A BRIEF INTRODUCTION TO BLOCKCHAIN DISPUTE RESOLUTION*

Cemre Ç. KADIOĞLU KUMTEPE, LL.M.

University of Leicester, PhD Candidate

New York and Istanbul Bar

cckk1@leicester.ac.uk

Abstract

Blockchain is the technology behind infamous Bitcoin and provides a structure for dispute resolution with the help of smart contracts. The technology aims to establish an anonymous and decentralized mechanism without any state oversight or intermediary for transactions. Blockchain works on a decentralized network creating an immutable record of transactions. A smart contract is a self-executing software program that automatically performs a function. Once the conditions are met, the contract enforces itself without any additional step. The blockchain dispute resolution (BDR) platforms offer services for disputes arising out of blockchain and smart contract transactions or for traditional disputes that are not related to blockchain transactions. Each of the platforms provides untraditional mechanisms for adjudication that are also different from each other, creating an unorganized and unregulated environment. The platforms do not comply with the accustomed principles of alternative dispute resolution (ADR) and online dispute resolution (ODR) mechanisms raising the question of validity and legitimacy of the platforms and the need for regulation.

The article aims to act as a brief introduction to some of these platforms and identifies major issues with BDR when compared to the established dispute resolution procedures. It briefly explains the blockchain and smart contracts with some examples on their alternative applications and then introduces BDR platforms. The article discusses concerns about BDR in light of ADR and ODR principles. It points out main issues following up the comparison of different mechanisms and tries to provide a perspective to find answers with discussion of possible solutions. Finally, the article suggests that the best way forward is to utilize BDR for supplementing ODR and ADR. If regulation is found absolutely necessary, then soft law instruments should be the first step in this respect.

Keywords: Blockchain, smart contracts, dispute resolution, ADR, ODR

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INTRODUCTION

Bitcoin and how it is transforming the financial world are trendy topics. In fact, a second peak of Google searches for Bitcoin occurred in the first two months of 2021 after an earlier peak in 2017.[1] Although the technology behind Bitcoin is the actual gem, that technology has not been given enough attention as Bitcoin or in its general name – cryptocurrencies.[2] Bitcoin and many other cryptocurrencies are based on a technology called blockchain, which works on a decentralized network,[3] and has many applications such as secure and transparent voting, music streaming, record keeping including health data, and delivering humanitarian aid.[4] Some other uses of blockchain include validation of education credentials, supply-chain, and as will be discussed, dispute resolution.

Blockchain is used for education credentialization as it provides a trusted source for verification and validation of records. Authenticity of a record such as a transcript, certificate or diploma is validated on blockchain without any paperwork.[5] Thanks to this technology validation becomes much faster and reliable, and translation, shipping, notary costs are avoided.

Blockchain is also used in the retail and supply chain industry. Organizations create a decentralized immutable record of all transactions so they can track assets from production to delivery or to end user. For certain products tracking the process is important. The China baby formula crisis sets an example for the significance of keeping reliable records of food products. In 2008, melamine, which is a compound that is illegally added to inflate the apparent protein content of food products, was found in a baby formula in China.[6] Melamine is not toxic but it causes kidney stones. As a result of the consumption of this baby formula, 300,000 babies fell ill, an additional "50,000 infants were hospitali[z]ed",

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[1] Google Trends, 'Bitcoin and Blockchain' <https://trends.google.com/trends/explore?date=all&q=bitcoin,blockchain> accessed 21 February 2021.

[2] Nathan Reiff, 'Forget Bitcoin: Blockchain is the Future' (*Investopedia*, 26 July 2021) <https://www.investopedia.com/tech/forget-bitcoin-blockchain-future/> 26 October 2021.

[3] ibid.

[4] Ian Tucker, 'Blockchain: so much bigger than bitcoin…' *The Guardian* (28 January 2018) <https://www.theguardian.com/technology/2018/jan/28/blockchain-so-much-bigger-than-bitcoin> 26 October 2021.

[5] See for example Marywille University, 'Blockchain: Advancing Maryville's Digital World' <https://www.maryville.edu/blockchain/ > accessed 26 October 2021.

[6] Editorial, 'China's Baby Formula Scandal' *The New York Times* (New York City, 19 September 2008) <https://www.nytimes.com/2008/09/20/opinion/20sat2.html> accessed 22 February 2021.

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and the scandal resulted in six premature deaths.[7] This unfortunate example suggests the important role that blockchain will play in validation, record keeping, and trust in the procedures.

Another application is providing a mechanism for dispute resolution. Platforms that use blockchain to provide dispute resolution services for disputes arising out of blockchain and smart contract transactions or for traditional disputes that are taking outside blockchain or not related to blockchain or smart contract transactions (referred as off-chain disputes). These platforms essentially lead to decentralization of the judiciary by eliminating the courts from the dispute resolution process. Each of the platforms provides untraditional mechanisms for adjudication that are different from each other, creating an environment with a group of unregulated, non-governmental, for-profit platforms. This article aims to act as a brief introduction to some of these platforms and indicate the main issues with blockchain dispute resolution (BDR) when compared to the established dispute resolution procedures.

The first section briefly explains the blockchain and smart contracts with some examples on their alternative applications without in-depth technical discussions. The second section introduces the BDR platforms. The third section discusses standards and principles established by alternative dispute resolution (ADR) and online dispute resolution (ODR) mechanisms. The fourth poses questions following up the comparison of different mechanisms and tries to provide a perspective to find answers with discussion of possible solutions. Finally, the conclusion suggests the best way forward.

I. BLOCKCHAIN AND SMART CONTRACTS

BDR platforms operate on blockchain and generally utilize smart contracts. Blockchain does not have a uniform definition. Blockchain works on a distributed ledger technology (DLT) that provides a decentralized network. The technology aims to establish an anonymous and decentralized mechanism without any state oversight or intermediary for transactions. When a party initiates a transaction, it is cryptographically represented online as a block. The block is broadcast to every party in the network. Those in the network approve the transaction as valid, in other words they reach a consensus. The process is considered to be democratic because it needs a majority decision to add a new block. The modification or tampering of older blocks become more difficult with

[7] Tania Branigan, 'China to execute two over poisoned milk scandal' *The Guardian* (Guangzhou, 22 January 2009) <https://www.theguardian.com/world/2009/jan/22/china-baby-milk-scandal-death-sentence> accessed 21 February 2021.

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new blocks added.[8] The new blocks are shared among the ledgers within the network, and "any conflicts are resolved automatically using established rules."[9]

A smart contract is "a self-executing software program that automatically performs some function[s]."[10] These functions are protocols that work on a blockchain. The code itself is called a "contract" and works on "if" and "then" basis.[11] Once the conditions on the code are met, the contract enforces itself without any additional step. Smart contracts do not require third parties to validate, facilitate, or enforce a contract.[12] Some examples for functions that smart contracts can execute could be transferring an amount of money on an exact date, without further action such as releasing "funds for someone's birthday each year", to make a payment after the other party "confirms receipt of delivered goods", and to enforce particular rights for digital assets holders.[13] A smart contract code may also include a code for an "automatically available" mechanism for the resolution of the disputes among parties.[14] This code can provide for an arbitration clause or any other dispute resolution method that the parties see fit.

In short, blockchain provides a decentralized mechanism removing the intermediaries in transactions; the technology has a decision-making step in a sense that adding new blocks requires consensus of the participants in a trustless environment. Smart contracts enhance this mechanism by removing the intermediaries for enforcement of party obligations providing immutable business logic acting as an agreement between parties. This property of the technologies enables anonymous people gathering on a platform to determine on the facts provided by the disputing parties and enforce the decision without any intervention by third parties, creating a novel way of dispute resolution – BDR.

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[8] Dylan Yaga and others, 'Blockchain Technology Overview' (2019) *NISTIR 8202*, 1 <https://nvlpubs.nist.gov/nistpubs/ir/2018/NIST.IR.8202.pdf> accessed 2 February 2021.

[9] ibid.

[10] Garrick Hileman, Michel Rauchs, '2017 Global Blockchain Benchmarking Study' (2017) Cambridge Centre for Alternative Finance 11 <http://dx.doi.org/10.2139/ssrn.3040224> accessed 6 December 2020.

[11] Scott A. McKinney and others, 'Smart Contracts, Blockchain, and the Next Frontier of Transactional Law' 13 WASH. J.L. TECH. & ARTS 313, 324 (2018).

[12] Crypto-Currency Act of 2020, H.R. 6154, 116th Cong. § (2), (10 (2020) (defining "smart contract"); CoinMarketCap Alexandria, 'Glossary' <https://coinmarketcap.com/alexandria/glossary> accessed 26 February 2021 (defining "smart contract").

[13] CoreLedger, 'What are smart contracts? A Breakdown for beginners' (*Medium,* 9 October 2019) <https://medium.com/coreledger/what-are-smart-contracts-a-breakdown-for-beginners-92ac68ebdbeb> accessed 21 February 2021.

[14] James Metzger, 'The Current Landscape of Blockchain-Based, Crowdsourced Arbitration' (2019) 19 Macquarie LJ 81, 87.

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II. BLOCKCHAIN DISPUTE RESOLUTION (BDR)

Alternative dispute resolution (ADR) is an alternative to court litigation. When we talk about ADR, we refer to arbitration, mediation, negotiation, and other out-of-court procedures. Arbitration among others, results in binding, enforceable awards that can be recognized and enforced by states. Online Dispute Resolution (ODR) on the other hand is when the "electronic communications and other information and communication technology" are used for resolving disputes facilitating ADR mechanisms.[15] In simple terms, ODR is ADR conducted online. "ODR encompasses a broad range of approaches and forms (including but not limited to ombudsmen, complaints boards, negotiation, conciliation, mediation, facilitated settlement, arbitration and others), and the potential for hybrid processes comprising both online and offline elements."[16] ODR gained popularity through the expansion of e-commerce.[17] Today, many e-commerce sites offer their own ODR platforms. For example, eBay's ODR system handles 60 million disputes a year.[18] ODR now extends beyond e-commerce, and the Covid-19 pandemic fueled the discussions on the use of technology for dispute resolution. The emerging technologies like blockchain and smart contracts have been suggested as an alternative or complementary to ODR.[19]

The idea was blockchain was going to be a dispute-free environment when it first emerged.[20] It is later seen that when there is human involvement, the disputes are inevitable. Apparently, there could

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[15] UNCITRAL Technical Notes on Online Dispute Resolution (New York, 2017) <https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/v1700382_english_technical_notes_on_odr.pdf> Section V, 24.

[16] ibid Section I, 2.

[17] Orna Rabinovich-Einy, Ethan Katsh, 'The New New Courts' (2017) 67(1) American University Law Review 165-215.

[18] Editorial, 'Separating the People from the Problem' (2020) 6(4) The Practice <https://thepractice.law.harvard.edu/article/separating-the-people-from-the-problem/> accessed 26 February 2021; Editorial, 'eBay-style Online Courts Could Resolve Smaller Claims' *BBC News* (16 February 2015) <https://www.bbc.com/news/uk-31483099> accessed 26 February 2021.

[19] Riikka Koulu, 'Blockchains and Online Dispute Resolution: Smart Contracts as an Alternative to Enforcement' (2016) 13(1) SCRIPTed 40; Ashish Chugh, 'Why We Don't Need Blockchain to Manage Cases in International Arbitration' (*Kluwer Arbitration*, 2018) <http://arbitrationblog.kluwerarbitration.com/2018/05/13/dont-need-blockchain-manage-cases-international-arbitration/?doing_wp_cron=1586980451.5285389423370361328125> accessed 6 December 2020 (rejects this idea).

[20] Orna Rabinovich-Einy and Ethan Katsh, 'Blockchain and the Inevitability of Disputes: The Role for Online Dispute Resolution' (2019) 2019 J Disp Resol 47, 59; Riikka Koulu and Kalle Markkanen 'Conflict Management for Regulation-Averse Blockchains?' (2019) in *RM, Ballardini and others, Regulating Industrial Internet through IPR, Data Protection and Competition Law* (Kluwer Law International 2019) <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3377143> accessed 28 February 2021.

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also be disputes that arise out of smart contracts or transactions on the blockchain. In addition to disputes arising due to these technologies, the scholars found that blockchain technology has an "inherent tendency towards judicialization."[21] This does not mean that the terms such as democracy, trust, and consensus used for describing the technology are romantically and conveniently aligned with the legal terms. Rather, this means that blockchain has an architecture fit for dispute resolution.[22] Consequently, blockchain and smart contracts are designed to resolve disputes, whether online/technology-based or traditional disputes that do not involve any technological issues.[23] Several initiatives work for the legalization of blockchain that offer different structures promising to perform judicial functions.[24] The platforms can be categorized in five groups according to their functions and structures, and the platforms can be under more than one category as the properties intersect.

The first group of platforms are set for resolving blockchain or smart contract disputes. For example, Aragon court has jurisdiction over the organization that entered into smart contracts on the Aragon platform.[25] ECAF, which is a dispute resolution platform of EOS, is for disputes regarding bugs in smart contracts, hacking, and other scams.[26] Kleros has a sub-court for blockchain disputes.[27] Sagewise established a mechanism to arbitrate disputes over blockchain transactions and the system uses smart contracts that include an arbitration clause.[28]

The second group is for disputes that do not necessarily arise on-chain. In addition to blockchain disputes, Kleros currently has five other sub-courts for disputes related to marketing, English language (Linguo translation app), video production, small disputes, and content of a lists

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[21] Pietro Ortolani, 'The Impact of Blockchain Technologies and Smart Contracts on Dispute Resolution: Arbitration and Court Litigation at the Crossroads' (2019) 24 Uniform Law Review 430, 432.

[22] ibid.

[23] Darcy Allen, Aaron Lane, and Marta Poblet, 'The Governance of Blockchain Dispute Resolution' (2019) 25 Harvard Negotiation Law Review 75, 100.

[24] Metzger (n 14) 87.

[25] Aragon, 'Aragon Courts' <https://aragon.org/aragon-court> accessed 25 February 2021.

[26] See Rabinovich-Einy and Katsh (n 20) 70-71 for description of EOS ECAF. At the time of writing this article, the website and the arbitration rules were not accessible. EOS held a vote among the participants for extinguishing the arbitration forum with the majority answering positively. There is no press release or announcement about the fate of ECAF. For discussions on ECAF's legitimacy see text to n 59.

[27] Kleros, 'Court'<https://kleros.io> accessed 25 February 2021.

[28] Jonathan Shieber, 'Sagewise Pitches a Service to Verify Claims and Arbitrate Disputes Over Blockchain Transactions' (*TechCrunch*, 3 August 2018) available at <https://techcrunch.com/2018/08/03/sagewise-pitches-a-service-to-verify-claims-and-arbitrate-disputes-over-blockchain-transactions/> accessed 26 December 2020. At the time of writing this article, Sagewise website (www.sagewise.io) directed to another address suggesting that the services are no longer available. However, the structure worth mentioning as it gives an idea on the BDR ecosystem.

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and registries.[29] Mattereum, which is a legal, technical, and commercial infrastructure layer for the on-chain property transfer and control, establishes a decentralized commercial arbitration center for disputes among the parties.[30]

The third group of platforms encourage parties to enter into friendly negotiations first. They have different incentive mechanisms and structures to assist parties to reach a consensus. Sagewise gave parties a chance to negotiate first. The system was designed to allow parties to upgrade the contract if they agreed, otherwise, a human third-party facilitator and experts would get involved.[31] In Juris, parties used to be directed to "crowdsource an opinion" only after they cannot find a common ground.[32]

The fourth group is work based on crowd intelligence and voting principles. Jur uses votes and crowd intelligence either on an open group with no certain expertise or among closed voters with expertise.[33] Kleros suggests crowdsourcing online dispute resolution with game theory principles.[34] The decision-makers called jurors do not have to be experts but jurors may choose one of the sub-courts mentioned above according to their expertise.[35] Another platform named Rhubarb uses PeopleClaim for poll verdict.[36] Parties hold a vote on their case and eventually the minority loses.[37] If parties choose in advance, this decision can be binding.[38] They may also enforce the decision through smart contracts.[39]

Finally, some platforms do not offer resolution procedures on blockchain, but at some point, they get assistance of traditional dispute resolution methods. Sagewise aimed to direct parties to an external ODR platform if the earlier negotiation and human facilitator procedures

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[29] Kleros (n 27).

[30] Mattereum, 'Working Paper: Smart Contracts: Real Property' <https://mattereum.com/wp-content/uploads/2020/02/mattereum_workingpaper.pdf> accessed 25 February 2021.

[31] Rabinovich-Einy and Katsch (n 20) 66.

[32] Adam J. Kerpelman, 'Introducing the Juris Protocol: Human-Powered Dispute Resolution for Blockchain Smart Contracts.' (*Medium*, 17 February 2018) <https://medium.com/jurisproject/introducing-the-juris-protocol-human-powered-dispute-resolution-for-blockchain-smart-contracts-bc574b50d8e1> accessed 26 October 2021. Just like Sagewise, Juris has become no longer accessible at the time of editing this article. These platforms indicate how fragile and dynamic the BDR market is.

[33] Jur, <https://jur.io> accessed 25 February 2021.

[34] Clément Lesaege, Federico Ast, and William George 'Short Paper v.1.0.7' (*Kleros*, September 2019) <https://kleros.io/static/whitepaper_en-8bd3a0480b45c39899787e17049ded26.pdf> accessed 6 December 2020.

[35] ibid.

[36] Rhubarb, <https://www.rhucoin.com/home.aspx> accessed 25 February 2021.

[37] ibid.

[38] ibid.

[39] ibid.

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failed.[40] Mattereum directs disputing parties to independent external arbitration court rendering legally binding awards and recognized under The Convention on the Recognition and Enforcement of Foreign Arbitral Awards (the New York Convention).[41] Juris for complex cases had "High Jurists" to render binding and enforceable awards that could be enforced under the NY Convention.[42] Rhubarb allows parties to use the poll verdict to help negotiation and mediation or as an expert opinion during court or arbitration proceedings.[43]

Each platform offers unique elements that are difficult to fit into any of the categories. In ECAF, parties may state the desired remedy and the arbitrators may order emergency measures of protection. The decision of a single arbitrator can be appealed to a panel of three. In Juris, decision-makers provide one of three justifications and brief reasoning and there are experts involved in the procedure. Aragon court penalizes jurors who share the codes or who do not vote on the case to prevent collusion.[44] Aragon court also does not ask jurors to vote impartially but encourages them to vote with the majority to gain rewards.[45] Sagewise was designed to work with smart contracts containing an arbitration clause that "activates the dispute resolution process", freezes smart contracts, and enforces the resolution after the contract's upgrade.[46] Similarly, Kleros acts as a self-enforceable arbitration method.[47]

When we talk about alternatives to litigation, ADR or ODR procedures come into our minds. With BDR this is hardly the case. There is no coherence among the platforms or a specific procedure that they follow. Non-lawyer decision makers, appeal procedures, and a lack of rules on code of conduct and the parties' rights raise red flags. This places BDR in a different place compared to ADR and ODR which both have widely-recognized principles and procedures that must be followed.

III. SOME CONCERNS OF BDR IN LIGHT OF ADR AND ODR PRINCIPLES

BDR is an area of progress that most of the time is at odds with customary judicial concepts. Some concerns regarding the BDR are worth discussing

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[40] Rabinovich-Einy and Katsch (n 20) 66.
[41] Vinay Gupta, 'The First Mattereum Briefing' (*Medium*, 15 December 2017) <https://medium.com/humanizing-the-singularity/the-first-mattereum-briefing-11a67c75d840> accessed 6 December.
[42] Juris, 'White Paper Version 2.0' (18 September 2018) <https://drive.google.com/file/d/1318klGEYL4g02VudL-C-BCnvpKujTnbF/view> accessed 26 October 2021; Rabinovich-Einy and Katsch (n 16) 16.
[43] Rhubarb (n 36).
[44] Aragon, 'Dispute Lifecyle' < https://help.aragon.org/article/43-dispute-lifecycle> accessed 25 February 2021.
[45] ibid.
[46] Rabinovich-Einy and Katsch (n 20) 66.
[47] Lesaege, Ast, George (n 34).

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in view of main ADR and ODR principles. ADR aims to provide disputing parties an alternative for court litigation upon their explicit consent. The confidentiality of the procedures and expertise of independent neutrals are among the common key elements of ADR methods. Parties opt for ADR, especially for cost and time efficient dispute resolution. ODR observes similar principles. Independence and expertise of neutrals, "explicit and informed consent" of the parties for ODR and transparency regarding conflicts of interest and statistics on outcomes are main ODR principles.[48]

Among other methods, whether online or traditional, arbitration has more formal requirements. The consent of the parties should be clear and free of any ambiguity and parties should agree to arbitrate a defined legal relationship in writing. Party autonomy is an important aspect of arbitration. The principle enables parties to choose the seat of arbitration, applicable rules and procedures, the language of the proceeding. They can appoint their arbitrators, who declare their independence and impartiality. Parties may challenge the arbitrator if they think that arbitrator is not independent or impartial. The parties may require arbitrators to have a certain level of expertise on a particular matter. Arbitrators also have a broad range of powers. They can decide on evidence-taking, hear witnesses and experts, issue interim measures and get court assistance for these matters. The awards rendered at the end of the proceedings are final and binding. The successful party seeks enforcement of the award from state courts and the opposing party may seek to annul the award from a court at the seat of arbitration. Therefore, courts occasionally get involved in the proceedings and ultimately overview the proceedings.

A few common properties can be listed for BDR platforms. They offer decentralized mechanisms that provide anonymity. Most integrate voting, wisdom of the crowds, and game theory principles into their decision-making structures. They defend the idea that a large group of non-experts would arrive at a better conclusion than a fewer number of experts or the elite.[49] As opposed to the expertise desired in ADR and ODR, in most of the BDR platforms, the decision-makers are not required to have a law background or even an expertise on disputed matter. The cases are determined without any set of procedural rules. The decisions are made based on the evidence provided by the parties. Decision-makers, who do not have the powers of a judge or an arbitrator, cannot take any

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[48] UNCITRAL Technical Notes on Online Dispute Resolution (n 15) Section II.

[49] Clay Halton, 'Wisdom of Crowds' (*Investopedia*, 23 July 2019) <https://www.investopedia.com/terms/w/wisdom-crowds.asp> accessed 28 February 2021; see Wei Gao, 'Let the Collective Intelligence Shine Through: Crowdsourced Online Dispute Resolution from a Chinese Perspective' (2018) 6(2) Peking University Law Journal 283; see also James Surowiecki, *The Wisdom of Crowds: Why the Many are Smarter than the Few and How Collective Wisdom Shapes Business, Economics, Societies and Nations* (Doubleday 2004).

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imperative action for evidence-taking or fact-finding. The decision-makers basically vote for what they think is right. In most of the cases, they are rewarded only if they vote with the majority. The reward is in the form of tokens that all decision-makers staked to access the voting. The rightfulness of the majority is not questioned.

In most instances, the disputing parties do not select the decision-makers, who remain anonymous. Considering parties' autonomy to appoint and challenge the neutrals, and desired transparency with respect to their independence and impartiality in ADR and ODR, anonymity creates transparency concerns with BDR.[50] During the procedures, no hearings are held, and no reasoning for the decisions are required from the decision-makers.[51] These make BDR more questionable in terms of judicial protections provided to parties in conventional methods such as right to be heard and due process.[52] Some BDR platforms give parties a chance to appeal the decision. However, these procedures involve going through the same process with a larger pool of decision-makers; hence, the appeal does not eliminate the problems innate to BDR. The other side of the coin does not shine any better. A BDR platform that directs parties to a traditional arbitration would likely require state involvement making the process somewhat centralized. This would thwart the technology and the reason why these platforms are intact in the first place.

IV. PERSPECTIVES FOR ADDRESSING BDR ISSUES

The central concerns with BDR are whether a decentralized technology without any state oversight or involvement can properly resolve disputes and whether this should be allowed. This issue has strong philosophical roots on understandings of justice and eventually the need for a central authority.[53]

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[50] Metzger (n 14) 87.

[51] Distinctively, Juris platform required jurors and arbitrators to provide justifications to their votes. Juris, 'White Paper Version 2.0' (n 42) 30-32.

[52] Article V of the New York Convention allows state courts to deny recognition and enforcement if there are conditions listed thereby. These conditions include violation of right to present one's case and public policy in that jurisdiction. In some jurisdictions, physical appearance before the court/tribunal is mandatory and considered as a part of the right to be heard. The discussion for regular arbitrations with virtual/remote hearings still continues. The International Council for Commercial Arbitration (ICCA) is running a project that investigates whether a right to a physical hearing exists in arbitration in different jurisdictions. Although this relates to remote hearings in arbitration, it may provide guidance for the courts' possible reaction to BDR. ICCA Projects, 'Does Right to a Physical Hearing Exists in International Arbitration?' <https://www.arbitration-icca.org/right-to-a-physical-hearing-international-arbitration> accessed 27 February 2021.

[53] Marcella Atzori, 'Blockchain Technology and Decentralized Governance: Is the State Still Necessary?' (2015) 6(1) Journal of Governance and Regulation 45 (discussing the need for a state and arguing that the decentralization can only be an organization tool rather than a political theory). Colin Rule and Larry Friedberg, 'The Appropriate Role of Dispute Resolution in Building Trust Online' (2005) 13(2) Artificial Intelligence and

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Simon Roberts in his book discusses disputes and attainment of order in pre-historic societies when there was no central authority or central power.[54] Based on anthropological observations made on tribes, he suggests that an order can be sustained without a government, state, a chief in charge, or attributing power to the male or someone older.[55] He also shows the way these tribes are resolving their disputes is a decentralized and generally very democratic process.[56] The key point, however, is that the parties actually do want to resolve their dispute. This is interestingly applicable to decentralized dispute resolution on blockchain, which provides a democratic resolution process on a decentralized platform among peers. Ortolani compares this system to pre-Westphalian era, where jurisdiction was a private service provided by professionals and mainly based on disputing parties' consent.[57]

On the other hand, disputes in decentralized societies are relatively simple and straightforward compared to the complex commercial relationships in today's global economy. This may indicate that the BDR is not inherently an unsustainable phenomenon that is indifferent to human nature but the system may work only if the parties really want to resolve their dispute and the disputes are at a small scale. Buchwald supports this argument and states that BDR is viable only for resolving minor disputes. He concludes that opportunities offered by on-chain dispute resolution, especially in terms of evidence-taking, are too scarce to effectively adjudicate complex disputes.[58]

In addition to the scale of the disputes, BDR could be sufficient for blockchain or smart contract disputes, since limited decisions in the form of "yes" or "no" could address many of the issues, and no broad evidence-taking would be necessary as they are already on-chain. Nevertheless, BDR for on-chain disputes is not a walk in the park, either. Many on-chain claims were submitted to EOS arbitration, ECAF. However, a crisis arose about legitimacy and transparency of the dispute resolution provided by the platform because participants wanted the

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Law 193 (see for an earlier and visionary discussion on the relationship between ODR and trust.) Seems like, this idea appealed to and inspired some of the entrepreneurs to shape their services. For instance, Kleros claims to be based on the old concept of demarchy, the Athenian idea of random selection of representatives for government and courts, enhanced by the collective intelligence concepts of the Internet Age. Kleros, 'Dispute Revolution: The Kleros Handbook of Decentralized Justice' <https://kleros.io/book.pdf> accessed 28 February 2021.

[54] See generally Simon Roberts, *Order and Dispute: An Introduction to Legal Anthropology* (Penguin 1979).

[55] ibid.

[56] ibid.

[57] Ortolani (n 21) 433.

[58] Michael Buchwald, 'Smart Contract Dispute Resolution: The Inescapable Flaws of Blockchain-Based Arbitration' (2020) 168 University of Pennsylvania Law Review 1369, 1422.

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libertarian and decentralized nature.[59] Even arbitration for BDR disputes was considered to be hindering the whole idea behind the technology.

Decentralization is obviously an important element for blockchain users. Some platforms offer resolution for traditional disputes. The need for decentralization for off-chain disputes should also be addressed. Can we also say that we need and desire decentralization? The citizens from OECD countries were asked if they have confidence in judicial systems and courts in their countries; 58% of them answered positively.[60] On average, 62% said that they can access and afford civil justice.[61] When they asked about their confidence in ADR, 80% answered that ADR mechanism is accessible, impartial and effective.[62] These data may indicate that as the court and state involvement in the process decreases, the confidence and effectiveness in the procedure increase, suggesting tendency towards decentralization.[63]

The number of court cases as well as enforcement filings have become astronomical in many countries. For instance, in Turkey as of February 15, 2021 there are 2,179,993 pending civil law cases and 22,204,240 pending enforcement and bankruptcy files before the execution offices.[64] In the US, the ninety-five percent settlement rate is now considered to be a myth.[65] In 2020, 50,258 and 332,732 new cases were filed in the U.S. Court of Appeals and U.S. District Courts,

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[59] Josiah Wilmoth, 'EOS Faces Constitutional Crisis Over Frozen Accounts' (*Yahoo Finance*, 19 June 2018) <https://finance.yahoo.com/news/eos-faces-constitutional-crisis-over-190508375.html> accessed 26 February 2021.

[60] OECD/ADB, 'Government at a Glance Southeast Asia 2019' (2019) <https://www.oecd-ilibrary.org/docserver/9789264305915-en.pdf?expires=1612636565&id=id&accname=guest&checksum=7AA84CA1E3730152D4A422EA70ECCC2F> accessed 24 February 2021.

[61] ibid.

[62] ibid.

[63] Queen Mary University of London lists three most notable attributes of international arbitration as ease of enforceability of awards (65%), decentralisation (64%) and flexibility (38%). Queen Mary University of London '2015 Improvements and Innovations in International Arbitration' (2015) <http://www.arbitration.qmul.ac.uk/research/2015/index.html> accessed 27 February 2021. Consequently, it is concluded that 'One can therefore not ignore the resultant benefits of arbitration in disputes arising out of smart contracts which are, themselves, decentralised. From this decentralisation, stems both, the inherent flexibility and the facilitated enforcement which are characteristic of international arbitration.' Francisco Uribarri Soares, 'New Technologies and Arbitration' (2018) 7 Indian Journal of Arbitration Law 84, 89.

[64] Ulusal Yargı Ağı Bilişim Sistemi [National Justice Network Informatics System], 'Statistics' (15 February 2021) <https://istatistikler.uyap.gov.tr> accessed 24 February 2021.

[65] See generally Theodore Eisenberg and Charlotte Lanvers, 'What is the Settlement Rate and Why Should We Care?' (2009) 6(1) Journal of Empirical Studies 111.

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respectively.[66] The number of new bankruptcy cases decreased with a slower rate compared to previous years.[67] Small claims can easily be self-enforced through smart contracts. Therefore, the technology could take the burden out of courts increasing the affordability and effectiveness of judicial systems, yet this is a dream that could be realized at a level of certain digitalization.

Blockchain could also be helpful for supplementing ODR and ADR procedures that have online elements in terms of enhancing cybersecurity and confidentiality as it is immutable and cryptographically protected.[68] Blockchain is not exempt from hacking or meddling with decision-making processes as once thought to be, yet it still has a more secure infrastructure compared to online platforms.[69] Blockchain and smart contracts would also be useful for ensuring enforcement of decisions particularly through ODR.[70] Ultimately, BDR could be useful to a certain extent due to two main reasons. First, the statistics suggest that parties to a dispute prefer more decentralized procedures and decentralization of justice may be necessary for increasing the access to justice. Second, the BDR platforms may provide the infrastructure that may address current ADR issues such as cybersecurity and confidentiality.

With BDR, there are no certain procedures, and the mechanisms do not exactly align with ADR or ODR principles. The second function is the determination of the decision-making procedures and coding how the decisions will be executed through smart contracts. In a way, code becomes the law with no rule-maker as "protocol is open-source and it can be review[ed] by anyone; the network is not owned nor controlled by any single entity; data are simultaneously kept by all nodes." [71] This raises the question whether BDR should be regulated or not.

Some scholars argue that existing international arbitration rules are sufficient and conclude that such rules can be used for blockchain

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[66] United States Courts, 'Judicial Caseload Indicators - Federal Judicial Caseload Statistics 2020' <https://www.uscourts.gov/statistics-reports/judicial-caseload-indicators-federal-judicial-caseload-statistics-2020> accessed 24 February 2021.
[67] ibid.
[68] Jeremy Barnett and Philip Treleaven (2018) 'Algorithmic Dispute Resolution-The Automation of Professional Dispute Resolution Using AI and Blockchain Technologies' 61 (3) The Computer Journal 399, 407 ('Parties will be able to keep sensitive material confidential during the transaction, with smart contracts in place to reveal the contents of files, plans, economic models and other digital data once a dispute resolution process has been begun')
[69] Koulu (n 19) 50; cf Kevin Werbach, 'Trust, but Verify: Why the Blockchain Need the Law?' (2018) 33 Berkeley Technology Law Journal 487, 493.
[70] Koulu (n 19).
[71] Atzori (n 53) 7.

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dispute resolution.[72] The existing international arbitration rules could be used if the platforms are providing traditional ADR methods or have the standards established by ODR mechanisms. Implementation of existing ADR rules for platforms based on voting principles and self-executing smart contracts does not seem to be a realistic solution. Some also raise concerns regarding rule of law and protection of basic rights, which "nation states are often bound by constitutional obligations to provide the rule of law" whereas this "is not the case with other actors in the field."[73] Thus, states are obliged to observe rule of law in judiciary through courts, whereas BDR platforms are not yet under such responsibility.

On the other hand, new regulations tailored for blockchain also would be a challenge as the platforms have more differences than common properties to bring them under the roof of a single instrument.[74] In either scenario, any regulation will mean state involvement. Intervention by states is considered sub-optimal as such an intervention hinders the purpose of the technology and soft law instruments such as guidelines or codes of conduct are suggested as an initial step towards the regulation of these dispute resolution mechanisms.[75]

V. CONCLUSION

Blockchain, known as the technology behind most cryptocurrencies, has many other applications. One such application is dispute resolution. Blockchain is a technology that works on a distributed ledger that enables keeping decentralized and an almost immutable record of transactions. Some of the uses of these functions are validation, verification, record-keeping and also decision-making. With the help of smart contracts, which are self-executing protocols on blockchain, a dispute resolution infrastructure is created on blockchain.

Several incentives utilize these technologies to perform judicial functions for disputes arising both on-chain or off-chain. The platforms offering BDR services are decentralized and based on anonymity. Each platform has a different procedure for dispute resolution. In general, they utilize voting and polling based on game theory, wisdom of the crowds and collective intelligence principles. The decision-making, voting and polling structures lead us to question the validity and legitimacy of BDR decision and at the same time make us revisit our ideas of justice and the origins of judicial decisions' legitimacy. Although the philosophical and

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[72] Tonya Evans, 'The Role of International Rules in Blockchain-Based Cross-Border Commercial Disputes' (2019) 65 Wayne Law Review 1, 14-16.
[73] Koulu (n 19) 67.
[74] Other than UNCITRAL Technical Notes on ODR, there is no global regulation for choice of law or jurisdiction, or the recognition and enforcement of ODR decisions; thus, BDR regulation seems much more challenging. See Koulu (n 19) 43.
[75] Ortolani (n 21) 441; cf Werbach (n 69) 550 ('It is tempting to see law and regulation primarily as impediments to these processes, but that would be a mistake. Too much law could stifle the blockchain or drive it underground, yet so could too little law.')

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psychological roots of this issue require further study, anthropological researches suggest that decentralized dispute resolution is achievable and applicable. The recent statistics, which indicate lacking confidence in judicial systems and lower rate of access to justice compared to alternative methods, may also be interpreted as a need for decentralization. The incomprehensible number of enforcement files also suggest that self-executing contracts or smart contracts with a self-enforcing dispute resolution clause could be helpful.

BDR is ill-fit for complex disputes requiring extensive procedural details. Additionally, BDR platforms also do not conform to the main principles of ADR and ODR, raising concerns among others particularly with respect to parties' rights, due process and right to be heard. This raises the question whether BDR should be regulated or not. Application of existing ADR rules is suggested but these rules do not exactly address the issues raised by BDR. Some also disagree with the regulation of BDR as it involves state involvement hindering the idea of decentralization. For this, soft law instruments that are not necessarily binding but has a significant impact such as guidelines and codes of conduct are suggested as an initial step towards the regulation of BDR.

BDR provides a structure that could enhance the cybersecurity compared to other online solutions used for ODR or ADR. BDR is an area of progress and does not conform with traditional principles. BDR should be studied closely in terms of its effectiveness, parties' satisfaction and deficiencies. There is not enough data to prepare a regulation and also the platforms have more things different than they have in common, which make it difficult to bring them under the umbrella of the same instrument. For the time being, BDR can be used for supplementing ODR and ADR and if regulation is absolutely necessary, soft rules in this respect could be the next step forward. ADR and ODR institutions as well as non-governmental organizations and similar stakeholders could play a role in creation of these rules and provide a certain level of institutionalization for BDR without any direct state involvement.

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A Brief Introduction to Blockchain Dispute Resolution

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Cemre Kadioglu Kumtepe (https://papers.ssrn.com/sol3/cf_dev/AbsByAuth.cfm?per_id=3642197)
University of Leicester

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Abstract

Blockchain is the technology behind infamous Bitcoin and provides a structure for dispute resolution with the help of smart contracts. The technology aims to establish an anonymous and decentralized mechanism without any state oversight or intermediary for transactions. Blockchain works on a decentralized network creating an immutable record of transactions. A smart contract is a self-executing software program that automatically performs a function. Once the conditions are met, the contract enforces itself without any additional step. The blockchain dispute resolution (BDR) platforms offer services for disputes arising out of blockchain and smart contract transactions or for traditional disputes that are not related to blockchain transactions. Each of the platforms provides untraditional mechanisms for adjudication that are also different from each other, creating an unorganized and unregulated environment. The platforms do not comply with the accustomed principles of alternative dispute resolution (ADR) and online dispute resolution (ODR) mechanisms raising the question of validity and legitimacy of the platforms and the need for regulation.

The article aims to act as a brief introduction to some of these platforms and identifies major issues with BDR when compared to the established dispute resolution procedures. It briefly explains the blockchain and smart contracts with some examples on their alternative applications and then introduces BDR platforms. The article discusses concerns about BDR in light of ADR and ODR principles. It points out main issues following up the comparison of different mechanisms and tries to provide a perspective to find answers with discussion of possible solutions. Finally, the article suggests that the best way forward is to utilize BDR for supplementing ODR and ADR. If regulation is found absolutely necessary, then soft law instruments should be the first step in this respect.

Keywords: Blockchain, smart contracts, dispute resolution, ADR, ODR

JEL Classification: K00, K40

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