"Blockchain Dispute resolution: an alternative dispute resolution?"

Nelsy Dubras

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Student number: 2645778
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Supervisor: Dr. Thibault Schrepel
Second assessor: Dr. Tina van der Linden

Table of Contents

List of Abbreviations

UDHR Universal Declaration of Human Rights

ECHR European Convention on Human Rights

ICCPR International Covenant on Civil and Political Rights

CFR Charter of Fundamental Rights of the European Union

DAO Decentralized Autonomous Organization

ECtHR European Court of Human Rights

ADR Alternative Dispute Resolution

ODR Online Dispute Resolution

Abstract:

Blockchain-based application has known exponential growth over the last few years. With the development of smart contracts, which are self-executing software programs, more companies and individuals are willing to integrate those technologies into their environment. Smart contracts rely on external actions (from human actions) or external data sources (such as an oracle) and are not exempted from generating disputes.

Blockchain technology operated on a decentralized network characterized by its immutability and anonymity. Within this space, organizations such as Decentralized Autonomous Organization becomes more and more popular, and blockchain transaction becomes more and more common in this space. Inevitably with the increase of transactions comes an increase of disputes. Disputes cannot always be settled by traditional justice and on-chain or blockchain dispute resolution has entered the picture.

This thesis aims to give a short introduction to those blockchain protocols and to identify the main challenges blockchain dispute resolution could face. This thesis will first explain some of the key concepts of web3, i.e. blockchain and smart contracts. It will after introducing the types of disputes and the current solutions offered by traditional dispute resolution mechanisms. In light of the limitation of traditional justice, the thesis raises awareness of the benefit of complementing traditional justice with blockchain dispute resolution. It identifies key difficulties after a comparison of various mechanisms and attempts to provide a perspective on how to find answers through a discussion of alternative solutions. Finally, the thesis will evaluate some of the solutions blockchain dispute resolutions could cover and under which conditions.

1. Introduction

Defi, blockchain, smart contract, distributed ledger, cryptocurrencies, dApps, and Decentralized Autonomous Organizations (also called DAOs) are all part of what can be called Web3. The term Web3 is popularly used to refer to the next internet generation.[1] While Web 2.0 is dominated by powerful intermediary platforms like Facebook, Amazon, Apple or Google, Web3 removes the need for trusted intermediaries and facilitates the direct exchange of value between users.[2]

Web 3 comes with its own set of revolutions, still underregulated. The uncertainty surrounding Web 3 should not affect the right and obligations of any individual.

Having access to a fair and equitable public hearing by an independent and impartial tribunal is a fundamental right. From general principles of Law to the Universal Declaration of Human Rights, nothing seems to contradict access to this right. In practice, however, with a global economy and the importance of cross-border transactions, access to justice might not be as smooth as it seems. To guarantee this right, International Law, as well as regional institutions, has enabled alternative and complementary solutions. A transaction carried fully online does not escape the law, and blockchain transactions neither. Blockchain transactions are carried in a decentralized environment and the trust element is not required (in comparison to centralized institutions) [3] However, even without this trust element, blockchain transactions can go wrong, in many ways. Behind blockchain applications, there are individuals for whom international law guarantees a right to access a fair and equitable hearing. Thus, Blockchain applications operating via smart contracts should incorporate appropriate dispute resolution mechanisms as traditional dispute settlement might not be able to guarantee the same level of protection.

Before going further, it is important to understand when and how blockchain dispute resolution mechanisms could be beneficial. An EU consumer requested a paid service from a company located in another EU country. According to the consumer, the transaction did not satisfy the

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[1] Sam Gilbert, *Crypto, Web3 and the metaverse,* Bennett Institute for Public Policy, 5 (2022) https://www.bennettinstitute.cam.ac.uk/wp-content/uploads/2022/03/Policy-brief-Crypto-web3-and-the-metaverse.pdf (explaining the term Web3 and the slang surrounding the Web3 space).

[2] Jason Potts and Ellie Rennie, *Web3 and the creative industries: how blockchains are reshaping business models*, in A RESEARCH AGENDA FOR CREATIVE, 93–111, 8 (2019) DOI:10.4337/9781788118583.00013 (Offers an alternative to centralised institution and explain the potential to reshape industries).

[3] Tina van der Linden, *Trust Me: Combining Online Dispute Resolution, Law and Blockchain Technology*,15 INDIAN J. L. & TECH. 454- 469, 464 (2019) http://ijlt.in/wp-content/uploads/2020/11/IJLT-152-200-215.pdf (explain the three types of trusts and the relation with dispute resolution).

advertised offer and the consumer requested a refund. Being both based in the EU, the consumer can either use the European Small claims Procedure or the Online dispute resolution (ORD). However, both procedures lack efficient enforcement mechanisms. If in this case, the consumer proceeded to the payment using cryptocurrencies within s smart contract application, the parties could have agreed beforehand to use a decentralized arbitration protocol built on blockchain. This solution can, in the cases where one or both parties are not identifiable, offers an alternative to guarantee the right to a fair trial for each party.

Kleros, a blockchain protocol built on top of Ethereum, is an opt-in court system, they are a decentralized application that works as a third party to a dispute on the blockchain. According to the Kleros Short Paper, both parties must agree before the litigation to use Kleros as their dispute resolution platform.[4] The parties can choose the type of court and the number of jurors who will release the decision. Once the decision is voted in accordance with the terms set by the Governance mechanism, the smart contract can execute the result of the decision without delays. Blockchain dispute resolution platforms such as Kleros could fill the current institutional gap decentralised transactions have created. While the term Blockchain will be explained thoroughly later, it is important to already state the following: Blockchain is a distributed ledger, which requires no intermediary, blockchain operates on peer-to-peer systems.[5] Individuals on the blockchain can be identified by their digital wallet address and they can therefore remain anonymous.[6] The two consequences are: the absence of one centralized institution controlling transactions and the anonymity of the parties. This environment allows individuals to validate transactions with no intermediary and fully anonymously. This anonymity challenges the right to a fair trial once a dispute occurs on the Blockchain.[7] In those cases, dispute resolution applications operating directly on the Blockchain with no regard to the territorial scope of the transaction and not requiring formal identification of the parties could come as a complementary solution when traditional institutions fail to intervene.

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[4] Clément Lesaege, Federico Ast, and William George, *Kleros, Short Paper v1.0.7,* Kleros, 3 (2019) https://kleros.io/whitepaper.pdf (indicate Kleros is an opt-in court and Kleros must be designated as arbitrator in the smart contract. The smart contract is the foundation of the agreement between the parties).

[5] See Freeman Law, *Permission and Permissionless Blockchains*, https://freemanlaw.com/permission-and-permissionless-blockchains/ accessed March 2022 (explain the different types and characteristic of blockchain technology).

[6] Anonymous in the sense the available data do qualify as personal data and do not permit to identify directly or indirectly nor to identify their residential address.

[7] Further development will focalise on this matter in light of the right to a fair trial.

Literature on the topic tends to state the potential benefits and risks of blockchain-based dispute resolutions.[8] A research gap exists in identifying potential solutions for those BRD to qualify as Alternative dispute resolution or Online Dispute resolution. This thesis aims to explain how the current dispute resolution tools are insufficient to protect the interest and rights of blockchain users and to identify how blockchain dispute resolution could fill this gap. Therefore, it is valuable to consider as a research question:

Under which conditions blockchain dispute resolution could guarantee a lawful settlement alternative when litigation is not accessible?

In answer to this question, the paper will also verify whether blockchain dispute resolution has the potential to qualify as an ADR or ODR. Due to the nature of the topic, the research method for this thesis is multidisciplinary: doctrinal, societal, and empirical. The thesis will try to apply existing regulations or legal principles to blockchain dispute resolution.

In the first section, this thesis will identify the framework in which those blockchain transactions operate (Section 2). This section will provide a general explanation to the technical aspect of Blockchain and smart contracts. The following section will highlight the different disputes that might arise around and within the blockchain (Section 3). This process will clarify in which situation blockchain dispute resolution platforms might provide the most value and guarantee the right to a fair trial. It is important to analyse how the current established solutions in those disputes are insufficient or incomplete (Section 4). To respond to the research question, the first step is to explain how those blockchain dispute resolution could intervene to fill the gap (Section 5). The second step is to identify the limitations of blockchain dispute resolution (Section 6). Identifying those limitations will lead to suggested amendments to blockchain dispute resolution procedural aspects. If adequate measures are implemented, blockchain dispute resolution might see a path leading to national recognition either as ARD or ORD (Section 7). Regardless of the national law and jurisdiction decision, blockchain technology itself could supplement traditional procedures on the enforcement procedures.

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[8] Some examples of the literature elaborating on this topic area: Tonya M. Evans, *The Role of International Rules in Blockchain-Based Cross-Border Commercial Disputes*, 65 Wayne L. Rev. 1 (2019) or Cemre Kadioglu Kumtepe, *A Brief Introduction to Blockchain Dispute Resolution,* John Marshall Law Journal, Vol. 14, No. 2, (2021).

2. The framework: Blockchain technology and Smart contract

The purpose of this section is to explain how blockchain technology and smart contracts work. This section will also highlight how those technologies allow transactions in comparison to more traditional centralized platforms.

This section will be divided into two subsections. Subsection 2.1 will provide an overview of how blockchain technology operates and the importance of cryptocurrencies in this scheme. Subsection 2.2 will present how smart contract applications transform the way agreements are traditionally enforced and their impacts.

2.1. The principle of Blockchain and cryptocurrencies

Cryptocurrencies operate on what is called Blockchain technology. The following subsection will elaborate on the scope, application and mechanism of this technology. It will also highlight some of the core characteristics of the technology.

2.1.1. The blockchain technology: scope and application

A monetary transaction between a buyer and a seller can be simple such as a cash transaction face to face, fast such as a click on a website, or decentralized such as transactions on the blockchain. In the latter case, money does not directly reach the seller. Transactions involving government-issued currency or also known as FIAT currencies are most likely processed by an intermediately who is often a financial institution such as a bank. Banking institutions are centralized systems that are operated by governing bodies and gatekeepers.[9] This centralized system was implemented to support cross-border transactions and was perceived as better than personal management.[10] As a consequence, financial institutions were granted the power to control the spending and transactions of any individuals. To balance this institutional monopoly, Satoshi Nakamoto, knowns as the founder of Bitcoin and whose identity remains undisclosed

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[9] E. Napoletano and Benjamin Curry, *What Is DeFi? Understanding Decentralized Finance,* Forbes Advisor, (April 8, 2022) https://www.forbes.com/advisor/investing/defi-decentralized-finance/ accessed April 2022 (explain briefly how centralized finance operate and the difference with decentralized finance).

[10] Kirill Bensonoff, *Decentralised versus centralised finance: Impacting a global market*, FinTech Futures (February 2020), https://www.fintechfutures.com/2020/02/decentralised-versus-centralised-finance-impacting-a-global-market/ accessed January 2022 (explain the need for centralized finance and present the perspectives of decentralized finance).

introduced a way for individuals to proceed to money transactions without a centralized authority.[11]

Decentralized Finance, also referred to as DeFi, comes as an alternative to centralized control over money. Centralized Finance refers to institutionalized control over money. In centralized finance, individuals put their trust in the institution. On the overhand, DeFi protocols offer a certain number of advantages compared to Centralised Finance or traditional finance. Decentralized finance provides more transparency, as it is deployed on a public blockchain, but it specifically removes the need for trust in the equation.[12] The original Bitcoin Whitepaper and code published by Satoshi Nakamoto, was the first known document to introduce the blockchain technology as we know it now.[13]

Bitcoin is a digital currency and blockchain is the technology that helps the transfer of digital currencies or assets from one person to another person, or to be more precise from one digital wallet to another. The technology rely on cryptography and hash functions.[14] To explain blockchain technology, the starting point can be the original technique introduced by a group of researchers in 1991. Their idea was simple, a blockchain is a cryptographically secured chain of blocks.[15] Their innovative idea was to calculate hash values of documents and save them with a timestamp. All the records would include the hashes of the precious records' certificate. This perpetual interlink is also at the core of Bitcoin and blockchain technology.

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[11] Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System,* (2008), 2-5. https://bitcoin.org/bitcoin.pdf accessed January 2020 (considered as the birth document of Bitcoin, the pseudonymous author presents how the technology works and its incentive scheme).

[12] Jiahua Xu and Nikhil Vadgama, *From Banks to DeFi: the Evolution of the Lending Market*, in Enabling the Internet of Value, How Blockchain Connect Global Businesses, 53-66 (2022) DOI:10.1007/978-3-030-78184-2_6 (explain further the problem with traditional finance with a focus on lending).

[13] See Satoshi, *supra* note 11.

[14] Priyanka Rathee, *Introduction to Blockchain and IoT,* in Advanced Applications of Blockchain Technology. Studies in Big Data (60) 1-14, (2020) DOI: 10.1007/978-981-13-8775-3_1 (Detailed explanation on the technical aspect of Blockchain).

[15] Stuart Haber and W. Scott Stornetta, *How to time-stamp a digital document,* J. Cryptology 3, 99–111 (1991). DOI:10.1007/BF00196791 (the paper introduces the combination of hash and digital signature as a secure way to time stamp a document, improving the naïve solution method).

2.1.1.1. Blockchain Mechanisms

Bitcoin, operating on the Blockchain, is a digital currency that aims to provide a trustless system that would prevent double-spending. The technology started to shake the legal framework as decentralized transactions are difficult to regulate [16]

A blockchain is a type of Distributed Ledger Technology, where transactions are recorded, traceable and immutable. Transactions are recorded on the blockchain within a chain of blocks. Each block needs to be confirmed by an immutable cryptographic signature. The digital signature is required from the responsible party to validate a transaction.[17] Each user on the blockchain platform will have at least two keys, a public key (which is public and visible by all users) and a private key (a secret key linked to the public key). While the public key serves as a virtual identification, the private keys should never be disclosed by their owner.[18] Once the transaction is signed by the user, the blockchain protocol will process and share the transaction to all the computers connected to this specific blockchain network. The transactions must be verified and validated by the network which is called a consensus. Once validated, the information will be added to the blockchain's public ledger, shared with the entire network of computers, and a new block will be created.[19] Each new blocks need a few data input including the *hash* result from the previous block. To simplify, the hash is a string of fixed size. The hash is generated using the input of data from the transaction. As all blocks are linked to another using the previous block hash, it is not possible to alter previously recorded blocks.[20] There are different types of blockchain, such as Bitcoin or Ethereum. Those blockchains always need to be validated by a form of distributed consensus. While there are different types of consensuses, such as proof of work or proof of stake. The idea is that validation from the whole network is required. Without centralized authority, blockchain protocols must provide an incentive for

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[16] Riikka Koulu, *Blockchains and Online Dispute Resolution: Smart Contracts As an Alternative to Enforcement*, Scripted 13 (1) 40–69 (2016) DOI: /10.2966/scrip.130116.40 (provide more information on the legal reaction to Bitcoin and smart contract but also how smart contract should be interpreted).

[17] Arvind Narayanan and others, Bitcoin and cryptocurrency technologies, 37-42 (2016), ISNB: 978-0691171692 (explain in detail the characteristics of digital signature and the idea that the public key is acting as an alternative identity).

[18] Id. at 165 (confirm the anonymity on the blockchain with the use of public key).

[19] Daniel Drescher, Blockchain Basics, A Non-Technical Introduction in 25 Steps, 147-170 (2017) ISBN: 978-1-4842-2603-2 (explain the concept of peer-to-peer system of computer).

[20] ByBit Learn, *Explained: What Is Hashing in Blockchain?* ByBit Learn, (December 17, 2020) https://learn.bybit.com/blockchain/what-is-hashing-in-blockchain/ accessed March 2022 (explain the concept of proof of work. This is the core element to blockchain immutability).

accurate and responsible record keepers. [21] Nonetheless which blockchain is used, once recorded, a transaction cannot be erased from the blockchain transaction history and therefore from the blockchain itself.

2.1.1.2. Blockchain characteristics

Blockchains can be public or private. Ethereum and Bitcoin are both public blockchains. Due to the limited scope of this thesis, only transactions on public blockchains will be discussed throughout the development. Blockchain provides a level of transparency, immutability and decentralization, an alternative solution to the centralized banking system. Nobody has officially and successfully been able to claim to be the founder of Bitcoin. Ethereum on the other hand has a public list of co-founders including Vitalik Buterin.

Although transactions can be verified on the blockchain its users can remain anonymous using private key encryption. Not only the sender and receiver can remain anonymous but any participant on the blockchain.[22] Blockchains are also immutable as once blocks are approved, they become irreversible. As mentioned in the previous section, each block needs the data from the previous block. Blockchain transactions are therefore linked to one another. Those transactions can be of monetary nature, for example, currencies can be sent, received and recorded on the blockchain.

2.1.2. Cryptocurrencies: definition and scope

Bitcoin is the first known example of a cryptocurrency recorded on a blockchain. As mentioned above, Bitcoin is a digital or virtual currency.
The court of Justice of the European Union in the case C-264/14 stated that Bitcoin is a virtual currency and that a virtual currency can be defined as a type of digital money, which is issued, operated, and controlled by such digital money developers, and accepted by members of a

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[21] Lin William Cong and Zhiguo He, *Blockchain Disruption and Smart Contracts*, THE REVIEW OF FINANCIAL STUDIES, vol 32(5),1754-1797 (2019) DOI 10.3386/w24399 (See section Decentralized Consensus, explain what Proof-of-work and Proof-of-stake are, both are incentive models on the blockchain technology).
[22] Orna Rabinovich-Einy and Ethan Katsch*, Blockchain and the Inevitability of Disputes: The Role for Online Dispute Resolution,* 2019 J. DISP. RESOL., 54 (2019) https://scholarship.law.missouri.edu/jdr/vol2019/iss2/6 (Anonymity do not only serve the users but also other participants in the network such as miners, this avoid conflict of interest and any potential corruption in the validation process).

specific virtual community. [23] There is however not yet a global consensus on its legal definition.

In Canada, cryptocurrencies are considered commodities. Indeed, the Canadian regulatory authorities including the Bank of Canada and the Canada Revenue Agency do not classify cryptocurrencies as 'money' or 'currency' to be more precise they do not consider that cryptocurrencies are legal tender.[24] Therefore, the use of cryptocurrencies to sell or purchase goods is considered a barter transaction meaning "two persons agree to a reciprocal exchange of goods and services and carry out that exchange usually without using money." [25] This justifies their disregard for cryptocurrencies as a form of payment thus cryptocurrencies do not qualify for taxation within their existing legal framework.

In the United States the focus is on the integration of cryptocurrencies into the existing regulations. Federal and state laws on the use of cryptocurrencies and other forms of money are quite different from one another. From a federal standpoint, the guidance provided in March 2014 by the Government Accountability Office clarifies the taxation guides that apply when dealing with cryptocurrencies. The guidance indicated that "convertible cryptocurrencies are treated as property and subject to the same taxation rules that apply to other property." Convertible cryptocurrencies are those that are equivalent to the value in real currency, or which can act as a substitute for real currency, such as bitcoin.Cryptocurrencies that are not convertible will not be subject to those tax principles. As such, "where cryptocurrency is referred to in the federal tax implications below it means convertible cryptocurrencies."[26] The discrepancies and classification hereby used for tax purposes are both complicated as well as counterintuitive measures thought to dissuade people against trading in cryptocurrencies. The key goal is to ensure that the protocols and mechanisms used are legal and suited to the purpose. Moreover, in the Notice 2014-21, the Internal Revenue Service (IRS) declared "For federal tax purposes, virtual currency is treated as property. General tax principles applicable to property transactions apply to transactions using virtual currency."[27]

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[23] Decision of the Court of Justice, C-264/14.

[24] Tariq Ahmad, *Cryptocurrency Regulations in Canada, BTC Wires,* CoinMarketop (September 28, 2020), https://www.coinmarketop.com/2020/09/28/cryptocurrency-regulations-in-canada-btc-wires/ accessed March 2022 (provide details on Canadian decision on the legal qualification of cryptocurrency).

[25] Alexandra Sims, Kanchana Kariyawasam, and David G. Mayes, Regulating Cryptocurrencies in New Zealand, in REGULATING CRYPTOCURRENCIES IN NEW ZEALAND, 90 (2018) ISBN: 978-0-473-45925-3 (Cryptocurrencies are not currencies according to the Canadian Tax authorities but are properties. The Canadian Tax Authorities however recognised that gains or losses on cryptocurrencies could be taxable).

[26] Ibid, 96.

[27] Internal Revenue Service, Notice 2014-21(US) (Cryptocurrencies fall under the general tax principles applicable to property transactions, similar to the Canadian regime, cryptocurrencies are not considered as currencies but can be taxed on gains or losses).

Whether cryptocurrencies can be seen as property or monetary value, the ownership right cannot be denied. Transactions on the blockchain involving cryptocurrencies, whether they are considered property or monetary value can lead to disputes. However, before discussing the matter involving dispute settlement, the mechanism of smart contracts should be explained.

2.2. The role of the smart contract on the blockchain

A smart contract is a concept that could be difficult to define at first. Intimately related to blockchain, smart contracts are computer programs filled with conditional clauses and obligations. They monitor the validation of the conditions to trigger automatic enforcement.[28] To understand a smart contract, it is important to first explain how they work, what advantages they provide, and in which context they can offer more efficient transactions.

2.2.1. The general principles of Smart contract

The traditional contractual relationship is often seen as a document that states an agreement between different parties, all parties to the contract should respect certain obligations. Even if the contract is oral or tacit, failure to fulfill open the right to seek compensation as even a non-written agreement can be qualified as a contract according to international customary law.[29] Indeed, if one party does not commit to what they agreed, ultimately a court decision could be the only solution for enforcement. Court proceedings are attached to high cost and slow procedures and might not appear as a reasonable solution for low-value transactions. With a smart contract, enforcement is not limited to the proceeding. Blockchain technology is used to draft agreements in code with no ambiguity.

No consensus has been found on the definition of the smart contract. A smart contract is computer software with straightforward conditions and obligations. The concept of a smart

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[28] Amy J. Schmitz and Colin Rule, *Online Dispute Resolution for Smart Contracts*, JOURNAL OF DISPUTE RESOLUTION 103, University of Missouri School of Law Legal Studies Research Paper No. 2019-11, 106-107(June 2019) https://ssrn.com/abstract=3410450 (draw an overview on the differences between a contract and a smart contract and mention what benefits the self-enforcement feature provide to smart contract).

[29] Beatrice Bonafé and Paolo Palchetti, *Legal normativity through tacit agreements: Putting Peru v Chile into a broader perspective*, QIL 18, 3-17 (2015) (short note on tacit agreement in light of the Vienna Convention on the Law of Treaties).

contract is intimately linked with the idea of automated performance.[30] Nick Szabo provided a broad definition of a smart contract: a computerized transaction algorithm, which performs the terms of the contract.[31] Some definitions are more detailed: "A smart contract is a piece of code which is stored on a Blockchain, triggered by Blockchain transactions, and which reads and writes data in that Blockchain's database".[32] To properly qualify smart contract as a contract, multiple aspects should be taken into consideration: definition and condition to form a contract, the enforceability of a contract, etc...[33] Regardless of the definition, a smart contract, once formally accepted by all parties, can be self-enforced contrary to traditional contracts.

2.2.2. The trust in smart contract

Contrary to a traditional contract, a smart contract can be automatically performed and is not relying on trust. Although breach of the agreed terms can occur when using a smart contract, trust in the other party to perform certain tasks is not required.

Three types of trust can be distinguished: calculative trust, personal trust, and institutional trust. Institutional trust refers to the trust individuals give to institutions.[34] For example, as a plaintiff will trust that the judicial system will provide access to a fair trial, the plaintiff will be more likely to use institutional means rather than personal revanche. For smart contracts, trust is put on the technology which can also be subjected to limitations: a technical disfunction, incorrect code, or incorrect validation from the network. Sometimes, automated enforcement of the smart contract is dependent on what is called an "Oracle". Oracle is a "system that provides blockchain with information coming from the real world."[35] Although smart contracts can be self-enforced, external data is sometimes required to confirm all conditions are met. The smart

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[30] Alexander Savelyev, *Contract law 2.0: 'Smart' contracts as the beginning of the end of classic contract law*, Information & Communications Technology Law, 26:2, (2017) 116-134, DOI:10.1080/13600834.2017.1301036 (the consent is also an important topic here. Smart contract can be enforce without the intervention of a national jurisdiction).

[31] Nick Szabo, *Smart contracts,* in Essays on Smart Contracts, Commercial Controls and Security (1994) https://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szab o.best.vwh.net/smart.contracts.html accessed March 2022 (Appears to be the first or one of the first mention of the term smart contract).

[32] Gideon Greenspan, *Beware of the Impossible Smart Contract*, Blockchain News (April 12, 2016) http://www.the-blockchain.com/2016/04/12/beware-of-the-impossible-smart-contract accessed March 2022 (Important to note the data read on blockchain database can also be called from outside sources)

[33] See Kevin Werbach and Nicolas Cornell, *Contracts Ex Machina*, Duke Law Journal 67, no. 2 (November 2017): 313-382.

[34] See van der Linden, *supra* note 3.

[35] See Giulio Caldarelli, *Understanding the Blockchain Oracle Problem: A Call for Action*, Information 11, no. 11: 509 (2020) DOI: 10.3390/info11110509.

contract needs to collect the data from oracles as the blockchain technology does not access the data externally.[36] Oracles can also involve human intervention and could be seen as contrary to the trustless idea of a smart contract. This is one of the most vulnerable parts of a smart contract. Oracles create a gap, if trust could still be dismissed, "it is advisable for businesses using smart contracts to incorporate appropriate dispute resolution mechanisms."[37]

2.2.3. The qualification as a contract

Smart contracts are agreements that can be self-enforced, and their code is immutable. When the parties to a smart contract agreed to a transaction, they enter into an agreement that some jurisdictions can be subject to the same rules as a contract.[38] A distinction is made between a "contract" and an "agreement". A contract means that the agreement is legally binding and enforceable in a court of law. In the United States, state courts verify whether an agreement satisfied several requirements including an offer, acceptance, and consideration.[39] Whether the smart contract is qualified or not as a legal contract by national jurisdictions does not undermine the fact that an agreement has been made between at least two parties. Parties to the smart contract might not always integrate dispute resolution tools into the agreement.

One of the distinctive characteristics of Blockchain is the anonymity of the parties. Transactions recorded on the blockchain are attached to a digital wallet. With only the public key, unless the owner discloses their identity, it is not possible to retrieve their personal data such as real legal name or country of residence. Unlike a traditional contract, with the smart contract it is possible to enter into an agreement smart contract using only the public keys of

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[36] Kamran Mammadzada1, Mubashar Iqbal, Fredrik Milani1, Luciano Garcıa-Banuelos and Raimundas Matulevicius, *Blockchain Oracles: A Framework for Blockchain-Based Applications*, in Lecture Notes in Business Information Processing, vol 393 (Conference BPM 2020 Blockchain and RPA Forum Seville, Spain, September 13–18, 2020 Proceedings) DOI: 10.1007/978-3-030-58779-6_2 (explain how oracles are included in blockchain data collection).

[37] van der Linden, *supra* note 3 at 466.

[38] See § 1.8 of Law Commission, *Smart legal contracts Advice to Government,* Law Com No 401, (2021) https://s3-eu-west-2.amazonaws.com/lawcom-prod-storage-11jsxou24uy7q/uploads/2021/11/Smart-legal-contracts-accessible.pdf (in 2019, in a legal statement the UKJT concluded smart contract "are capable of giving rise to binding legal obligation". Although this does not mean smart contract are recognised as contract, rights and obligation can derive from it).

[39] Stuart D. Levi and Alex B. Lipton, *An Introduction to Smart Contracts and Their Potential and Inherent Limitations*, Harvard Law School Forum on Corporate Governance, (May 26, 2018), https://corpgov.law.harvard.edu/2018/05/26/an-introduction-to-smart-contracts-and-their-potential-and-inherent-limitations/ (as the United States function at a federal level and state level, the enforceability of a contract is dependant to state law. There are core standard but different states could have different interpretation on the legal qualification of smart contract).

the parties and therefore without formally identifying the parties. If a dispute arises from a transaction where only the public keys are known, it will be impossible to deliver formally the summon. A dispute between two parties on the Blockchain using only their public key will therefore not allows access to a national court. In those cases, the right to a fair trial is not guaranteed.

Even outside the decentralized industry, cross-border transactions represent a high volume in the total worldwide transactions. It is necessary to guarantee the proper protection of any individual who enters into an agreement online on the blockchain. That protection also includes access to proper dispute resolution mechanisms.

Knowing smart contracts on the blockchain could potentially lead to contractual relations which itself can result in a breach of contract, dispute resolution mechanism should be accessible and available. It is important to look at the more conventional dispute resolution tools and then examine whether a solution can be provided with blockchain technology. Before this, the next section will provide clarity on the different disputes which could arise on the blockchain.

3. Disputes and relations around the blockchain

An agreement can be as simple as a handshake or on the contrary, it could be a thousand lines on a document an online stored and digitally signed by all parties. Proper contract drafting is important, especially in cases of litigation. In contractual relations, the choice of court clause should be added even more when the parties are geographically located. For online transactions, it is essential to look at the competent jurisdiction.[40] Online transactions can have both online and offline consequences for both parties. The same logic is applicable to blockchain disputes.

3.1. Different disputes around the blockchain technology

The different forms of blockchain disputes affect how disputes are handled in the blockchain environment. Usually, disputes among blockchain users can range from disputes based on

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[40] Reference to the applicable law and competent judge according to International Private Law.

network access conflicts to compliance issues regarding the terms of use. Disputes can also be based on the way transactions are fulfilled on the network.

Typically, there are three types of disputes that can affect a given protocol or blockchain network. The three disputes are non-transactional, off-chain governance disputes, and on-chain disputes.[41]

In the case of non-transactional disputes, the disputes are not related to the blockchain transaction itself. Such disputes cannot be addressed on the blockchain since they are neither recorded nor performed on the network. Non-transactional disputes are based on the behaviours of the parties in the real world. For instance, the confidentiality provisions are part of the terms and conditions for any given network, but such information is not part of the data stored in the blockchain. In most cases, resolving such disputes requires the use of strategies other than the ones that may be applicable in dealing with transactional disputes. NFTs are another impactful example. While a NFT's property rights are recorded on the blockchain, the NFT itself is hosted/saved outside of the blockchain. Only the metadata of the NFT will be recorded to the blockchain. Some NFTs are stored on external servers sometimes centralized or sometimes decentralized such as IPFS.[42] For example, if a centralized server decides to stop or restrict access to the storing location, it is impossible to recover the actual product or image. In this case, the dispute is outside the blockchain, the metadata on the blockchain is correct but the actual content has been corrupted.

On the other hand, off-chain governance disputes can be settled using the standard dispute resolution systems such as the state courts. Some of the decisions that fall within the scope of off-chain disputes include decisions regarding how the blockchain network evolves. Usually, such decisions should be made through unanimous agreements for example in a Decentralised Autonomous Organisation (which will be developed further). The off-chain governance decisions are a fundamental necessity for any given blockchain protocol, but they tend to be more complicated than other decisions.

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[41] Abdulhakim Alhabib, Jenny Cieplak, Nadia Hewett, Brooke Padgett, Masha Smith, *Bridging the Governance Gap: Dispute resolution for blockchain-based transactions*, World Economic Forum, Whitepaper, 7 (December 2020) https://www3.weforum.org/docs/WEF_WP_Dispute_Resolution_for_Blockchain_2020.pdf
(the paper focus on on-chain disputes but provide some information of off-chain disputes as well).

[42] Eric Khun, *NFT misconception: JPEG aren't on the Blockchain,* Eric Khun (October 31, 2021) https://erickhun.com/posts/nft-misconception-image-arent-on-blockchains/ accessed March 2022 (due to the size of NFTs, it is not efficient to store it on the blockchain directly).

The third category of blockchain disputes is on-chain disputes. On-chain disputes are based on the on-chain transactions that should be performed either partially or fully on the blockchain protocol. On-chain disputes can revolve around issues such as payments or the timely delivery of products and much more. In such cases, proper dispute resolution mechanisms should be adopted to ensure that the blockchain transactions lead to the best possible outcomes within the legal parameters of the blockchain network.

Participating in the on-chain dispute resolution process requires the key parties to decide on the ideal approach to dispute resolution whether it would be in front of a national court or via online dispute resolution tools. While disputes related to a transaction recorded on the blockchain and arising as a result of a trigged smart contract could potentially be resolved with traditional dispute resolution methods, it could lead to difficulties if the parties involved cannot be identified outside the network. This paper will primarily focus on the latter case. In those cases, the dispute involves individuals identifiable only by their digital wallet address and their geographical location remains undisclosed.

Before exploring the different solutions available to the parties, it is important to identify the two different cases this paper will try to cover. A dispute on the blockchain can result from a transaction between two digital wallets but also because of a DAO's action.

3.2. A transactional dispute: two cryptocurrency addresses

As explained previously, there are different types of disputes which could occur on a blockchain protocol, but it is important as well to distinguish between a dispute involving only two parties and a dispute involving multiple parties such as a DAO.

This first part will take into consideration a more common dispute situation: one involving two crypto addresses or also called a crypto wallet. Cryptocurrencies can be stored in different ways. When cryptocurrencies are bought on brokerage centralized platforms such as Kraken, Binance or Coinbase, those cryptocurrencies are held on a "custodial wallet".[43] Excluding this type of

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[43] For more information see: Binance Academy, *Custodial vs Non-custodial wallets: What's the difference?*, Binance Academy (March 23, 2022) https://academy.binance.com/en/articles/custodial-vs-non-custodial-wallets-what-s-the-difference accessed March 2022.

wallet, two types of cryptocurrency wallets can be distinguished, hot-wallet and cold-wallet.[44] A wallet is essentially the support on which is linked to a crypto address. A crypto address will have a public key and a private key.[45] To transfer cryptocurrencies, only the public key of the receipt is necessary, private keys are always kept secret. However, unlike banks, there is no identification procedures or protective procedure in place. This means if the sender makes one typo in the address, the funds will be transfer to another crypto wallet or just lost. No recall button exists on the blockchain. Arguably, in the case of a unilateral mistake from the sender it could be difficult to open a dispute. Disputes based on transaction between wallet or crypto addresses can also involve fraud or failure to fulfil their obligation. In a recent case court, a claimant was granted a Norwich Pharmacal order, a court order who impose a duty upon a person to disclose full information on wrongdoers.[46] In this case, unauthorized Bitcoin transfers from claimant's wallet were identified. With the blockchain technology, some of the Bitcoin were identified in another Bitcoin address on a crypto exchange. The claimant requested to the court to force the exchange to disclose the necessary information. Although this request was granted with no regard to the jurisdiction of the exchange, the power of the court is limited when transactions are fully decentralized. Indeed, a dispute can occur between two crypto addresses outside of centralized and custodial wallets, for example, a buyer on the blockchain is not satisfied with the quality of the product or service. If the transaction occurred solely on the blockchain with no intervention of a centralized platform, a court would have difficulty providing support because the owner of the wallet is anonymous.[47] Smart contracts being the new form of contract relations on the blockchain, it is expected disputes will arise soon or later. This case could be similar to a traditional breach of contract, each crypto wallet being either the claimant or the respondent. Unfortunately, the court will not be able to summon the parties

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[44] Ryan Haar, *How to decide on a hot wallet or cold wallet for your crypto, and whether you need one at all*, The Time/ Next Advisor, (September 23, 2021) https://time.com/nextadvisor/investing/cryptocurrency/hot-wallet-vs-cold-wallet/ accessed March 2022 (A hot-wallet is a software wallet store on a phone or computer and who is connected to the internet. A cold-wallet is a hardware wallet who keep the stored assets offline).

[45] See Vitalik Buterin, *Vitalik Buterin explain Bitcoin terminology Part I,* Bitcoin Magazine https://bitcoinmagazine.com/technical/introduction-to-bitcoin-terminology-1330755526 accessed February 2022

[46] Addleshaw Goddard, *Norwich Pharmacal Order granted against two bitcoin exchanges*, Addleshaw Goddard, (March 24, 2022) https://www.addleshawgoddard.com/en/insights/insights-briefings/2022/dispute-resolution/norwich-pharmacal-order-granted-against-two-bitcoin-exchanges/ accessed April 2022 (In this decision the court released the decision on companies who are out of its jurisdiction to protect the interest of the claimant).

[47] Syed Rahman, *Cryptocurrency and anonymity – why the two does not necessarily go hand to hand*, Global legal post (August 24, 2021)*,* https://www.globallegalpost.com/news/cryptocurrency-and-anonymity-why-the-two-do-not-necessarily-go-hand-in-hand-1223430970 accessed March 2022 (explain the position of the High Court, the court intent aims to limit the impact of anonymity in crypto transactions).

to a hearing. The fourth section of this thesis will explain further the reason behind the powerlessness of the courts.

3.3. Between an individual and a DAO

An individual can also have a dispute with DAO. In general, when a dispute arises liability is one of the most important legal questions: who is responsible for what. The type of dispute which could arise between an individual, through its crypto wallet, and a DAO could be first seen as related to the liability of the DAO. Indeed, the action of a DAO on its community and network can have a negative impact on individuals, but it can also occur that core members of a DAO themselves damage the DAO structure or reputation. DAO could potentially be well structured and could carry due diligence and know-your-customer procedures on its member. However, because decentralized governance is often a major aspect of their internal policy, proper identification of its members is usually not required. Before further explanation, it is necessary to shed light on the first DAO controversy/dispute known so far.

In 2016, the notorious Decentralized Autonomous Organization ("DAO) called "The DAO" suffered from a malicious attack shortly after its creation.[48] The open-source protocol "The DAO" was operating on Ethereum and intended to act as an investor-directed venture capital firm. Due to a loophole in its code, "The DAO" was hacked and around 60 million dollars of Ether (ETH) was stolen from the initial 150 million dollars this protocol raised. The community behind the project collectively raised funds and retributed the lost amount to the victims. This case has shown that the blockchain-based community can have an incredible unified collective power within or out of the DAO structure. Although the Blockchain is seen as immutable, there could be a breach or a leak resolving in a massive loss for its members. This unicity shown by "The DAO" community could just be an exception and this level of cooperation cannot be expected any time a DAO faces a financial issue. If an asset owned on the Blockchain can be seen or qualified as financial assets or at least as property, the prejudiced party would want to proceed with legal action. As for the Blockchain, "The DAO" operated via a decentralized

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[48] T.J. de Graaf1, *From old to new: from internet to smart contracts and from people to smart contracts,* Computer Law & Security Review 35, 10, (2019) DOI: 10.1016/j.clsr.2019.04.005 (provide more background information on how the DAO hack occurs)

network and therefore legal action against such an "organization" could hardly be pursued in the jurisdiction of the prejudiced party.

A DAO is usually created to support and enforce the objectives of its blockchain protocol, but it is also used to manage a treasury.[49] Having a DAO that vote, communicate, and supports its protocol has an impact on its reputation. The blockchain protocol is therefore intimately linked with the DAO, and the DAO could have an impact on the value of the token. The DAO set its own voting system[50] which can implement governance policy for the whole network. Academic literature has yet to come to a consensus on the definition of the DAO. Nonetheless, several distinctive characteristics can be drawn from the literature.

The definition of DAOs is still very broad to the extent of a community around a blockchain protocol on a social media platform such as Telegram or Discord, is sometimes perceived as DAOs. In short, a DAO is an organization led by a community that can make operational decisions without centralized power.[51] Decentralized Autonomous Organizations or DAOs are organizations where business rules are usually encoded and embedded in smart contract programs. These programs are executed only when the specified rules are fulfilled. In the recent past, the uptake in these types of organizations is popular among software communities that are seeking to re-implement traditional decision-making rules through blockchain technology. According to Dwivedi and Udokwu et al, "the DAOs regulations and transactions are stored on a blockchain which increases the transparency among shareholders while the execution of the said DAO's rules is controlled by programming code."[52] The first DAO crowdfunding project was launched in 2016 in the Ethereum blockchain. The sole purpose of this project was to provide a novel business model where the shareholder or the investor can run both not-for-profit and commercial enterprises without an existing management structure. As a means to

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[49] Jishnu Bhardwaj, Raunak Negi, Preeti Nagrath, and Mamta Mittal, *Applications of Blockchain in Various Domains,* in Smart IoT for Research and Industry, Innovations in Communication and Computing, (2022) DOI:1007/978-3-030-71485-7_1 (see figure 1.6 on the role of Decentralized Autonomous Organization).

[50] Middle.X @ PAKA Labs, *In-depth analysis: 7 common voting mechanisms of DAO*, CoinYuppie (January 12, 2022) https://coinyuppie.com/in-depth-analysis-7-common-voting-mechanisms-of-dao/ accessed February 2022 (exploring the different type of voting mechanism for DAO, DAO governance is an extensive topic. DAO are decentralized and aims to empowers its users. The voting power is therefore one of the foundation in DAOs governance).

[51] Jacquelyn Melinek, *Despite tooling limitations, DAO optimists see new use cases for a democratic, token-based future*, TechCrunch, (March 29, 2022) https://techcrunch.com/2022/03/29/despite-tooling-limitations-dao-optimists-see-new-use-cases-for-a-democratic-token-based-future/ accessed April 2022 (DAO has the potential to be applied to different organizations and communities).

[52] Vimal Dwivedi, Alex Norta, Alexander Wulf, Benjamin Leiding, Sandeep Saxena, and Chibuzor Udokwu, *A Formal Specification Smart-Contract Language for Legally Binding Decentralized Autonomous Organizations,* IEEE Access, Vol. 9, (2021), DOI: 10.1109/ACCESS.2021.3081926.

deviate from the traditional business model generation, DAOs are an alternative business model tool though within the blockchain technology space.

As mentioned above, the first major challenge facing DAOs at the onset was the loss of funds due to a malicious attack caused by a flaw in the code of the smart contract's DAO. The second major challenge is the lack of an appropriate legal foundation in which DAOs are established and run. Although blockchain technology is not as such new, the innovativeness such as the emergence of DAOs makes them complex to develop, manage and find willing users besides those acquainted with the blockchain technology.

Unforeseen events can make DAOs unreliable. Therefore, DAO must allow changes in their code if they wish to remain operational. Since they are also based on specific and strict rules, the process in which rules can be changed is tedious and complex. Based on the nature and how smart contracts are designed for DAOs, the long procedures requiring DAO token holders complicate their governance resulting in a lack of strategic oversights and voting proposals. Moreover, "while some DAOs use a traditional one-token-one voting scheme, others wary of concentrating power use a range of novel schemes including reputation-based systems and conviction voting."[53] This makes DAOs more complex to manage and handle especially in the case of disputes arising from their use.

A lack of proper governance models for DAOs makes them riskier since some of the creators have made attempts at creating DAOs without an appropriate legal structure. So far there have been some dispute resolutions within DAOs handled by third-party providers such as the Decentralized Dispute Resolution Services (DDRS). To some extend by allowing anyone to appeal a decision it has been counterproductive to their reliability. The complicated nature of these cases and the implications of the creation of DAOs either for commercial or non-profit purposes overlap with the traditional legal structures thus necessitating a clarity of their organizational fit. For instance, non-profit DAOs are likely to be treated as unincorporated societies or associations.[54] Partnerships, unincorporated societies or associations are not separate legal entities and in law cannot hold and own assets and are unable to enter into contracts. DAOs operate like machines since they can only accomplish the job they're assigned within a spelled procedure and rules. Members of a DAO use tokens as a voting right to decide

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[53] Alexandra Sims, D*ecentralised Autonomous Organisations: Governance, Dispute Resolution, and Regulation,* Dispute Resolution and Regulation (2021), DOI: 10.2139/ssrn.3971228.
[54] See Gene Takagi, *DAO: What is it? What does it mean for nonprofits?*, Non Profit Law blog (November 21, 2021) https://nonprofitlawblog.com/dao-what-is-it-what-does-it-mean-for-nonprofits/ (Possibility for unincorporated DAO to obtain IRS recognition of its tax exemption under Section 501(c)(3) of the Internal Revenue Code).

on topics ranging from funds raising to allocation. A majority of DAO members can be allocated with more voting rights depending on their contribution to the project but depend as well on the voting system of the DAO. Thus, the "outcome can be based on the degree of participation as well as a voting preference."[55] In a traditional limited company, the directors of the company have voting rights with each director holding a single vote. The governments' concern about the use of smart contracts such as those deployed by the use of DAOs is a means of control than governing their use. Over the past few years, governments across the world have fought hard against cryptocurrencies such as bitcoin in efforts to suppress the wave of decentralization sweeping across the world. However, the efforts made to suppress it revolve around legal processes and systems necessary for the enforcement of dispute resolution measures. For instance, one of the most cited concerns for governments and the legal system is on the bearer of liability in case "a mistake is made in the node for example if the money paid into the smart contract is now frozen and neither party can recover the money".[56] Though these are thought of as the least likely events, the traditional legal system covers such incidents, including mistakes, negligence, and unjust enrichment. As such, the lack of case law to form and legal definition are unclear since DAOs do not rely on real human beings with their true identities. As posited by Sims et al., "to be sure, if the parties to the smart contract are pseudonymous or anonymous there will be difficulties in ascertaining their identity, but most people in commerce will want to use their real names."[57] The lack of a legal cover and riskier part in the case of DAOs is, therefore, more liability to the user than to the agency or enterprise itself.

DAOs though safe for use by those who understand them, their complexity and lack of recognition especially within the broader legal systems make them less attractive to a majority of potential users, investors, and shareholders. However, rapid uptake in the recent past several years has led to an explosion of various formats and types with varying benefits to their users. Not without a fight, the deployment and transacting using cryptocurrencies and smart contracts attract different consequences for users in different countries.

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[55] Adrianna Hamacher, *We Can DAO It': How a new wave Of Cypherpunks Is Disrupting Venture Capital – Decrypt, Decrypt,* (April 3, 2021) https://decrypt.co/63807/we-can-dao-it-how-a-new-wave-of-cypherpunks-is-disrupting-venture-capital accessed March 2022 (DAO can be highly adaptable according to the need of its community).

[56] Sims, Kariyawasam, and Mayes *supra* note 25 at 28.

[57] Sims, Kariyawasam, and Mayes *supra* note 25 at 27-28 (those who decided to enter into agreement via a smart contract and remained anonymous, they are accepting to take the risk it comes with).

In the case at the Court of Justice of the European Union, *Skatteverket v David Hedqvist* ruled that "bitcoin exchange transactions do constitute a supply of services effected for consideration and that exchange of traditional currencies for cryptocurrencies are financial transactions that fall within the exemption under Article 135(1) (e) of the VAT directive."[58] Consequently, in March of 2014, the UK government clarified on its position about the tax treatment of cryptocurrencies thus declaring that the initiative was sole "to tax purposes and was no indication of the treatment of cryptocurrencies for regulatory or other purposes."[59] In a different governmental directive in 2015, the UK government maintained that though cryptocurrencies seemed attractive they are so for both legal and illegal purposes. Reiterating on this, in response to the written question directed to the "Chancellor of the Exchequer as to "What steps his department is taking to regulate (a) bitcoin and (b) other cryptocurrencies, the answer was: *The UK government is currently negotiating amendments to the 4th Anti-Money Laundering Directive that will bring virtual currency exchange platforms and custodian wallet providers into Anti-Money Laundering and Counter-Terrorist Financing regulation, which will result in these firms' activities being overseen by the national competent authorities for these areas. The government supports the intention behind these amendments. We expect these negotiations to conclude at EU level in late 2017/early 2018"*[60]. The fact that these amendments were effected without the involvement of either stakeholders or active affected parties such as the wider population points to a dark future in case governments maintain hold of the rigid traditional fiat currency monetary system. The eventual declaration of the changes in "The Sanctions and Anti-Money Laundering Bill 2017-19" Sims et al., decreed among others the mandatory revelation of trader's identities. To most users of blockchain technologies such as DAOs, the merit of the platform is further compromised whenever the element of decentralization is eliminated thus exposing users to more risks associated with their use of cryptocurrencies or smart contracts.

Understanding the value DAOs add to blockchain protocol is the first step. Understanding the risk DAOs bring to a decentralized network is the second step. On a blockchain protocol, when a dispute between two users or owners of crypto wallets arises it is quite straightforward on

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[58] Skatteverket v David Hedqvist, Case C-264/14, Judgment of the Court (Fifth Chamber) of 22 October 2015. ECLI:EU:C:2015:718.
[59] HMRC Brief 09/2014, *Bitcoin and Other cryptocurrencies,* (2014) (The UK government emphasis their intent: the purpose behind tax treatment of cryptocurrencies is limited and do not indicate that this is the starting point for further regulation at this stage).
[60] Sims, Kariyawasam, and Mayes *supra* note 25 at 29.

who is blaming who to be liable. However, DAOs are sometimes complex structures and multiple parties might be involved. The complexity of DAOs structure tends to highlight different types of conflicts. A conflict can occur:

1) between the DAO developers and the DAO users who had invested in it;

2) between the DAO and the hacker/wrongdoer;

3) between the investors and the hacker/wrongdoer;

4) between the DAO and the blockchain network; and

5) between the blockchain network and the hacker/wrongdoer.[61]

Because most DAOs do not possess a legal structure, finding the liable legal person is not simple, nor suing a DAO.[62]

Even if some jurisdiction has started to consider DAO as legal entities,[63] no consensus has been found on the legal qualification of a DAO. Therefore, it is important to consider the possibility to lodge a complaint before the court in cases an unregistered DAO is involved. The different types of on-chain disputes could indicate that one solution is not sufficient. Court cases are not the only solution to a dispute, alternative dispute resolutions are often mandatory before any court case, and for some arbitration is the best alternative.

4. Available solutions to solve blockchain disputes

Disputes are inevitable. A dispute may be defined as "a specific disagreement concerning a matter of fact, law or policy in which a claim or assertion of one party is met with refusal, counter-claim or denial by another."[64] To find a solution to a dispute, parties might pick between different dispute resolution mechanism. In the "Handbook of Dispute resolution", the author explains that resolution is not a single event, a court ruling by itself is not necessarily the resolution of the dispute.[65] The same logic is applicable to disputes on the blockchain. In a

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[61] Riikka Koulu and Kalle Markkanen, *Chapter 19: Conflict Management for Regulation-Averse Blockchains*? in Regulating Industrial Internet through IPR, Data Protection and Competition Law, 381 - 408 (2019) ISBN: 978-9403517704 (at §19.03 explain in detail which liability could be involved).

[62] Stephen D Palley, *How to sue a Decentralized Autonomous Organization*, CoinDesk, (March 20, 2016) https://www.coindesk.com/markets/2016/03/20/how-to-sue-a-decentralized-autonomous-organization/ accessed March 2022 (suggest to start by suing the DAO members or the DAO founders if the DAO is not incorporate).

[63] For example, in the State of Wyoming – see Wyoming State law - SF0038 21LSO-0263 - Decentralized autonomous organizations.

[64] J.G. Merrills, International Dispute Settlement, (2005), ISBN: 9781139165488 (dispute inevitably happens and dispute resolution mechanisms are implemented to avoid self-help situations).

[65] Michael L.Moffitt, and Robert C. Bordone, The handbook of dispute resolution,, 4 (2005) (court decision need as well to be implemented, just having a court ruling does not mean the dispute has been solved).

dispute between two holders of a crypto wallet, the resolution does not only mean the transfer of funds from the respondent to the claimant if they go to court.

The complex nature of dispute resolution is more noticeable in cases that would involve DAOs. To illustrate this thesis, an example will be taken as a used case. A DAO offering grants to another DAO could see their own community questioning their decision. As those grants are sponsored by the DAO treasury and therefore by the DAO member's funding. DAO grants are usually provided in the native token of the DAO and therefore of the blockchain protocol. Grants often represent a large sum of tokens and if those grants are cashed out to stable coins or any other currency, this could affect the value of the native token. The action of the DAOs who received the grant can negatively affect the DAO members, who are also holders of the native token. Those DAO members who have a right derived from their assets could seek compensation. In the event of a dispute resolution between the DAO and its members, recovery of tokens is not the only aspect that they would expect in the resolution.

In any case, if an individual can prove their rights have been breached by a transaction on the blockchain, they might seek a dispute resolution.

Most legal systems encourage out-of-court settlement or Alternative dispute resolution (ARD) before litigation. Different options that might be possible in case of an on-chain dispute will be presented as potential solutions.

4.1. Mediation, an Alternative dispute resolution (ADR)

Alternative dispute resolution or ADR refers to a "procedure for settling a dispute by means other than litigation, such as arbitration or mediation."[66] From mediation, arbitration, or conciliation, ARD is not one solution but covers multiple dispute resolution tools.

In French law, article 750-1 of the Civil Procedure Code state that it is mandatory to proceed to an alternative dispute resolution before lodging a complaint to the court except in situations expressly provided by the article.

ARD has shown to be also costly for companies, as the more formal ones required a mediation agent or conciliator. Most ADR are non-binding and not always an end by itself.[67] Although ARD could frequently be used for disputes with lower values as those procedures are still faster

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[66] See *Black's Law Dictionary* 91 (9th ed. 2009)
[67] Todd B. Carver and Albert A. Vondra, *Alternative Dispute Resolution: Why It Doesn't Work and Why It Does*, Harvard Business review,(May–June 1994) https://hbr.org/1994/05/alternative-dispute-resolution-why-it-doesnt-work-and-why-it-does accessed March 2022 (There are in practice little incentives to use certain ADR, as ADR are not binding but can be costly, a litigation in disguise without the benefit of it).

than court litigation, online dispute resolutions appeal to be an interesting alternative when transactions are partially or fully carried online.

Due to the limited scope of this thesis, this section will focus on mediation. The "Singapore Convention on Mediation" provided private contractual agreements with a legal status comparable to foreign arbitral awards under the New York Convention on Arbitration.[68] The convention recognized the use of mediation as "a method for settling commercial disputes in which the parties in dispute request a third person or persons to assist them in their attempt to settle the dispute amicably."[69]

In most jurisdictions, mediation is loosely regulated, meaning the formalities are limited and mediation can take multiple forms. However, there are some common grounds, often starting with the qualification of the mediator.[70] Mediation can range from informal to formal discussion, the proceeding is not heavily regulated and therefore flexible.[71] The outcome of mediation is however difficult to recognize in all jurisdiction and settlement is subject to the goodwill of the parties. Mediation does come with a cost, as the mediator is compensated. Both parties of a blockchain dispute could decide to hire a mediator, however, this will be based on their own will and if they do not reach an agreement, they will have to find another settlement method. When an agreement is not found, parties can seek litigation.[72]

Resorting to mediation or another type of ADR in on-chain disputes can provide limited advantages. Parties to an on-chain dispute must elect a mediator. They can proceed to mediation off-chain if they disclose some personal information. Supposedly a mediator is

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[68] Nadja Alexander and Shouyu Chong, *An Introduction*, in THE SINGAPORE CONVENTION ON MEDIATION: A COMMENTARY, Volume 8, 1-19 (2019) (explain the main principles set in the Singapore Convention on Mediation, this related primarily on facilitating the circulation of international mediated settlement agreements. As many transactions are cross-border, it is also important to understand the rules applicable to enforce those settlements even if they are non-binding agreements).

[69] Preamble of the United Nations Convention on International Settlement Agreements Resulting from Mediation (2019) https://uncitral.un.org/sites/uncitral.un.org/files/singapore_convention_eng.pdf accessed April 2022 (the Convention also indicate that mediation is a process whereby parties attempt to reach an amicable settlement with the assistance of a third person, the mediator. Here again, mediation is broadly defined).

[70] FindLaw Attorney Writers, *What is mediation and how does it works?*, FindLaw (May 24, 2016) https://corporate.findlaw.com/litigation-disputes/what-is-mediation-and-how-does-it-work.html accessed May 2022 (Mediator in most jurisdictions are required to have a minimum hours of mediator training).

[71] Nadja Alexander, *Chapter 1: International and Comparative Mediation: Definitions and Developments,* in INTERNATIONAL AND COMPARATIVE MEDIATION : LEGAL PERSPECTIVES, (2019) (see table 1for an overview).

[72] Scott Brown, Christine Cervenak and David Fairman, *Alternative Dispute Resolution, Practionners Guide*, 21-23, (1998) https://www.usaid.gov/sites/default/files/documents/1868/200sbe.pdf (ADR do not follow clear legal norms and do not have precedents.

chosen, the settlement will be non-binding, which comes with same the limits mediation offers in off-chain situations.[73]

4.2. Online dispute resolution (ORD)

A private ordering is a form of non-binding negotiation or mediation which can insert into a contract (and by extension a smart contract). On top of being non-binding and therefore taking the risk of being challenged by the losing party, the outcome of a private ordering or negotiation for a smart contract would need to be manually executed.[74] Amazon, Alibaba, eBay are known as some of the leaders in online shopping. This increase in online transactions has also led to an increase in online dispute resolution (ODR).

Online dispute resolution can be defined as "the use of information and communications technologies to prevent, manage and resolve disputes." ODR takes new technology tools with ethical standards and best practices of the ADR field to solve disputes online. Using the multiple possibilities offered by information technology, the goal of the ORD is to increase access to justice and deliver quick and fair resolutions to as many disputants as feasible.

ODR appeared first in the late 1990s as a method of resolving disputes around online purchases. Even in cross-jurisdictional transactions, early ODR pioneers like the global eBay marketplace proved how large volumes of disputes might be quickly settled using this method.[75] ODR is not a perfect dispute resolution tool. However, ODR has been able to settle small disputes between consumers and commercial entities. Whether ODR is negotiation or mediation online and has similar features to traditional ADR. As indicated, the only difference is the parties can participate from anywhere in the world as the proceeding is fully carried out online.

Resorting to an ORD in the case of on-chain disputes seems to already be more adequate than traditional face-to-face ADR. ODR resolves the issue of cross-border transactions and the problem with the unknown geographical location. The identity of the parties could to some extent be discarded. Indeed, if the parties agree to enter a dispute resolution of their own will,

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[73] Alexander, *supra* note 71, see table 1 "Nature of outcome".

[74] Darcy W. E. Allen; Aaron M. Lane; Marta Poblet, *The Governance of Blockchain Dispute Resolution*, Harvard Negotiation Law Review 25, no. 1, 75-102, 86 (2019) DOI: 10.2139/ssrn.3334674 (as those settlement are non-binding they will not be enforced).

[75] Hiroki Habuka and Colin Rule, *The Promise and Potential of Online Dispute Resolution in Japan*, International Journal of Online Dispute Resolution, Issue 2 (2017). DOI:10.5553/IJODR/235250022017004002017.

negotiation can start. However, it is most likely, like ADR, that no agreement is to be found or that the solution is not enforced if the parties are not cooperative. In those cases, having to formal identification of the opposite party will suspend further development.

4.3. Traditional arbitration

Arbitration can also be considered as a form of Alternative dispute resolution. However, arbitration has been recognized and regulated by international law.[76] Although arbitration is to some extent regulated by international treaties, arbitrators are mandated to use national law. According to the Black's law dictionary, arbitration is "a method of dispute resolution involving one or more neutral third parties who are usu. agreed to by the disputing parties and whose decision is binding."[77] Arbitration follows international standards and conventions and should satisfy a few legal requirements.

Effective arbitration requires a high level of confidentiality and trust, which explains why sensitive disputes are subject to arbitration.[78] Arbitration is however known as a costly procedure and is mainly used between businesses rather than between private individuals. Arbitration requires prior agreement and usually, the parties will give up their right to court. Arbitration has 4 fundamental features: it is an alternative to national court, a private mechanism for dispute resolution, selected and controlled by the parties, final and binding.[79] Contrary to the other ADR, Arbitration award has a real binding effect, nonetheless due to the cost of the procedure, arbitration is not sought as the first solution in dispute with lower monetary value.[80]

Resorting to arbitration for on-chain disputes could provide a level of certainty but might not be accessible to smaller disputes. Arbitration could also occur on the blockchain. The next sections will discuss further on blockchain dispute resolution as those blockchain dispute resolution are not necessarily arbitration on the blockchain. In blockchain arbitration, the

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[76] New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards, 330 U.N.T.S. 3. (One of the most known convention by the UNTC, it set the framework for arbitration).
[77] See Black's Law Dictionary 91 (9th ed. 2009).
[78] WIPO, *What is Arbitration?,* WIPO https://www.wipo.int/amc/en/arbitration/what-is-arb.html accessed March 2022 (the core characteristic of arbitration: consensual, choice of arbitrator, neutral, confidential and binding).
[79] Julian D. M. Lew; Loukas A. Mistelis; Stefan Michael Kröll, *Chapter 1 Arbitration as a Dispute Settlement Mechanism,* in Comparative International Commercial Arbitration, 1 - 15, 3 (2003).
[80] https://www.adrtimes.com/how-much-does-arbitration-cost/ accessed May 2022 (Arbitration fees includes not only the arbitrator fees, which can be between 375 to thousands dollar per hours. The fees can add up quickly).

arbitral decision can be recorded on a blockchain to allow for the self-execution of the arbitral award. If that is not the case, the arbitration process can be integrated within the smart contract to allow an algorithm to resolve the dispute after certain pre-conditions are met. The blockchain dispute resolution process raises serious questions regarding how the technology fits into the modern arbitration environment. There are some concern on the legal qualification of smart contracts where no consensus has been found.[81] Smart contracts are subject to scrutiny based on different national and international laws. Nonetheless, arbitration on the blockchain can be recognized following two international legal instruments: UNCITRAL Electronic Model Law on Electronic Commerce (1996 Convention) and the 'UNCITRAL Convention on Electronic Communications in International Contracts (2007 Convention)'.[82]

Arguably, many of the current laws and policies do not include proper structure to the new form of technology and arbitration. However, the challenges should not deter lawyers and legislators from adapting the rules of blockchain to the novel technical developments and promoting the benefits associated with these technologies. Smart contracts and blockchain arbitration are the future of arbitration, and industry stakeholders should embrace the developments. On a side note, while arbitration could be used to solve issues arising on the blockchain, the technology itself could cater to the implementation of the arbitration awards. In the subsection 5.3, a court case will illustrate this point.

4.4. The formal requirements to access court proceedings

Court proceedings are the traditional path to dispute settlement. Decisions released by a state court are binding and can be enforced nationally and outside of the national jurisdiction if an exequatur procedure is finalized. The court needs to confirm its competency to rule according to International Private Law. In the event of a dispute arising within the EU, the state court will apply Brussels I recast also known as EU Regulation on Jurisdiction and the Recognition and

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[81] Sarah Chaplin, *Blockchain and the future of dispute resolution*, Financier Worldwide Magazine (June 2021) https://www.financierworldwide.com/blockchain-and-the-future-of-dispute-resolution#.Yn5Vxi8RpQI accessed May 2022 (Although uncertainty remain, arbitration appear to offer more advantages to the need of technology like blockchain).

[82] Sharath Mulia and, Romi Kumari, *Blockchain Arbitration: The Future of Dispute Resolution*, Fox Mandal (November 23, 2021) https://www.foxmandal.in/blockchain-arbitration-the-future-of-dispute-resolution/#_ftn3 accessed March 2022 (see Articles 6 and 18 of the 2007 Convention of the convention).

Enforcement of Judgments in Civil and Commercial Matters (recast). The regulation limits the competency of the court with geographical and material criteria.[83]

Court proceedings are regulated by national law but also international instruments. Access to a fair trial is a right granted by the European Convention on Human Rights[84] but also by the International Covenant on Civil and Political Rights (ICCPR).[85] Although one of the parties to a dispute would want to bring the dispute before the court, it might not always be possible. Court proceedings require a high level of formalities which start with formal identification and localization of the parties. Furthermore, court proceedings are binding and respect strict civil proceeding rules.

Lodging a complaint before the court in a blockchain dispute might be more difficult than in an off-chain situation. As mentioned in section 3, one of the most known characteristics of blockchain technology is the possibility to remain anonymous. Indeed, transactions recorded on the blockchain are attached to a crypto wallet. Any crypto wallet possesses a public key (which is a known address like an identification number). Unless the owner of the wallet discloses its identity, it is not possible to retrieve their personal data including their real name or country of residency. Contrary to a traditional legal contract, it is possible to conclude an agreement (smart contract) without revealing the identities of the parties. The parties will only use the public keys of their wallet as the identification tool. If a dispute arises from a transaction where only the public keys of the parties are known, it will be impossible to refer the case before any state court. Thus, the right to access a fair trial will be compromised if at least one of the parties cannot be formally identified. Their right is therefore not guaranteed by the national courts with the current solution offered.

4.5. Distributed jurisdiction: on-chain dispute resolution

Due to the limited possibilities to settle blockchain disputes with more traditional solutions, lawful alternatives using the blockchain should be considered.

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[83] Brussels I recast article 1, paragraph 1 and 2.
[84] See Article 6 of the Convention – Right to a fair trial.
[85] See Article 14 of the Convention.

The concept of distributed jurisdiction has been introduced in recent years as a solution: relying entirely on blockchain technology to fulfil the different stages of the dispute resolution process.[86] According to Kaal and Craig, distributed jurisdiction must maintain anonymity and must have internal blockchain-based governance.

Distributed jurisdiction or blockchain dispute resolution involves the implementation of solutions that are equivalent to traditional arbitration or ODR. However, in the case of blockchain dispute resolution, the smart contract automatically executes the awards or the final decision, for example this is the case for a blockchain protocol called Kleros.[87] The key to effective blockchain dispute resolution is ensuring the possibility of executing the awards without necessarily involving third parties such as a bailiff or requiring any additional action by the parties involved in the dispute. blockchain dispute resolution or on-chain dispute resolution can be achieved by using smart assets, such as cryptocurrencies, to ensure that once certain conditions are fulfilled, the awards are transferred from one party to the other. The parties involved in a typical dispute can request the use of such mechanisms to resolve the case after a dispute has arisen.

Part of what makes blockchain dispute resolution interesting is the fact that it deviates from the traditional approaches to conflict resolution entirely. In other words, blockchain dispute resolution departs from the traditional system of the enforcement of awards involved in the commercial arbitration process. It involves the automatic execution of awards, which implies that there is no need to examine whether the awards fulfil the requirements for enforcement as outlined by the state court and other traditional channels of justice. Arguably, blockchain dispute resolution is effective, but its application in large cases involving complex documentation can be challenging. While blockchain dispute resolution platforms could open a new door for decentralized justice, they might not yet meet all the legal requirements to be recognized as a lawful and legal dispute resolution.

As indicated previously, a smart contract is another form of an online contract. However, when using the blockchain, the parties can proceed with a transaction and remains anonymous. They

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[86] Wulf A Kaal., and Craig Calcaterra, *Crypto Transaction Dispute Resolution*, THE BUSINESS LAWYER 73, no. 1 109–152,142 (2017) https://www.jstor.org/stable/26419193 (explain first where court proceedings are lacking and what solution blockchain dispute resolution can offer. In order to maintain the advantages of the technology, blockchain dispute resolution procedures must keep its anonymity feature and must have proper governance mechanisms).

[87] See *supra* note 4, Kleros Short Paper v1.0.7

could also not be aware of the physical localization of their counter-party jurisdiction. In those cases, it would be near impossible, or it might require a high cost to bring the case before the court. The solution currently available on the blockchain are often opt-in court.[88] They could provide support in DAOs disputes as members and DAO itself can be identified and "prosecute" using only their public key.

The right to a fair trial (set in the European convention of human rights and in the Universal Declaration of Human Rights) might not be guaranteed by traditional courts. Therefore, there is a need for the co-existence of decentralized alternatives for on-chain disputes.

5. Blockchain disputes resolution: Opt-in courts

The previous section highlighted the need to allow alternative dispute resolution directly conducted on the blockchain. The following section will look at how dispute resolution protocols work, and to which extent they can guarantee the right to a fair trial. Furthermore, the last part of this section will present the limited scope of the first court decision which recognized an award granted by a blockchain-based opt-in court.

5.1. Decentralised judicial platforms: a new court system

As mentioned in the previous sections, transactions on the blockchain can result in disputes between different parties. If at least one of the parties decided to remain anonymous or not cooperate, it is near impossible for the wronged party to refer the matter to a national court. In those cases, decentralized justice could offer an alternative to traditional dispute resolution mechanisms.

Jur, Kleros, or Aragon Courts can be qualified as decentralized judicial platforms. They are "digital courts" or digital platforms supported by blockchain technology. They aim to deliver fair decisions as a crowdsourced online dispute resolution.[89]

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[88] Id.

[89] CoinYuppie, *Decentralized Arbitration: Kleros, Aragon, Jur*, CoinYuppie (June 28, 2021) https://coinyuppie.com/decentralized-arbitration-kleros-aragon-jur/ accessed March 2022 (Decentralized arbitration is said to be the result of ODR, blockchain, international arbitration and mechanism design. Further in this paper, this specific question will be discussed, whether blockchain dispute resolution could qualify as a ODR or ADR. According to this article, the aim of decentralized justice is to reduce transaction cost and fill the gap left by traditional dispute resolution)

In this paper, Kleros will be used as an example as its structure closely resembles an arbitration tribunal. But before further development, it is essential to define the concept of decentralized justice and specifically what is a decentralized judicial platform.

5.1.1. Decentralised justice and decentralized judicial platforms

The previous subsection displayed smart contracts as capable of self-enforcement. By its systematic or automatic execution, smart contracts do not rely on direct human intervention in most cases. Conflict can result from this systematic enforcement as smart contracts do not proceed to a subjective evaluation of the agreement's conditions. To provide a solution, decentralized justice is presented as the next step for smart contract dispute resolution. Decentralized justice inevitably includes decentralized decision-making.[90]

Decentralized Autonomous Organizations are organizations whose business rules are encoded and embedded in smart contract code. Taking into consideration the criteria of classification suggested by the Weingast and Hadfield,[91] DAOs organisation could satisfy the rule of law, an element necessary to the emergence of a legal order.

To be able to qualify as a justice system, decentralized justice must comply with certain key features. Decentralized justice satisfies those features which are equality of citizens, predictability, and community governance.[92] The system is immutable, and no agent can influence unilaterally or arbitrarily the decision-making process. Furthermore, the system is transparent and managed by the community. The next subsection will examine the case of the decentralized platform named Kleros; a DAO built on blockchain specialized in dispute resolution.

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[90] Federico Ast, and Bruno Deffains, *When Online Dispute Resolution Meets Blockchain: The Birth of Decentralized Justice,* STANDFORD JOURNAL OF BLOCKCHAIN LAW & POLICY, (June 30, 2021) https://stanford-jblp.pubpub.org/pub/birth-of-decentralized-justice/release/1 (the problem in decentralized justice is the necessity to include a decision-making mechanism without intrdocuting a point of failure into the system. This point is important to maintain legal certainty).

[91] Gillian K. Hadfield and Barry R. Weingast, *Microfoundations of the Rule of Law,* THE ANNUAL REVIEW OF POLITICAL SCIENCE 21, 32 (2013) DOI: 10.1146/annurev-polisci-100711-135226 (in the literature there are different theory on what define the rule of law. In this paper the author mention the rule of law according to the Workd Bank, using 4 criteria: the government itself is bound by the law, every person in society is treated equally under the law, the human dignity of each individual is recognized and protected by law, justice is accessible to all).

[92] See *supra* note 90.

5.1.2. Kleros: an example of a decentralized judicial platform

Since the emergence of blockchain technology in 2008, the legalities surrounding its use and value continue to rise as they gain popularity across the world. The most prominent disputes affect both traders, users, and businesses that accept or operate within the blockchain industry. Kleros is a blockchain resolution platform that promises a safe and secure way of authenticating and democratizing access to justice in the 21st century to many blockchain protocols and other organizations running on the blockchain. [93] As a blockchain-enabled dispute resolution mechanism, the benefits attached to its use include the accumulation of cryptocurrencies by jurors in what is now commonly known as cryptocourts, acting to some extent as escrow accounts.

The arbitration processes involving blockchain technology help in shifting from the traditional legal industry. Thus, dispute resolution platforms such as Jur and Kleros aim towards reforming the 21st-century justice system that does not involve the existing state bureaucracies and state courts. They aim at bringing the decentralized justice system to the blockchain industry.

According to Dylag and Smith, "Kleros describes its platform as the 'justice protocol' enabled by an assemblage of blockchain, smart contracts, cryptocurrency, and crowdsourcing to create an 'open dispute resolution platform' bringing justice to all."[94] The adoption of these platforms is however prone to changes and uncertainties due to their lack of reliability to the wider population and potential lack of recognition by national courts. This part will be further developed later in this paper.

As opposed to the traditional legal systems, "digital courts", such as Kleros, do not match the expectations in the real world since they are embedded in the speculative blockchain technology yet untested and not adopted to its fullest capacity. Since its creation in May 2017,

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[93] James Stuart, *Welcome To Decentralized Insurance - Kleros & Unslashed Finance Unite*, Kleros, (July 14, 2021) https://blog.kleros.io/welcome-to-decentralized-insurance-kleros-x-unslashed-finance/ accessed March 2022 (a tutorial on how to use Unslashed on Kleros, Unlashed is a decentralized insurance)

[94] Matthew Dylag and Harrison Smith, *From cryptocurrencies to cryptocourts: blockchain and the financialization of dispute resolution platforms,* INFORMATION, COMMUNICATION & SOCIETY, 2 (2021)

Kleros has grown steadily with over 500 disputes solved as of November 2020.[95] Kleros "targets dispute resolution for escrow transactions, token curated registries (the use of decentralized jurors and economic incentives for compliance verification) and dispute resolution for oracles" Kleros facilitates disputes of varying scale and contexts including those of e-commerce, insurance, freelancing, intellectual property, and finance among others. Besides major partnerships such as Unlashed, they also provide insurance claimants with a risk protection cover.

To summarise, Kleros is an opt-in court system. According to the Kleros Whitepaper, smart contracts have to assign Kleros as their dispute resolution platform before litigation. The parties can choose which specialized court and the number of the juror which will rule the dispute submitted. Parties must pay fees according to the number of jurors. Jurors are selected randomly but based on their expertise. Parties will submit their evidence but will not be able to access the proofs submitted by the opposing party. The identity of the parties remains anonymous to the jurors and the jurors have a limited time to submit their vote. It is important to note that jurors received incentive in cases where they are part of the majority in the decision-making, they can also lose their incentives if they are part of the losing panel.

Once the decision is voted in accordance with the terms set by the Governance mechanism, usually based on fairness, the smart contract can execute the result of the decision without delays. An appeal is possible but required double the initial amount of Juror plus one.[96]

As indicated on its official blog, Kleros allows its users to challenge and report a case during a limited period. Those cases are brought to one of the Kleros courts where they will be reviewed and adjudicated by jurors on the platform.[97] A claim can be appealed more than one time while unchallenged claims are paid automatically.

The use of services by a majority of its clientele based is a sign of its credibility and reliability to the community. To gain the trust of the community, the dispute resolution platforms need to respond to the needs of the users in regard to the jurors, cryptocourts, and platform features.[98]

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[95] Yann Aouidef, Federico Ast, and Bruno Deffains, *Decentralized Justice: A Comparative Analysis of Blockchain Online Dispute Resolution Projects,* Frontiers in Blockchain 4 (2021) DOI:10.3389/fbloc.2021.564551(blockchain dispute resolution platform attract more and more users, each platform has their own features. An overview is available, see figure 2: FIGURE 2 | Different mechanism design choices on page 5)

[96] See Kleros Whitepaper – Clément Lesaege, William George, and Federico Ast, (2020) Kleros – Long Paper v1.0.0, (https://kleros.io/whitepaper_long_en.pdf).

[97] James Stuart, 2021 *supra* note 93.

[98] Dylag and Smith, 2021 *supra* note 94.

Contrary to centralized justice, the dispute resolution techniques deployed through platforms such as Kleros provide a challenged system and open possibilities for changes.

The main advantage of these platforms remains on the lack of reliance on trust. The direct language and authenticity mechanisms required in a smart contract can challenge the traditional and complex contractual language commonly used and known among legal practitioners, insurers, or auditors.[99] The adoption of such dispute resolution platforms thus eliminates the roles of traditional professionals. Hence, this results in uptake in the roles of scientists, and engineers responsible for the disintermediation in the decentralized justice.

It is however worth noting there have been critics around the ability of blockchain to automate the execution of smart contracts. The fine line between legal and technical rules can in the long term produce a strict regulatory system, a more mathematical and systematic model.

The main advantage of the decentralized justice system is the affordability of its services and transparency guarantees for the users. [100]As the world shifts towards the adoption of technology in nearly all domains, the advent of dispute resolution platforms enhances swift payments with a faster and cheaper adjudication system.[101] On the contrary, "traditional legal and arbitration systems have high costs." Indeed, in traditional justice, the way institutions operate give a monopoly to legal experts' services whether for lawyers or arbitrators. [102] However, the rise in the adoption of dispute resolution platforms such as Jur and Kleros is more effective since the crypto-economics mechanisms in which they are built leverage on individual work and knowledge as opposed to an overreliance on those that are recognized by a specific system.

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[99] Bronwyn E. Howell, and Petrus H. Potgieter, *Uncertainty and dispute resolution for blockchain and smart contract institutions,* Journal of Institutional Economics (2021), 17(4), 545-559, p.554, DOI:10.1017/S1744137421000138 (On-chain dispute resolution are still new and they do not follow specific rules in regards to their decision, there is no such a thing as precedent).

[100] On average, for a court decision, from lawyer fees, bailiff to appeal fees, the cost can rise substantially. For more detail, the European Commission has published a "Study on the Transparency of Cost of Civil Judicial Proceedings in the European Union" which provide further information on the cost of court procedure overall (JLS/2006/C4/007-30-CE-0097604/00-36).

[101] Federico Ast,, and Bruno Deffains, *When online dispute resolution meets blockchain: The birth of decentralized justice,* Stan. J. Blockchain L. & Pol'y 4 (2020) (the authors promote an efficient procure as being fast and low-cost).

[102] Bronwyn and Potgieter, *supra note* 99 p.554.

5.2. The insufficiencies of decentralized justice

Understanding how dispute resolution protocol on the blockchain operates is the first step. From the explanation provided in the above section, some elements can be highlighted. Although there are advantages to the adoption of those solutions, there are also numerous challenges which will be briefly outlined in this section.

The main benefit of using a platform like Kleros can be noticed when traditional courts are not capable of handling the case due to civil procedures. Other benefits would be: the independence and impartiality of the jurors, the reasonable length of the proceedings, the self-enforcement of the decision, and in some cases the ability to verify the evidence directly via the blockchain.

When using blockchain technology, the decision-maker (in the case of Kleros they are called jurors) would not be informed of the identity of the parties. This would therefore reduce any biases and potential conflict of interest. Contrary to a traditional court proceeding, the length of a case in Kleros's court is extremely short. The voting procedure is limited in time, only a few days. Even when using online dispute resolution such as the European small claims procedure,[103] the lead-time would be at least a few weeks (generally months) and for traditional in-court trial often years. Furthermore, once the decision has been voted, it will be executed using the smart contract. This means that the compensation will be withdrawn from the losing party fund (from a crypto wallet) and sent to the winning party. In some cases, if the party submitted a proof recorded on the blockchain, the juror would be able to verify with certainty this proof. This is also an advantage if a limited proof is submitted to the case.

Nonetheless, there are in comparison to a court case a handful of drawbacks, to quote only a few: the complexity of the case those courts can handle, the qualification of the jurors, the legal ground on which the decision is based, etc. Those challenges are not only applicable to Kleros but also to Aragon Court (where jurors are referred to as Guardians).

Firstly, the complexity of the case is one of the most noticeable challenges of the platform. In most cases, this procedure is suitable for binary decisions and primarily if monetary

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[103] European Consumer Centres networks, European Small Claims procedure, How and when to start a small claims procedure?, European Consumer Centres networks, https://www.eccnet.eu/consumer-rights/how-enforce-my-consumer-rights/european-small-claims-procedure accessed April 2022 (an overview of the procedure, when and why it could be used).

compensation is possible. For example, in cases where reputation is affected, this system would not be able to directly provide non-pecuniary compensation. Indeed, the compensation is taken directly from the escrow account which holds the agreed compensation at the start of the contract. This is also problematic if the claimant is the one who acts as the buyer. In this case, the assets present in the escrow account belong originally to the buyer. If the buyer wants compensation, the buyer will only be able to retrieve their initial payment.[104]

A second challenge is the legal competence or qualification of the jurors. As indicated at the beginning, jurors participating in the decision-making are usually experts in the field but do not necessarily hold legal qualifications. Jurors from Kleros and Guardians from Aragon Court are randomly selected from a pool of expert jurors. Juror does not necessarily have a legal background and it is difficult to judge whether they are fully competent to rule on a specific case.

A third challenge worth mentioning is the legal ground on which the decision is delivered. Decisions delivered by Kleros's Courts and Aragon's Courts are not based on law, it is based on fairness and the personal opinion of the voters based on the evidence submitted. It is therefore unpredictable and can be to some extent even go against the law. Jurors and Guardians will only give their final decision without the need for legal argumentation. Jurors on Kleros are required to only provide a "short text explaining their vote.'[105]

The question of reward offered to the decision-makers can also hinder the fairness in the final decision.

Kleros state that Jurors are incentivized make the right decision and to join cryptocourts in fields where they are expert.[106] However, in reality, jurors or Guardians appears to be indirectly encouraged to be part of the majority. In the process, they might take more into consideration what the community or the other participants would decide overall in order to be on the winning side or the majority. This could prevent some juror to give an alternative opinion: it is the dilemma of being in majority vs providing a correct or fair opinion.

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[104] See *supra note* 96 Whitepaper Kleros (long paper) (The payment is stored in Kleros custodial wallet, however, there is no moral damage compensation added).

[105] Federico Ast and Daniel Dimov, *Is Kleros a Fair Dispute Resolution System?* Kleros, (October 18, 2020) https://blog.kleros.io/is-kleros-a-fair-dispute-resolution-system/ accessed March 2022 (This is however not a legal argumentation as it could be expected in a court decision).

[106] Ibid (this decision is taken by the juror itself, Kleros expect the juror to choose the field they have the most competence in, which could allow them to rule better and have better incentives).

Submission of evidence is a key factor in the judicial process. Evidence can be understood as any "type of proof legally presented at trial (allowed by the judge) which is intended to convince the judge of alleged facts relevant to the case. It can include oral testimony of witnesses, experts on technical matters, documents, public records, objects, photographs and depositions (testimony under oath taken before trial). It also includes so-called "circumstantial evidence".[107] The principle of discovery of evidence in common law or the EU Evidence regulation,[108] are reminder of the importance of evidence in the proceeding. In decentralised dispute resolution platforms such as Kleros, evidence submission is not subject to discovery. Indeed, the parties are required to submit their evidence during a set period and will not have access to the evidence submitted by the opposition party. This means that there is not a possibility to counter or dismiss evidence provided by the other party.

Production of evidence are also not regulated by those platforms. There is little guidance on what can or should be included as evidence. Furthermore, how evidence can be obtained is not really restrained.

Lastly, although appeal is possible but can be costly and therefore not used. In cases of errors in the decision or a "procedural vice", the decision would still be automatically executed. The question would be whether the court would reject their competences and call on the non bis in idem principle.

Some arguments provided by dispute resolution platform such as Kleros try to encourage the adoption of their solution. For instance, the rise in demand for resolutions cases result in incentives increase for jurors to join in the dispute. As indicated by Aouidef et al. "with each turn of the cycle, as more users join the network, an increased specialization generates better, cheaper, and faster decisions."[109] Although critics point out the unreliability of platform, the solution provided could to some extend become a solution against traditional judicial system: costs, procedure length, and the self-enforcement mechanism.[110]

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[107] See definition of Evidence, Gerald Hill and Kathleen Hill, The People Law's Dictionary, p.160 (they also indicate the notion of objection, which imply evidence can be challenged).

[108] For further details see Council Regulation (EC) No 1206/2001 of 28 May 2001 on cooperation between the courts of the Member States in the taking of evidence in civil or commercial matters

[109] Aouidef, Yann, Federico Ast, and Bruno Deffains *supra note* 95, 3. (the quality of the service provided rely on the quality of its users).

[110] Pablo Sanz Bayón, *Key legal issues surrounding smart contract applications,* KLRI JOURNAL OF LAW AND LEGISLATION 9, no. 1 (2019), 68, (when the conditions are met, the decision can be executed by the algorithm).

The constant debate between traditional judicial solution and decentralised dispute resolution involved other aspect as well.

The trajectory of the blockchain reinforces the creation of faster, cheaper, and more transparent systems registered in a decentralized environment. For most people or users, this advantage adds up to their appetite for blockchain-related technologies. In the traditional system, the litigation process between parties reduces the speed to which the disputes are resolved. In the case of Jur, which was established in Switzerland in October 2017, by Alessandro Palombo and Giotto Filippi, the company differs from other dispute resolution platforms in its choice of operation and type disputes. According to CoinYuppie, "the project whitepaper claims the system will cover a variety of cases through three different courts: a court tier (similar to the traditional ODR arbitration system for higher value disputes, which claims to produce legally binding decisions), an open tier (more akin to the Kleros system with a decision logic based on collective intelligence), and a community tier (a private court with specific rules defined by the creator)." [111] Jur, which appears to have undergone changes, will be built on Polkadot blockchain. Jur seems to build not only a dispute settlement platform but also a contract management platform, innovating using blockchain technology at a different level. Dispute resolution platforms do not have to be restricted to one model.

As such, the variations between dispute resolution platforms add potential alternatives: appeals mechanisms, the complexity of cases, governance model, jury selection, subscription fees...

Kleros and Jur's use of blockchain technology in unexplored territory, albeit inventive, increases their opportunities. The major breakthroughs in the field of dispute settlement, for Kleros, face a well-structured justice system. On the other hand, Jur concentrates on solving a few key areas in which the cost or technical complexity of cases could be difficult if not near impossible to be taken by traditional courts. The two players have unprecedented access to an abundant market that they can exploit.

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[111] *Supra Note* 89 Coinyuppie, (Kleros opted for an open tier type. The jurors have control on the decision, in some way, it is also the community).

Since dispute resolution platforms rely upon market forces to stabilize the cost of resolutions, the collective deliberation can hinder the right resolution since the winning 'bid' does not reflect the common good but rather the crypto-economics mechanisms used to choose among the jurors as seen with the case of Kleros. As a result, it's critical to investigate how a more decentralized approach to conflict resolution could serve the public good and what steps should be taken by those platforms to be as compliant as possible with current and future regional or national regulations. Although the fate of blockchain technology remains elusive to ordinary citizens across the world, the applicability of solutions such as blockchain platforms can be confirmed in different cases across different industries.

Blockchain dispute settlement platforms allow resolution even with the anonymity of the parties. It can act almost like an escrow account (i.e.: Kleros). Procedures are fast and efficient, within a few days only. Compared to arbitration, the cost is lower, and access is facilitated. However, unlike arbitration, blockchain dispute platforms do not specifically follow international treaties or national laws. There is uncertainty on whether they will be recognized as legal and lawful alternative dispute resolution.

5.3. A step forward with Court recognition

If the arbitration protocol albeit international treaties, there is a chance that the national court would recognize the validity of an arbitration award.
So far one Mexican court has released a decision recognizing the validity of an arbitration award granted by Kleros.[112] This cannot be considered as a precedent as it has been ruled by only one single national court which was not even a national supreme court. Nonetheless, this has been a steppingstone for blockchain arbitration protocols such as Kleros.

The case involved a real estate leasing contract governed by Mexican law which included an arbitral clause according to the standards set by the "New York Convention".[113] The parties

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[112] Mauricio Virues Carrera, *How to Enforce Blockchain Dispute Resolution in Court? The Kleros Case in Mexico,* Kleros (January 10, 2022) https://blog.kleros.io/how-to-enforce-blockchain-dispute-resolution-in-court-the-kleros-case-in-mexico/ accessed March 2022 (in this case Kleros was not used as the main dispute settlement tool. Rather, it was used as a way to enforce the award from the arbitration settlement).
[113] For more information, see the court decision "Mexican Company X v. Mexican Company Y" https://jusmundi.com/en/document/decision/es-mexican-company-x-v-mexican-company-y-solicitud-del-tribunal-de-copias-originales-wednesday-28th-april-2021 also available in article of Mauricio Virues Carrera, "Accommodating Kleros as a decentralised dispute resolution tool for civil justice systems: Theoritical model and case of application" on annexes V, VI and VII

decided however to include a clause in which "the arbitrator should draft a Procedural Order addressed to the decentralized justice platform 'Kleros', which would then issue a decision based on its blockchain arbitration protocol."[114] Although the blockchain arbitral award has been accepted by a Mexican, this cannot be considered as a precedent due to the hybrid nature of the case. Indeed, the parties to the agreement relied on an existing legal framework which is the New York Convention to designate a competent arbitrator and competent applicable laws. Using blockchain technology together with a national or international framework could be a foundation for the legal recognition of decentralized justice platforms.

Nonetheless, except for this court decision, no other court has confirmed the lawfulness of a blockchain dispute resolution protocol. It would be in the interest of those dispute resolution platforms to address any incompatibility courts could point out.

6. Limitation challenging the validity and recognition of blockchain dispute resolution

Blockchain dispute protocols offer a solution for specific cases where traditional courts would not be able to justify their competency or handle the procedure according to the principles of civil proceedings. When dealing with an anonymous party on the blockchain or a decentralized autonomous organization, it is favourable to include a real alternative, and this alternative can be a dispute settlement platform on the blockchain. Although blockchain dispute resolutions are not perfect, they offer a bridge between traditional legal systems and decentralized environment. However, those platforms did not receive a unanimous welcome. In his paper, Jeremey M Sklaroff stated the danger of solely using dispute resolution based on blockchain. According to him, those platforms which "rely on an ever-changing, unpredictable, unaccountable, and opaque group of decisionmakers, decentralized adjudication cannot

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(https://ipfs.kleros.io/ipfs/QmfNrgSVE9bb17KzEVFoGf4KKA1Ekaht7ioLjYzheZ6prE/Accommodating%20Kl eros%20as%20a%20Decentralized%20Dispute%20Resolution%20Tool%20for%20Civil%20Justice%20System s%20-%20Theoretical%20Model%20and%20Case%20of%20Application%20-%20Mauricio%20Virues%20-% 20Kleros%20Fellowship%20of%20Justice.pdf) (This is a specific case where the arbitral award followed the requirement of the New York Convention, the court would probably have ruled differently if it was not the case).
[114] Maxime Chevalier, *Arbitration Tech Toolbox: Is a Mexican Court Decision the First Stone to Bridging the Blockchain Arbitral Order with National Legal Orders?*, Kleuwer Arbitration Blog (March 4, 2022) http://arbitrationblog.kluwerarbitration.com/2022/03/04/arbitration-tech-toolbox-is-a-mexican-court-decision-the-first-stone-to-bridging-the-blockchain-arbitral-order-with-national-legal-orders/ (Blockchain awards could see way to have more legitimacy in front of court when they meet those requirements).

generate contract "public goods" like performance standards, which emerge through the stable application of interpretation rules by courts."[115]

Parties to a given dispute should have agreed prior to the dispute on how to manage their contractual relationships. This agreement defines the specific dispute resolution tools that will be used to resolve the dispute, for example through arbitration. In a contractual agreement, the chosen dispute resolution tool is fundamental. In the case of arbitration, the parties in the dispute want total impartiality, anonymity, and trust from the arbitrator. Given the legal constraints of the arbitration process, it is only logical for the parties to ensure that the final decision made by the arbitrators is legally binding and indisputable. In the case of blockchain dispute resolution platforms, the decisions released by those courts do not have the guarantee yet to be qualified as enforceable in national jurisdictions. Indeed, the court might rule that those decisions will be void based on different legal grounds. Those platforms should therefore centre their attention on the alterations that could prevent this situation.

Parties to a dispute on the blockchain have the potential to choose from a variety of available dispute resolution processes. However, the possibility to use alternative dispute resolution mechanisms does mean the parties will decide to renounce on litigation. In theory, any breach of any right could open the right to a fair trial. Factors such as the failure to cooperate and fulfil contractual obligations have a significant impact on either of the parties and they would have a valid reason to prioritize proper litigation. Potential litigants should have a clear understanding of how the litigation process works, including the aspect of how to determine whether litigation is the optimal solution to dispute resolution for different disputes. In some cases, parties to a dispute may have the perception that using a certain jurisdiction has the potential to result in the optimal outcome that they want. However, it is crucial to consider certain fundamental questions in considering whether the chosen court will allow the jurisdiction or whether the forum of choice has the legal capacity to survive a jurisdiction challenge. Parties also opt for litigation based on whether they had an ex-ante agreement on the choice of the law to be used. Electing a certain jurisdiction does not provide guarantees that the jurisdiction will declare itself competent. In the cases the parties cannot go to court, they might opt for blockchain dispute resolution platforms. The key challenge there is the fact that

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[115] Jeremey M Sklaroff, Smart Contracts and the Cost of Inflexibility, (2018) 166 University of Pennsylvania Law Review 263,300–301 (provide more arguments against the idea of dispute resolution on blockchain.)

the law in some national jurisdictions has not kept pace with the rapid rate of technological advancements, which implies that the legality and enforceability of agreement mechanisms such as smart contracts are not yet aligned. Therefore, this could be the case as well with decisions from blockchain dispute resolution platforms.

6.1. Challenges related to the self-enforcement nature of smart contracts

One of the key issues in evaluating the possible use of blockchain dispute resolution platforms is the question of the legality and enforceability of the final decision.

Before going further, it is important to define what is implied here behind the term "final decision". The legal definition of "final decision" according to the Legal Information Institute state that it is "the last decision from a court that resolves all issues in dispute and settles the parties' rights with respect to those issues. A final judgment leaves nothing except decisions on how to enforce the judgment, whether to award costs, and whether to file an appeal." The final decision does not necessarily require the decision to have reached the highest courts, a court verdict will be qualified as a final decision if the parties did not appeal. A final decision in the case of Kleros is simply a decision in which neither of the parties will use the appeal mechanism within the protocol. In this sense, the question can be whether the final decision from a Kleros's court qualifies as a final decision by the courts.

To do so, it is best to compare the decision from Kleros's court to the award from an arbitration court and to a decision from an alternative dispute resolution. In the case of arbitration, there is no right to appeal, the parties could decide otherwise by adding a clause. However, the case will be handled as a new case rather than an appeal.[116] Challenging an arbitral award in a national court is exceptional, and it will be fair to consider an arbitral award as a form of final decision. On the other hand, alternative dispute resolution offers as their final decision what can be called a settlement agreement. If a settlement is agreed upon, this decision can become final once it has been validated by a court which will also enforce the agreement. However, it is a decision that both parties have agreed to and therefore it is often not necessary to use the court to enforce the decision.

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[116] American Arbitration Association, *What happens after the arbitrator issues an award*, ard.org, AAA229, https://www.adr.org/sites/default/files/document_repository/AAA229_After_Award_Issued.pdf (arbitration awards are qualified as final decision).

Kleros's decisions are not settlement agreements as the parties involved did not negotiate the solution, and it is not an arbitration award as it does not follow the international regulation on arbitration. Nonetheless, if the decision is not appealed the decision will be enforced by the smart contract. Therefore, it could be considered by the courts that Kleros's court decision is final and has been enforced.

Indeed, contrary to traditional courts, dispute resolution protocol on the blockchain operates on a short timeframe, only a few days from the start of the complaint submitted to the court to its enforcement. The problem lies here, in the cases a dispute reached the last phase. If the losing party of a dispute resolution protocol wants to lodge a complaint to a traditional court (after even one appeal in front of the dispute resolution protocol), it is questionable whether the case will be considered as final as it has been enforced. Due to the principle of "Double Jeopardy ",[117] the court would have to assess whether the decision delivered by the protocol was valid. With other alternative dispute resolution, even if there is a losing party, the decision is not always automatically executed. In the case of dispute resolution on the blockchain, both parties agreed to this means of settlement and the verdict has been enforced. When the parties have the right to appeal in front of national jurisdiction they might do so if the resolution does not satisfy them. It might have consequences on the length of the procedure but could also guarantee the right to a fair trial to the parties.

The use of smart contracts can provide the parties in dispute with various advantages. However, it is noteworthy that smart contracts do not escape regulation. The use of smart contracts in solving commercial disputes will inevitably result in more conflicts. Concerns exist on whether smart contracts are flawed, and the provisions incorporated are poorly drafted.[118] The use of smart contracts is a relatively novel approach, and the key concern is whether the outcomes based on smart contracts are legally binding and enforceable. The legal system has not yet fully considered the potential implementation of the smart contract and even less in cases, smart contracts are used to enforce a decision from a dispute resolution platform and they are not retroactive.

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[117] The principle also known as ne bis in idem rule. Article 50 of the Charter of Fundamental Rights set this rule for criminal offense. The principle is also widely accepted as the prohibition of double punishment.
[118] See for more details: The Cardozo Blockchain Project, ""Smart Contracts" & Legal Enforceability" (2018). Reports. 2. p.9 https://larc.cardozo.yu.edu/blockchain-project-reports/2

6.2. Challenges inherent in the dispute settlement proceedings: incentives mechanism, jurors qualifications…

One of the key elements that remain questionable when it comes to the implementation of smart contracts and blockchain dispute resolution is the juror selection and the incentive-based procedure. The juror selection process is dependent on the randomized functionality of the protocol.[119] Unlike the traditional legal system where the jurors are selected not on a voluntary basis, on-chain juror selection is anonymous, and juror candidates can volunteer by making cryptocurrency deposits.[120] The entry ticket can in some way is money and not qualification. A conversation can start on whether those jurors would be qualified as arbitrators or jurors by traditional standards.

The selection approach used depends on the platform. For instance, in the case of JUR, it provides "Hub" as virtual tribunals where administrators screen juror candidates to determine if they possess certain required attributes and also use international rules.[121] The disputants have the option to cover additional costs that are associated with the aspect of hiring reputable jurors. The arbitration fee that the disputants pay should be proportional to the reputation of the jury. The key goal here is to incentivize quality decision-making and eliminate the likelihood of non-meritorious claims. After a sufficient pool of candidates has submitted token deposits, a randomized lottery takes place to select the jurors. In some cases, the likelihood of selection is equal to the amount deposited. The application of proportionality and randomization deters potentially malicious parties from manipulating the system to be in control.

The dynamics of on-chain juror decision-making and financial incentivization separate the process from any other form of the arbitration process. On-chain jurors remain pseudonymous throughout the arbitration process. Jurors are scored based on their decision-making from previous cases, and jurors with higher scores are more likely to be selected for future cases. The process starts with selecting a random set of jurors who meet the qualifications to serve as jurors. For instance, if there is a requirement that an individual must have been an active participant in at least 10 different disputes, then that would be the criteria

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[119] See *supra* note 4, Kleros Short Paper v1.0.7, see 4.2.2 about Jury selection.

[120] See James Metzger, The Current Landscape of Blockchain-based, Crowdsourced Arbitration, 19 Macquarie L.J. 81(2019); Kleros Whitepaper (The whole systems is incentive based and juror are encouraged to make the right decision in order to be in the majority).

[121] JUR Team, *White Paper 3: The Open Justice Platform and the Justice Problem in the Pandemic,* Jur.io (March 25, 2021), accessed on March 2022 https://jur.io/blog/white-paper-3-the-open-justice-platform-and-the-justice-problem-in-the-pandemic/ (Contrary to Kleros, JUR seems to use legal instrument as the basis of their decisions such as the New York convention).

used for selecting this initial group of potential jurors. On the other hand, the on-chain arbitration process uses a financially incentivized approach to promote a majority voting scheme. The approach encourages the selection process to consider jurors who are more likely to remain impartial. In addition, the blockchain ensures that all the parties involved in a case are pseudonymous throughout the entire arbitration process. It guarantees that only essential information linked to an ongoing case is revealed to all parties.

An individual's private information such as their financial details or identity is not disclosed for any reason outside of an active case. Jurors who do not vote with the majority face penalties and lose part of their initial deposit or the entire deposit. Jurors can also be penalized for revealing their vote prior to the mutually agreed upon time. Each case is assigned a randomly generated integer, from amongst a series of integers. Jurors (or potential jurors) check the list of active cases in the system, and for each case, the juror must rate their decision about how likely they are to agree with different arguments presented by each party, based on whether or not that argument was given during the arbitration. The juror's response will be made public as part of an arb-info file.[122] The lack of a clear structure and financial incentivization renders the blockchain dispute resolution system flawed.

Blockchain dispute resolution mechanisms and protocols have numerous advantages over the traditional legal system. They are cost-effective methods for the parties involved in any dispute. Blockchain dispute resolution complicates the litigation process and decisions must be enforced automatically. However, the blockchain jurors and arbitrators are not qualified legal experts in most cases, and this can render blockchain dispute resolution unsuitable for solving complex disputes. It raises the fundamental question of whether the outcomes are fair. In addition to the lack of legal training, jurors will also rule and cast their votes according to their own terms based on fairness and common sense. An honest and fair juror might end up losing assets if this juror is not part of the majority.[123] Honesty does not pay the bill.

A court case or an arbitration decision is all based on legal principles and precedent. Decisions should have been justified by legal reasoning. In the dispute resolution protocol, decisions are taken based on the solution which had the larger number of votes. Those cases could be compared to a jury trial. However, jury trials are used in criminal court where the offense has

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[122] See *supra note* 96 Whitepaper Kleros (long paper) (this is a way to provide more transparency to the decisions).
[123] Lui Bergolla, Karen Seif and Can Eken, *Kleros: A Socio-Legal Case Study Of Decentralized Justice & Blockchain Arbitration* 37 Ohio St. J. on Disp. Resol. 1, (July 30, 2021). p.14 http://dx.doi.org/10.2139/ssrn.3918485 (In theory, the decision could be unfair or unjustified, as long as there is a majority of vote for one solution, this solution end up being the wining solution and decision).

also affected society and not only one individual. The implication of members of the society seems therefore justified.

The application of the distributed ledger technology implies that the parties to the dispute have to settle for the inflexibility of the terms of settlement in blockchain dispute resolution. Outcomes are mainly binary, which implies that likely decisions include paying the claimant, do not pay the claimant, and other similar outcomes.[124] The blockchain dispute resolution strategies leave little room for a middle ground. It begs the question of whether the outcomes from the blockchain dispute resolution process represent the most equitable decision. It is not possible to include for example compensation for immaterial or moral damages. As explained in the previous subsection, when the plaintiff is the buyer, if the plaintiff wins it will be only its own payment, any other damages caused by the breach (delays or consequences of non-execution of the contract) will simply not be taken into consideration by the decision.

Another point that might be problematic is paradoxically one of the advantages of blockchain dispute resolution. Smart contracts and dispute resolution verdicts can be automatically enforced via the blockchain. This advantage removes the need for administrative procedures and in the worst case the use of force. However, this limits the possibilities that those protocols could offer. In e-commerce cases involving a physical product, the question is how could the blockchain force the delivery of a product. The technological advantage here is not applicable. Smart contracts offer limited flexibility. Contractual relationships are prone to unexpected events or unpredicted actions. Due to the characteristics of the smart contract, it will be difficult to guarantee proper execution in an uncertain environment.[125]

The key challenge with the blockchain dispute resolution mechanisms and protocols is the complexity of the cases and the limited scope of application. The outcomes are heavily dependent on the dynamics of economics and the influence of the game theory. Jurors are incentivized to make the "right" decisions. The process does not involve communication between the jurors. As a result, the process is affected by the potential biases on the part of the

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[124] See *supra note* 96 Whitepaper Kleros (long paper) (In the event of the claimant being the one who purchase or paid for the service, the claimant can at best be refunded, also this solution works only for parties who has enter into a contract, it will therefore not be possible to submit a claim if it is indirect relation).
[125] M Sklaroff, *supra note* 115, p.280 (Enforcement might not be possible if it is for example an physical good to be shipped or a service to be executed).

jurors since they think that a given decision can be considered right because the majority thinks it is right. The key question that arises with this particular concern is the question of whether the approach can be described as a principled approach toward delivering justice.

The decentralized approach to the pursuit of justice incentivizes jurors to make decisions based on the standards established by other randomly selected jurors and their perceived reasonableness. The approach to arbitration can be defined as a private legal process based on the foundations established in the arbitration clause. Parties have more choices in the dispute resolution procedure and can decide to put emphasis on equitable principles such as good faith and reasonableness. Good faith and reasonableness are existing principles in the traditional legal system. The ability of blockchain dispute resolution to achieve justice is parallel to arbitration based on equitable principles. What this means is that there is a non-biased decision-maker, the goal of which is to give each person an equal opportunity and chance to prove their case. If done correctly, this process will produce justice for both people involved in the dispute. However, if not designed properly, one party may be unjustly favoured over the other — which could be detrimental to the network as a whole. Blockchain dispute resolution has an obvious advantage: it's public and immutable. The jurors rule the case based on what is deemed fair and equitable, but without necessarily applying the rules of applicable law.

In practice, this means that jurors are forced to weigh relevant matters of fact and law in resolving the dispute. It is possible because on-chain dispute resolution relies on an immutable series of facts (i.e., the immutable blockchain). The transaction-related information is permanent, as it is stored in the blockchain. A juror overseeing a case can use the blockchain to track legal compliance, which eliminates a large amount of uncertainty surrounding judicial proceedings. The value of the blockchain dispute resolution mechanism can also be evaluated on the basis of the economic lens of cost and efficiency. The cost of legal cases is generally already expensive taking into account legal fees, court costs, and legal fees. The decision will often be delayed for years, which may result in increased opportunity costs for investors or potential detrimental outcomes for the disputants.[126] The long-term cost of on-chain dispute resolution using a blockchain is significantly lower than traditional arbitration. All decisions are made by an impartial and neutral third party, who adopts a libertarian approach to justice. The decentralized system can plug existing gaps in dispute resolution for parties seeking legal

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[126] OEDC, Judicial performance and its determinants: a cross-country perspective. A GOING FOR GROWTH REPORT, (June 2013) n.5, OECD Economic policy papers, https://www.oecd.org/economy/growth/FINAL%20Civil%20Justice%20Policy%20Paper.pdf, accessed March 2022 (provide an analysis on the length of trial).

recourse. It can be achieved by eliminating the need for a judge to interpret or review the facts and then make a decision by using a "black letter of law" approach. On-chain dispute resolution has the potential to make courts and arbitration proceedings significantly faster, more efficient, and cheaper.

6.3. The potential incompatibility with general principles of law

Another key concern with the implementation of blockchain dispute resolution protocols is the question of possible compatibility or incompatibility with the general principles of law. In particular, questions arise regarding whether the general principles of traditional law are applicable in the blockchain dispute resolution process. As mentioned previously, not all protocol follow the same logic. While some protocol might apply some specific international treaties, other are just based on common sense and fairness of the community. The paper will focus on the latter.

General principles of law are listed as a source of international in Article 38(1) of the Statute of the International Court of Justice (ICJ) and Article 38 of the Statute of the Permanent Court of International Justice (PCIJ). [127] Although no consensus has been found on the limitation of the scope of those general principles of law, historically general principles of law have supported issues where conventional and customary rules were underdeveloped.[128] The lack of regulation within the blockchain scope could justify the emergence of general principles of law. Indeed, general principles of law are often used as "gap fillers" in areas where international law does not provide sufficient guidance.

Although there is no list of general principles of law, a few principles have been developed over time such as *audiatur et altera pars, actori incumbit onus probandi* etc.. Those principles can be recognised as a source of international law, even as a set of rules applicable across jurisdictions.*[129]*

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[127] In the ICJ, under article 38 §1 al. c, the treaty clearly indicate that general principle of law recognized by nations. Those principles are widely accepted internationally as general rules.

[128] Xuan Shao, *What We Talk about When We Talk about General Principles of Law*, Chinese Journal of International Law, Volume 20, Issue 2, June 2021, 219–255, https://doi.org/10.1093/chinesejil/jmab019 (More information is provided on what constitute a general principle of law and the idea of recognition by civilised nations).

[129] Sean Morris, *General Principles a s a Source of International Law: Art 38(1)(c) of the Statute of the International Court of Justice by Imogen Saunders*, Asian Journal of International Law, Vol 1, Issue 2, July

According to the Guide to Latin in International law by Fellmeth and Horwitz, *audiatur et altera pars is the* "due process according to which parties before an authoritative tribunal must have an equal opportunity to be heard and their arguments considered under the law".[130] This principle refers to the discovery of evidence principles. As mentioned previously this principle is not really integrated into the solution offered by the on-chain dispute resolution Kleros.

There are areas where it could be argued that the blockchain dispute resolution process is compatible with some general principles of law. One of the key elements of blockchain dispute resolution is the fact that it upholds equitable outcomes.[131] The outcomes are largely dependent on the question of how the various parties are satisfied with the outcomes. In their Short paper, Kleros indicate that the juror must provide a justification for their vote and the notion of fairness is also mentioned. However, this on-chain dispute resolution platform is based on incentives for the jurors, who are the final decision-makers. The key challenge with this approach is the fact that jurors may not be in a position to make decisions based on the merit of each party. Instead, jurors could make decisions based on how the other jurors vote rather than what seems fair and equitable to them.[132] It may be difficult to achieve rational and fair decisions through the blockchain dispute resolution mechanisms.

The blockchain dispute resolution process is complex and challenging. Arguably, such an approach is mainly applicable for low-risk disputes that are anonymized. On-chain dispute resolution could provide a good approach for blockchain based disputes, but any dispute resolution platform involved should make clear decision regarding the mechanisms and protocols that should be used. The use of third-party arbitrators is the most ideal option to ensure that the process guarantees to provide civil guarantees. Third-party arbitrators are independent and impartial since they are not influenced by the incentives as is the case with typical jurors. As a result, third-party arbitrators have the potential to make fair and impartial

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2021, pp. 1 – 2 DOI: https://doi.org/10.1017/S2044251321000473 (the book review indicate the position of Saunders. General principles of law could have a global dimension).

[130] Aaron X. Fellmeth and Maurice Horwitz, Guide to Latin in International Law, 2009, DOI:10.1093/acref/9780195369380.001.0001 (definition of *audiatur et altera pars*).

[131] American Society of International Law and the International Judicial Academy, Opinion and Commentary Subsidiary Sources and Evidence of International Law, April 2008, International Judicial monitor, http://www.judicialmonitor.org/archive_0408/generalprinciples.html ("equity and fairness is a general principle of law recognized by all civilized legal systems", the Kleros protocol indicate fairness is a key principle of their dispute settlement mechanism).

[132] Bergolla, Luis and Seif, Karen and Eken, *supra note* 123

decisions that protect the individual rights of the key parties involved in a given dispute. Those platforms should aim to meet some of the fundamental principle's requirements uphold by the general principles of law.

7. Blockchain dispute resolution within a legal framework

The previous section highlighted some of the areas where blockchain dispute resolution might benefit from trying to meet more international rules requirements. Assuming public and permissionless blockchain protocols would attract more users and therefore will record more on-chain transactions, the number of disputes will by extension continue to rise. The current state of the decentralized industry seems to keep anonymity most probably as a key element. Therefore, this next section will focus on areas where could those protocols move forward to accommodate anonymous and decentralized disputes on the blockchain. In other word, this section will cover how blockchain dispute resolution could provide a form of recognised settlement mechanism when court proceeding can difficultly be accessible.

Dispute resolution and Blockchain technology can lead in different directions, this paper will focus on the possibility of blockchain dispute resolution qualifying as ODR or as a tool for arbitration.

7.1. Qualifying as an Online Alternative dispute resolution (ODR)

Online dispute resolution are flexible dispute resolution mechanisms, which can be recognised by court. Blockchain dispute resolution could qualify as an ODR. Julien Chaisse in this paper use the concept of ODR+ as a potential future for blockchain dispute resolution.[133]

It is interesting to start by reviewing the differences between Online dispute resolution (ORD) and Alternative dispute resolution (ADR).

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[133] Julien Chaisse, Smart Courts, Smart Contracts, and the Future of Online Dispute Resolution. STANFORD JOURNAL OF BLOCKCHAIN LAW & POLICY, January 2022, https://stanford-jblp.pubpub.org/pub/future-of-odr (the terms is define in this article and seems to be the first mention of it).

The Directive 2013/11/EU paragraph 5 states that Alternative dispute resolution (ADR) offers a simple, fast, and low-cost out-of-court solution to disputes between consumers and traders.[134] The term ORD is also rather broadly defined. According to Colin Rule, ORD corresponds to "any use of technology to complement, support or administer a dispute resolution process".[135] A narrow definition could be considered as the use of new technologies supplementing ADR mechanisms.[136] ORD has specific features which differentiate it from ARD. Parties using an ORD mechanism do not need to meet in person and the meeting could be arranged at different time zones and locations as it is held online. Although the term ORD has a broad definition, guidance has been provided by the Working group III of the United Nations Commission on International Trade Law.[137] Those principles, unfortunately not clearly elaborated, include the principle of impartiality, independence, efficiency, effectiveness, fairness, transparency, due process, and accountability. The EU has however come up with more guidance on the principles ARD must follow in a Green Paper as a way to establish a set of minimum quality standards.[138]

Platform similar to Kleros or Jur should therefore aim to not only follow general principles of law but also try to qualify as Online Alternative dispute resolution. Blockchain can be considered as technical support of the ARD.

Using blockchain technology as an ORD is an idea that has also been taken into consideration in some jurisdiction. In China for example, blockchain dispute resolution as a ODR might complement the Belt and Road initiative disputes.[139]

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[134] See Directive 2013/11/EU of the European Parliament and of the Council of 21 May 2013 on alternative dispute resolution for consumer disputes and amending Regulation (EC) No 2006/2004 and Directive 2009/22/EC (Directive on consumer ADR)

[135] Colin Rule, Online dispute resolution for business: B2B, E-commerce, consumer, employment, insurance and other commercial conflicts (September 2002) (citation on the definition of ODR)

[136] Martin Gramatikov, COSTS AND QUALITY OF ONLINE DISPUTE RESOLUTION: A HANDBOOK FOR MEASURING THE COSTS AND QUALITY OF ODR, (2012), (providing an alternative definition)

[137] See United Nations Commission on International Trade Law, Working Group III (Online dispute resolution) Thirty-third session, A/CN.9/WG. III/WP. 140, UNCITRAL Technical Notes on Online Dispute Resolution, paragraph 3 (Technical Notes on ODR).

[138] See also Green Paper on Alternative Dispute Resolution in Civil and Commercial Law, COM (2002) 196 final, paragraph 9 (Green Paper on ADR, only guidance which national states are highly encouraged to take into consideration).

[139] Julien Chaisse, *supra note* 133 (this article provides a positive assessment on ODR+ for the Belt and Road initiative).

Because of the high cost of traditional litigation, ODR gives easier access to justice.[140] The recognition of Blockchain dispute resolution as an ODR will therefore be beneficial in guarantying the access to justice.

7.2. A step closer to online arbitration

Arbitration opens another possibility to ensure the lawfulness and legality of blockchain dispute resolution platforms. Arbitration is considered often a separate form of dispute resolution and not an ADR. New forms of arbitration, such as Online arbitration or e-arbitration, could offer blockchain dispute resolution platforms a path to recognition by national courts and international law. Blockchain could be used as a way to facilitate online arbitration or may be directly as an arbitration tool.

7.2.1. Blockchain protocol as an online dispute resolution platform facilitator: the case of JUR

Some blockchain dispute resolution platforms such as Kleros could qualify as Arbitration relying on blockchain technology. Those platforms offering a *sui generis* form of arbitration should correct their incompatibilities with the international arbitration framework.[141]

JUR has launched a platform called the "Open Platform Justice" (OPJ) which is a blockchain-powered decentralized. JUR claims its platform is a multi-jurisdiction ODR.[142] Indeed, JUR indicates following international standards and its arbitration award to be binding. The platform indicates specifically being an online arbitration platform, utilizing the Convention on the Recognition and Enforcement of Foreign Arbitral Awards 1958.[143] The case of JUR vaguely mirror the case mentioned in section 5.3. Blockchain technology and specifically smart contracts have definitely the potential to be used in dispute resolution as an enforcement tool

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[140] See Wendy *Carlson, Increasing Access to Justice Through Online Dispute Resolution*, 6 Int'l J. O.D.R. 17, 17-31 (2020), https://www.elevenjournals.com/tijdschrift/ijodr/2020/1/IJODR_2352-5002_2020_006_001_003.
[141] Maxime Chevalier, From Smart Contract Litigation to Blockchain Arbitration, a New Decentralized Approach Leading Towards the Blockchain Arbitral Order, Journal of International Dispute Settlement, Volume 12, Issue 4, December 2021, Pages 558–584, https://doi.org/10.1093/jnlids/idab025 (according to the author, those form of arbitration must rely the self-enforcement as a tool against off-chain opposition to the decision).
[142] JUR, https://justice.jur.io/ (on the home page).
[143] JUR https://jur.io/blog/white-paper-3-the-open-justice-platform-and-the-justice-problem-in-the-pandemic/ (JUR appears to be more than just an ODR, but aims to be an arbitration platform powered by the blockchain technology).

of arbitration awards. Pushing it forward with certain requirements, it could be also qualified as a new form of arbitration.

7.2.2. Blockchain arbitration

According to Chevalier, the current state of the blockchain dispute resolution platform does not satisfy the following requirements: the designated seat of arbitration, motivated decisions, decision based on law and formal requirement attached to the arbitration procedure. By operating some changes in the cited areas, blockchain disputes resolution platforms will increase the probability the decisions delivered by the juror of being recognised by the court as valid.

The seat of arbitration is one of the most important requirements which should be stated in the arbitration agreement.[144] A seat of arbitration is a location chosen by the parties as the legal place of arbitration, which establishes the arbitration's procedural framework. The selection of the seat of arbitration should allow the parties to decide ex ante.[145] It could also be made possible for the arbitrators to choose the seat of arbitration before the start of the arbitration.[146] However as blockchain technology is the means of transaction, the procedure is held online and the physical location of the seat of arbitration seems insignificant. It has therefore been suggested to determine the seat of arbitration differently by taking into consideration: the place of the website where the case is being administered, the place where the servers are located, the place where the computers are, the place where the e-arbitration provider is based or the place of the e-platform.[147] But this could also be dismissed as too many locations could qualify. Some support the idea of delocalization of the arbitration procedure, having those

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[144] Alexander J. Belohlávek, *Importance of the Seat of Arbitration in International Arbitration: Delocalization and Denationalization of Arbitration as an Outdated Myth*, 31, ASA Bulletin, Issue 2, 2013, pp. 262-292, https://kluwerlawonline.com/journalarticle/ASA+Bulletin/31.2/ASAB2013030 (the seat of arbitration is not specifically related to one aspect, it is for example not necessarily the place where the hearing takes place, the place where the award is made is one of the hints).

[145] Michael Buchwald, *Smart Contract Dispute Resolution: The Inescapable Flaws of Blockchain-Based Arbitration,* 168 U PA L Rev 1369, 1399, 2020 (the section on online arbitration illustrates the difficulty with electing a seat of arbitration with online cross-country disputes).

[146] Maxime Chevalier, *supra note* 141

[147] Cemre Kadioglu and Sadaff Habib, Virtual Hearings to the Rescue: Let's Pause for the Seat?, Kluwer Arbitration Blog, 27 October 2020, http://arbitrationblog.kluwerarbitration.com/2020/07/13/virtual-hearings-to-the-rescue-lets-pause-for-the-seat/ accessed February 18, 2022 (Seat of arbitration is related to the governing law, but during the COVID pandemic this concept has been challenged, and alternative way of determining the seat of arbitration arose).

"CyberTribunals" applying principles from *lex mercatoria and lex electronica*.[148] Nonetheless, blockchain dispute resolution platforms should start addressing the issues related to the seat of arbitration.

Lack of motivated decisions is also a principle that is debatable. Generally, motivation of decision is mandatory in a national court. For arbitration, Article 31(2) of the UNCITRAL Model Law indicate that, unless the parties agree otherwise, the award shall state the reasons upon which it is based. There are some exceptions for example in the US,[149] or in England.[150] Blockchain dispute resolution should therefore clearly define which procedural law their arbitration procedure will follow.

Not only procedural law should be indicated, but the arbitration award should also be based on the law. Although this is the most frequent solution, it is also possible to use *amiable compositeur*. Indeed, "Article 28(3) of the Model Law provides that the arbitral tribunal can decide as *amiable compositeur* but only if it has been *expressly* authorized to do so by the parties." As it would be inconvenient to select a specific national due to the decentralized nature of the transactions, blockchain dispute resolution platforms could allow their juror to decide as *amiable compositeur* but only if it has been *expressly* authorized to do so by the parties.

Finally, there are formal requirements attached to any arbitration agreement and any arbitration award. Article II(1) of the New York Convention confirm the written requirement of the arbitration agreement. However, an arbitration agreement concluded via electronic means of communication is also accepted. Nonetheless, the arbitration agreement is a contract, and its validity will be challenged against national laws, specifically in regard to the smart contract consent. The arbitration award should be written but also signed by the arbitrators. This condition seems to be prevailing in a few national legal systems.[151] There is still the question of electronic signature.

Having contracts in written form guards against the danger of perjury and prevents the potential enforcement of unfounded fraudulent claims. The writing outlines the material elements of a

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[148] Eric A Caprioli, Arbitrage Et Médiation Dans Le Commerce Électronique (L'expérience Du «CyberTribunal»)' Revue de l'Arbitrage, Vol 1999, Issue 2, 236–37 (update June 2005)(Cybertribunal supporters belive in giving up the physical designation of the seat of arbitration and promote the application of the *lex electronica*).

[149] For more details see : *United Steel Workers of Am v Enter Wheel & Car Corp* (1960) 363 US 593, 598; *DH Blair & Co v Gottdiener* (2006) 462 F3d 95, 110; James E Berger and Charlene C Sun, 'Rules of Reason: U.S. Courts Grapple with the Requirements for a Reasoned Award' (2016) 5 Indian J Arb L 196–207

[150] See also s 52(4) of the English Arbitration Act 1996. This states that 'the award shall contain the reasons for the award unless it is an agreed award, or the parties have agreed to dispense with reasons.

[151] There are different national acts which confirm this condition, see s 52(3) of the English Arbitration Act 1996, arts 1506, 1481 and 1513 of the French Code of Civil Procedure, s 1054(1) sentence 1 of the German Code of Civil Procedure, art 189(2) of the Swiss Private International Law Act, art 31(1) sentence 1 of the UNCITRAL Model Law on International Commercial Arbitration (2006 amendments), in Kreis and Kaulartz (n 8) 354.

given contract and, what qualifies as valid writing does not have to be too thorough. Such writing can be based on electronic writing, and an agreement can comprise certain aspects of the agreement. The key question that the legal systems consider when considering the validity of given writing is the question of whether the writing is valid and creates a legally enforceable contract.

The arbitration award should have valid signatures that cannot be generated automatically. Parties to a blockchain dispute intending to use smart contracts can validate a transaction that initiates the execution of the smart code. The initiating transaction and the code used to develop the smart contract could be identified as the material elements of a given contractual agreement, but signature is as mentioned a key element for the arbitration award formalities.

The Uniform Electronic Transactions Act, passed in 2005, was made "to promote a high degree of confidence in the electronic marketplace and to provide safeguards for both users of electronic commerce and those who conduct business electronically by establishing certain standards for legal recognition, validity and enforcement with respect to electronic records and signatures." The UETA defines an electronic signature as "[a] digital or electronic signature executed or adopted by a person with the intent to sign a record, performed with the person's electronic signature device, transmitted to and recorded on a record by a person or entity with the intent to sign that recording. " In the case of arbitration awards delivered on a blockchain dispute resolution platform by a simple vote, the validation of the signature condition could be challenged. Indeed, the signature is carried by the vote and has no visible form. It consists of a token-secured key paired with the e-award.

8. Conclusion

Perhaps, one of the key challenges to the legitimacy of the blockchain dispute resolution mechanism is to determine whether the decisions are based on fairness or collective agreement. Jurors can act against the interests of the parties in dispute. Establishing a clear set of rules under both international arbitration conventions and general principles of law could reduce the uncertainty attached to the recognition by national courts of the decision delivered by

blockchain dispute resolution platforms. Indeed, so far, the legal uncertainty surrounding blockchain technology and smart contract prevent higher market adoption.[152]

So far, whether blockchain dispute resolution platforms could qualify as e-arbitration, an ARD or ORD is still not clear.

Nonetheless, blockchain dispute resolution platforms can also decide to involve arbitrators according to international conventions. In some cases, the parties to a given on-chain dispute have the option to request the involvement of reputable arbitrators to resolve their disputes. Usually, this approach is mainly preferred by parties in cases where the case and its outcomes are highly important and strategic to the point that the ultimate decision cannot be exposed to cognitive biases. The key motivation behind the implementation of the third-party arbitration method is the desire to ensure that the arbitral award is final and legally binding. Adding the contractual aspect of enforceability to a given arbitral award implies that one party is legally bound to compensate the other based on the outcomes. However, this approach can be tedious and lengthy. Parties to a dispute may not be willing to cover the massive litigation costs and wait for a lengthy period before the hearings and the decision stage. The key idea is to hire external arbitrators with an understanding of how blockchain processes and smart functions function to solve the complexities associated with the arbitration process. Notably, as well, the arbitrators have to maintain a sense of impartiality to render their decisions final and legally binding. If current procedures do not satisfy international standards, integrating blockchain technology into traditional arbitration agreements could guarantee innovative solutions. Having blockchain dispute resolution qualified as ADR could provide a complementary solution to fill the gap created by the decentralization and anonymity of transactions.

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[152] The LawTech Delivery Panel, Legal statement on cryptoassets and smart contracts, UK Jurisdiction Taskforce, November 2019, p.4 https://35z8e83m1ih83drye280o9d1-wpengine.netdna-ssl.com/wp-content/uploads/2019/11/6.6056_JO_Cryptocurrencies_Statement_FINAL_WEB_111119-1.pdf accessed March 2022 (The paper tries to highlight some uncertainty areas impacting the market adoption and provide their conclusions).

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