account or blocking a user from the system. The potential democratic application of a smart contract arises from the possibility that all parties interested in entering a

[20] See Gastil and Wright (2019)

[21] See Maugeri (2020).

[22] See Gatteschi et al. (2019).

[23] See McKinney et al. (2018).

market can do so because of the simplicity of the transaction, faith in the result, and low cost.

3.1. CMaaS

One example for this are the above mentioned CMaaS platforms[24] which can be seen as democratizing manufacturing services through cloud manufacturing.[25] Emplying a highly technological system, CMaaS make manufacturing expertise easily accessible to end users. They shift the technological and intellectual burden away from users.[26] In a nutshell, users are in the position to receive a quotation for a manufactured part within seconds. They are also able to ask for immediate changes to the manufactured parts and are able to do all this within the cloud.[27] CMaaS involves three different players: stakeholders, assets and the core manufacturing system network. Clients interact with a digital twin of the model and can bring about parametric change; once the asset is finalized, transactions are generated on the blockchain to store the event and to keep track of all steps.

These platforms are thus conceived to place highly sophisticated knowledge in the hands of users who can exploit it easily. The final result is to democratize knowledge and accelerate the productive cycles because CMaaS enables small production quotes to be obtained quickly. The platforms work using 'digital twins' of both real products and users. This said, the collection and transfer of digitalized manufacturing across the so-called thread has raised technological and legal concerns. The latter include the protection of intellectual property rights and privacy. Centralization of data within an intermediary agent can raise issues of data ownership, integrity and liability concerns. It suffices here to give the example of a part of an aircraft: the know-how behind its manufacturing is complex and highly sophisticated, and protected by licenses.

Blockchain technology and smart contracts have thus been introduced to solve part of the above legal issues. Blockchain can provide the tamper-proof transmission of manufacturing data, while allowing traceability of the data among all participants. So-called blockchain cloud manufacturing architecture will improve the development of a distributed peer-to-peer network of cloud manufacturing nodes. Globally accessible public blockchains such as Ethereum are used to secure fungible asset transfer models for automated contract negotiations. The roles played by smart contracts are of the utmost importance; all transactions occurring within the platforms now under scrutiny occur thanks to smart contracts. Smart contracts are a type of software programmed to execute a given action. Smart contracts are based on the *if-then* relationship. Given a certain input a determined output is expected to be the result. Smart contracts can be modelled to execute any kind of binary transaction, triggering any legal effect or avoiding it.[28] Smart contract code can thus be constructed to exchange information or

[24] Section 1 above.

[25] See Hasan and Starly (2019).

[26] See Wu et al. (2015).

[27] Krima et al. (2019).

[28] See Di Matteo et al. (2019).

to properly close a transaction (buy and sell). Smart contracts can be used to receive, elaborate and return instant quotations or, once the quotation is accepted, to close the transaction. CMaaS Platform have developed three standardized types of smart contracts, one for each level of platform participants: for stakeholders, assets and users.

This option will favour the definition of methods, behaviours and attributes of smart contracts, without creating disparate models. As such, these smart contracts contain a minimum of information which is standard and which can be increased if needed. It is worth noting that the smart contract corresponding to the asset has been shaped as an ERC-721[29] non-fungible token representation of the part on the blockchain. Each step is thus registered as an ERC-721 token transaction on blockchain. The ERC-721 defines the minimum interface that shall be implemented in the smart contract: smart contracts can thus be owned, managed, transferred and traded.[30] The nature of these smart contracts is highly debated. Depending on their functions, they could be only code, entailing plain provisions (if-then) or having legal value when a transaction is finalised through them. From a purely legal perspective these different natures of smart contracts have not raised much attention. The data exchange between smart contracts occurs through internal transactions which are not serialized and not generated by external accounts. As a consequence, this design pattern of encoding manufacturing systems and stakeholders' smart contracts as autonomous entities increases the difficulty of malicious participants breaching the privacy of a stakeholder.

This said, blockchain-based manufacturing networks have so far been employed to track product history in a number of sectors, such as agriculture,[31] diamonds industry (such as Everledger) and to ensure food safety.[32]

3.2. fetch.ai

Another example which exemplifies the idea of a possible democratic use of blockchain is fetch.ai, an e-commerce platform developed on the Ethereum public blockchain. Because of decentralization, the platform presents itself as truly democratic: it is open to all who have an interest in selling or buying a certain product. The level-playing field offered by fetch.ai is not just for big players but also, and mainly, for small-medium players. In a nutshell, fetch.ai aims to connect suppliers and

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[29] The website Ethereum explains: "The ERC-721 (Ethereum Request for Comments 721), proposed by William Entriken, Dieter Shirley, Jacob Evans, Nastassia Sachs in January 2018, is a Non-Fungible Token Standard that implements an API for tokens within Smart Contracts. It provides functionalities like to transfer tokens from one account to another, to get the current token balance of an account, to get the owner of a specific token and also the total supply of the token available on the network. Besides these it also has some other functionalities like to approve that an amount of token from an account can be moved by a third party account." https://ethereum.org/en/developers/docs/standards/tokens/erc-721/ (accessed 9 Feb 2022).

[30] See Iyer and Dannen (2015).

[31] See Sylvester (2019).

[32] See Tian (2017).

consumers in multiple sectors such as energy, supply chain, hotel, parking or energy consumption. Each participant plays in the market through its Fetch agent, a sort of digital twin who knows its real twins' needs and tastes. For each product sector, an "agent" has been developed, written with a machine-learning algorithm, capable of processing all the data made available to users of the platform. The latter is in fact open to any interested user (supplier / consumer) who can enter by purchasing fetch.ai's 'FET' token. Once inside, each user can share and obtain information in their sector, without the need for a third party.

For example, if 'A' needs to park his or her car, once he or she reaches the proximity of the place where to stop, they can ask their digital twin to find a parking spot and to reach the best deal with the parking lot owner; the same happens if 'A' is looking for a pair of jeans. The real twin expresses its need and the digital twin starts processing all information available connecting with all the digital twins of jeans sellers. In practice, the 'artificial intelligence agent', once a transaction has been requested in a given sector, allows its conclusion by putting in contact the supplier and the consumer to obtain the best conditions, exploiting the benefits of a competitive market.[33] The assumption is that people want to spend less but they do not want to or do not have the time to look for the right pair of jeans or to get the best deal. To "solve" the issue, agents, acting as the digital twins of an individual, are in charge to get the best deal, for instance to buy a new pair of jeans. Once the deal is reached, a smart contract is signed and executed within the platform. The smart contract contains all the information related to parties, products, price, and delivery. Designed as such, the platform is meant to be a multi-agent system working without a central authority and avoiding any form of monopolization.

Both abovementioned scenarios represent the most recent application of blockchain in a democratic way; this means that all can be part of the chain no matter how big they are. All players - operators or sellers - are placed at the same level.

4. Blockchain, smart contracts and freedom of contract: the coders

Smart contracts (created by coders) and smart legal contracts (created by coders and economic operators that are legally binding) are drafted, ruled and executed through international cooperation between coders and economic operators. In this sense, technology contributes to democratising contract law among nodes and e-traders.[34] Moreover, it is also possible to say that smart contracts are providing support to the governance of the entire blockchain(s) as described in section three above. Thus, smart contracts may be conceived as instruments of governance and democratization in the digital world according to the theory of contract governance.[35]

[33] Polson and Scott (2020).

[34] Hesselink (2015).

[35] Grundmann et al. (2015).

From a theoretical perspective, “Code is law” refers to the idea that, with the advent of digital technology, code has progressively established itself as the predominant way to regulate the behaviour of the nodes in trading within the blockchain ecosystem.[36]

Yet, while computer code can enforce rules more efficiently than 'legal code’, it also comes with a series of limitations, mostly because it is difficult to transpose the ambiguity and flexibility of legal rules into a formalized language which can be interpreted by a machine. With the advent of distributed ledger technology (DLT) and associated smart contracts, code is assuming an even stronger role in regulating people’s interactions over the internet, as many contractual transactions get transposed into smart contract code. In this paper, we describe the shift from the traditional notion of “code is law” (i.e., code having the effect of law) to the new conception of “law is code” (i.e., law being defined as code).[37] According to Szabo, the very nature of this technology, which is characterized by the absence of a centralized government system and intermediaries, inevitably entails the risk of a detachment from the usual regulatory architectures. On this point, for example, the dogmatic beliefs about blockchain are simple: the envisaged principle is that the DLT protocol should never be modified by members of the community, except when this is necessary for the purposes of its technical maintenance. The adoption of this law would also have the intention of ensuring freedom and equality between the members of the technological infrastructure.[38]

More generally, the doctrine underlines some of the peculiar characteristics of the l*ex Cryptographica* mentioned above. A regulatory mechanism appears to be 'embedded' directly in the fabric of the technological system.[39]

In other words, regulation, in dictating constraints and incentives for community members, is based on numerical expressions and algorithms. This law is distinguished, then, in that it would find itself operating autonomously, independently of any government or other centralized authority. So, if the vision of DLT advocates came close to reality, we could imagine delegating power to DLT technology in place of the current rule-making mechanisms, the hierarchy of sources and the law itself as an expression of the will of parliament. Nevertheless, some authors[40] are wondering whether this technological order will respect the freedom and autonomy of individuals as stated in our legal systems. When government disappears, it is not as if paradise will take its place. When governments are gone, other interests will take their place.

From a practical perspective, it is therefore true that coders’ self-regulation plays a role in DLTs governance and smart contracts. In particular, with respect to the focus of this section, it should be noted that programmers are cooperating with each other in order to design standards for digital contracts on the blockchain.

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[36] De Caria (2017). See also Di Matteo et al. (2019).

[37] Finck (2018).

[38] Szabo (1996).

[39] Wright and De Filippi (2015).

[40] De Filippi and Wright (2018).

One of the main examples is the Ethereum Request for Comments (ERC)-20 standard smart contract.[41] Using the ERC-20 standard makes it possible to create a token exchange system on Ethereum. The "transfer function" is the key feature, as it ensures direct fund transfers according to the receiver's address and the number of tokens being sent. The transfer return value is supplied as a report on receipt of the tokens. All functions are executed by the Ethereum Virtual Machine, powered by the computational power of every Ethereum node. This gives ERC-20 tokens the ability to be involved in the automation of complex business processes and tasks in cloud-like virtual machines.

On such basis, it is really interesting to note that, in its current form, ERC-20 is based upon cooperation between programmers and nodes - physically located in any jurisdiction - who continuously share views, comments and suggestions for the best drafting and management on-chain of smart contracts on Ethereum. Needless to say, legal scholars from all jurisdictions question whether ERC-20 may be understood in terms of a legally binding contract.[42]

In this respect, we argue that the analysis should be conducted by academics and practitioners on a case-by-case basis to find out whether the smart contract is a legally binding agreement according to contract law of a given country and the well-established and internationally recognized common practices of blockchain traders.[43]

5. Standardising smart contracts: the industry

Notwithstanding the lack of a clear international and national legal framework, the practice of relying on smart contract is particularly widespread in international trade[44] and finance.[45]

This occurs in the absence of a clear legal framework at the international and domestic levels in a growing number of industries operating cross-border.[46] Scholars also envisage new applications linking smart contracts and the "internet of things".[47]

It therefore seems that security in operational processes, as well as trust in technology and blockchain community and democracy, are the characteristics that now motivates parties to commit themselves by entering into a smart contract. Therefore, digital trust (even in relation to technology) takes on a primary role for economic operators when entering into a contractual relationship in international trade and finance.[48]

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41 Ansari and Kulkarni (2020).

42 Procopie (2021). Verstraete (2019).

43 Chandler (2019).

44 Cole (2019); for International Federation of Consulting Engineers, (FIDIC) contracts, see Bari et al. (2019).

45 Auer (2019); see also Ream et al. (2016).

46 Uncitral and Unidroit (2019); Chamber of Digital Commerce (2016).

47 Christidis and Devetsikiotis (2016).

48 Werback (2018).

In fact, regardless of the uncertain regulatory framework, economic operators are increasingly ready to accept digital contracts for cross-border trade due to their characteristics, which include cost reduction, automation and standardisation. Additionally, smart contracts do not require trust as previously noted. In the case of smart contracts, economic operators (i.e. private entities) are substantially contributing to drafting, coding, managing and executing smart contracts for international trade and finance. This occurs primarily through the process of international standardisation of smart contracts: a process that is mainly driven by industries themselves rather than public institutions.

Indeed, contract standardisation has a long history which begins with the emergence of standard form contracts for consumers and businesses. Technology and globalisation have fostered the practice of developing standard models of contracts in certain industries. Specifically, cross-border contracts in the fields of banking and finance, energy, and construction, to mention just a few, have been the subject of an international standardisation process through the efforts of the relevant industry and economic operators. Furthermore, many of these contracts have become almost identical internationally, for example the standard contracts of the International Federation of Consulting Engineers, (FIDIC).[49]

Here, the point is that, notwithstanding the lack of legal certainty, smart contracts are currently undergoing an international standardisation process. The drivers of this process aimed at overcoming the shortcomings of the law are coders, programmers, economic operators and their associations. Indeed, the divergence of smart contract protocols depending on the blockchain (i.e. the problem of lack of interoperability between blockchains) can be an additional motivation for identifying some standards that economic operators could adopt internationally, also avoiding confusion in terms of the huge number of different models of smart contracts. This process may also be useful in managing the aforementioned problem of lack of interoperability between blockchains.

In our case, economic operators are also significantly contributing to regulatory design through international standardisation.

5.1. The ICC

In September 2019, the International Chamber of Commerce (ICC) published its Incoterms 2020, in force from 1 January 2020. In that regard, it should be noted that the International Chamber of Commerce initially signed an agreement with Perlin, one of the most influential blockchain certification platforms, only then to develop

a customisable, self-executing digital sales agreement, incorporating the new Incoterms rules. The incorporation of smart Incoterms® rules, or Smart INCOs, will help facilitate trade by reducing costs and barriers faced by importers and exporters worldwide, notably, small and medium enterprises.[50]

[49] See Bari et al. (2019).

[50] (ICC 2019).

The ICC has recognised that blockchain technology can facilitate trade, making it more secure and thus engendering trust in traders. This technology in fact highlights all steps in the production chain, thus simplifying cross-border imports and exports. This new "trust" in the chain should also facilitate exchanges between small or medium-sized economic operators.[51] The latter can in fact rely upon the fact that the contract signed in the smart form is self-executing, thus being more likely to be executed, irrespective of any recourse to the judicial authority. This final step often involves particularly high costs.[52]

Additionally, smart derivative contracts are worthy of particular attention. Notwithstanding the peculiarities of finance, it offers a promising example of the possible role that may be played by private entities and self-regulation (i.e. soft-law) in this respect. In finance, the need for regulatory reporting, portfolio reconciliation and a large number of transactions is pushing a trend toward transaction automation which could save money and time. Furthermore, derivative contracts are highly technical in nature, with the parties' primary obligations being payments to one another, which can be accomplished by debiting accounts (money or securities), making them especially well-suited to automation.[53]

5.2. ISDA

Thus, the International Swap Derivatives Association (ISDA) is leading the field in terms of contract digitalisation and standardisation. In fact, ISDA has promoted the standardisation of contractual documents on derivatives with the aim of increasing efficiency and avoiding unnecessary complexity in cross-border transactions. Practically, ISDA has released a set of legal guidelines for smart derivatives contracts which are intended to explain the core principles of ISDA documentation and raise awareness of important legal terms that should be maintained when a technological solution is used in derivatives trading. It should also be noted that these guidelines define the term of a smart derivatives contract.

> This is a derivatives contract where some terms are capable of being automatically performed, either by expressing those provisions using some formal representation that enables their automation, or by referring to the operation of smart contract code that is external to the contract.[54]

More specifically, in January 2020, ISDA published a White Paper entitled 'Private International Law Aspects of Smart Derivatives Contracts Utilising Distributed Ledger Technology'.[55] Co-authored with Clifford Chance, R3 and Singapore Academy of Law, the ISDA White Paper discusses private international law, or conflict of laws, aspects of derivatives contracts governed by the laws of Singapore and England and Wales involving distributed ledger technology. Indeed, DLT systems are frequently

[51] (Werbach 2018).

[52] Dimitrieva and Schmidt-Kessen (2019).

[53] Guo and Liang (2016).

[54] ISDA White Paper 2020, p. 5.

[55] (ISDA 2020).

borderless, allowing multiple users or participants to exchange records in a shared database that may be based in multiple jurisdictions.

6. Blockchain and smart contracts: any role for national or supranational regulators?

Here the point is to discuss whether the exercise of democracy and the freedom of contract granted by and within the blockchain and discussed in the previous sections should be subject to international and/or domestic regulation.

Technological innovation is not a question of today; it has always been there. What has changed are the effects innovation may have within the society. Some innovation does have a disruptive effect; others do not. Currently, we are living at a time where technological innovation, be it represented by distributed ledger technologies or artificial intelligence, are having a disruptive effect. As it has been suggested, the disruption consists in the fact that nowadays humans are not no longer at the centre of the universe.[56] Certain technologies are in fact there to (partially) substitute human beings. Also, as already seen, new technologies are questioning the governance of states and public authorities: emerging private powers are able to define new forms of governance.[57] Blockchain and smart contracts are indeed enabling this new form of governance. The former enables the construction of autonomous "society" abiding by rules enacted by the chain while the latter gives private parties the freedom to define rights and obligations (allegedly) irrespective of any given contract law or national or supranational mandatory provisions.[58]

Smart contracts ensure contractual automation and this may raise attention to the importance of fulfilling obligations on time. And this is nothing new, given that it reflects the principle of the sanctity of contract. Smart contracts will then truly become tools enabling the automation of (certain) relations. How they are regulated then becomes a question of outmost importance. In fact, traditionally contract law contains a number of mandatory limits and prohibitions which impact on the party's freedom to determine content and to conclude contracts.[59]

From a legal perspective, two questions arise with regard to smart contract nature and applicable law. As regards the former, it is debatable whether smart contracts signed within a CMaaS platform or fetch.ai do have a legal nature or whether they work only as a software executing a given transaction.

At first glance, smart contracts may resemble traditional contracts because of the elements they contain: parties, obligations and price. However, the contract's legal value cannot be acknowledged once and forever; instead, its legal value is ascertained according to the law applicable to the smart contract in question. And here the first problems arises. The concept of contract as defined by the law differs between civil

[56] See Floridi (2011).

[57] See Pollicino and Bassini (2021).

[58] See Sirena and Patti (2021)

[59] Poncibò (2020); Michaels and Jansen (2006).

law countries and common law countries. Also, within countries of the same legal family, definitions are not necessarily identical. The conditions that French law requires to assume a valid contract may not correspond to those required by German law.[60]

Italy, France, Germany and the US states of Arizona, California and Delaware have adopted special definitions of smart contracts. Some legitimize the use of smart contracts, assuming they are *if-then* software executing transactions. Some others qualify them as contracts differing from traditional ones only for the technological *medium* they use.[61] Interestingly, the European Union (EU) and the Hague Conference of International Law have so far not taken any position yet with regard to how to qualify and regulate smart contracts. The question arises, whether the legal nature of smart contracts requires special attention at all. They could simply be taken to be computer software producing certain pre-determined effects. However, given that consumers ought to be protected and market operators ought to find a safe environment, the question is how provisions and principles already in force within private contract law at least at the European level apply also to smart contracts. As shown above, smart contracts make the automation of private relationships possible. At the same time, the freedom of private parties is never 'unlimited' in law. Contemporary private contract law wants to protect the weaker party and support a balanced relationship.

So, how can a legal framework deliver such limitations? Within the EU one could question whether the applicable law and the jurisdiction can be determined using conflict of law rules already in force.[62] These rules only apply to matters within their scope. Therefore we have to ask two questions: Do transactions carried out by way of smart contracts have a civil or commercial character? Do they give rise to a contractual–governed by the Rome I Regulation[63] – or extra contractual –governed by the Rome II Regulation[64]–obligation ? These questions also determine the applicability of the 'Brussels System'.[65] The trading platforms mentioned above make establishing the connecting factor (i.e. the habitual residence) easy. Even though blockchains transactions bank on the pseudo-anonymity of users, those users still have to register on entering a CMaaS or 'Fetch' so that all relevant data is collected..

The approach referred to above was explored when regulations first had to cope with the advent of the internet. Legislators opted for an evolutive interpretation of the

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[60] Di Matteo et al. (2019).

[61] Mik (2020).

[62] Rühl (2019-2020); Bertoli (2020); Cappiello (2020).

[63] Regulation (EC) No 593/2008 of the European Parliament and of the Council of 17 June 2008 on the law applicable to contractual obligations (Rome I). See also Salerno and Franzina (2009).

[64] Regulation (EC) No 864/2007 of the European Parliament and of the Council of 11 July 2007 on the law applicable to non-contractual obligations (Rome II).

[65] Mainly Regulation (EU) No 1215/2012 of the European Parliament and of the Council of 12 December 2012 on jurisdiction and the recognition and enforcement of judgments in civil and commercial matters (recast). See also Salerno (2015).

existing provisions. The existing rules and an evolutive approach can therefore be used to provide society with the protection of user interests .

The EU *acquis* also comprises substantive norms classed as mandatory within the EU private international law system which apply irrespective of the applicable law.[66] Among the mandatory rules applicable equally to smart contracts, attention shall be given to consumer law.[67]

EU law provides for some boundaries of private autonomy in consumer contracts, especially by EC Council Directive 93/13/EEC on unfair terms in consumer contracts (the Unfair Terms Directive).[68] Smart contracts could may include such obligations which are "not negotiated or contrary to the requirement of good faith" (Art.3 Unfair Terms Directive). So, the use of an automated enforcement mechanism could be one example where mandatory provisions adopted under the Unfair Terms Directive prevent the enforcement of provisions in a smart contract. In this way, public authorities could exercise control on the contractual automation process, also requiring modification of the smart contract software if the case may be. Accordingly, new technological tools could become a way to improve the application of consumer law, ensuring its effectiveness.

In light of the above, there are a number of unresolved issues and legislators have not yet focused on all potential uses of blockchain technology. To reach a solution, in a number of legal systems, legislators have created so called sandboxes.[69] These tools are meant to support companies in carrying out their activities and developing new technologies in an environment exempted by legal constriction. Sandboxes provide a safe space where companies can test their product – such as platforms using smart contract - without the need to abide by irrevocable legal provisions. Within a sandbox, specific regulatory burdens are lifted to favour company experimentation;. However, this could compromise consumer protection and legal certainty.[70] Generally, regulating new technologies is a question to be decided by the legislature. The sandbox technique allows the legislators to react when a normative provision seems to stifle innovation, so that alternative options remain available to legislators, without impacting on legal certainty.

7. Conclusion

In conclusion, this chapter stresses that a participatory and democratic method that involves coders, economic operations and their cross-border collaborations governs both the blockchain and smart contracts in cross-border transactions. Our analysis confirms that self-regulation of the market based on ‘full’ (some might say extreme)

[66] Brownsword (2018).

[67] Borgogno (2019)

[68] Reich (2019).

[69] Allen (2019); Zetzsche et al. (2017).

[70] Magnuson (2020).

freedom to enter into contracts and establish democratic processes plays a central role in defining standard smart contracts. Specifically, we argue that, firstly, smart contracts are drafted, ruled and executed through a democratic process of cooperation and, secondly, that they contribute to exercising democracy on the blockchain. In the light of the above, we have discussed how technology is redesigning our understanding of freedom of contract and of democracy.

In this sense, it is possible to conclude that this innovation enhances freedom of contract and democracy and this – we argue – explains the success of smart contracts where the parties may freely manage their exchanges of virtual currencies and digital assets, based primarily on technology, automation and stability. Doubtlessly, standardisation and technology are promoting contractual practices that meet the needs of the contemporary economy by fully enhancing freedom and international cooperation of blockchain coders and economic operators. This all being true, this incredible improvement brings with it negative externality: it is fair to question whether the self-regulation of blockchain and smart contracts will also assure the fairness of transaction processes and outcomes generally guaranteed by the law and specifically by mandatory consumer laws in the physical world. In other words, there are still some grey areas – represented by the protection of fundamental values – within technology that legislators at all levels have not yet touched upon.

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