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Unpacking the technology of trust: establishing trust and fairness in online dispute resolution through blockchain and smart contracts

Cemre C. Kadioglu Kumtepe*,

ABSTRACT

As society and the economy become increasingly digital, the range of disputes expands—from e-commerce issues to conflicts on social media platforms or crypto transactions—challenging traditional dispute resolution. Legislators have responded by making online dispute resolution (ODR) mandatory for certain digital platforms, following the premise that a robust dispute resolution mechanism is crucial for maintaining trust in any market. Blockchain, often marketed as a trust-enhancing tool, shifts reliance from intermediaries to technology itself. The meaning and components of trust can differ in the context in which they are used. This article explores various interpretations of 'trust' within the context of blockchain-based ODR systems. The article states that while blockchain may enhance trust in dispute resolution, integrating procedural fairness into the design remains essential, as trust in technology alone is insufficient. By embedding procedural guidelines, blockchain-based ODR mechanisms can achieve the legitimacy and fairness needed for their continued adoption.

Keywords: blockchain; smart contracts; online dispute resolution; trust; procedural fairness; dispute resolution system design.

INTRODUCTION

As society, economy, and almost all aspects of everyday life digitalize, types of disputes diversify from e-commerce to social media platforms or crypto transactions, challenging traditional institutions and urging for innovative ways for resolution. Observing the trend, legislators are making online dispute resolution (ODR) a requirement for digital platforms. One example is the EU, with the Digital Services Act (DSA) obliging digital platforms to direct users to an

* Cemre C. Kadioglu Kumtepe, Assistant Professor, Faculty of Law, Information and Technology Law Department, Ankara University, Ankara, Turkey; University of Leicester, UK (PhD); Georgetown University, USA (LLM). Email: cckadioglu@ankara.edu.tr

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ODR mechanism for their disputes, even though these processes shall only allow parties to engage in good faith negotiations, and the outcomes shall not be binding.[1] Similarly, in its recitals, the EU's Digital Markets Act (DMA) invites gatekeepers to provide for an alternative dispute resolution (ADR) mechanism.[2]

ODR encapsulates ADR processes ranging from negotiation and mediation to binding arbitration that use information communication technologies (ICT), combining online and offline mechanisms when the parties to a dispute resort as an alternative to the courts.[3] With the imploration to use ODR comes a significant responsibility of ensuring the fairness of the ODR processes for the user's satisfaction, protection of their rights, and sustainability of the system.

One secret ingredient to a successful dispute resolution system, including ODR and other e-justice schemes, has been identified as the establishment and maintenance of trust. It is observed that trusting the system encourages participants to work out their conflicts.[4] The very existence of an ODR mechanism also serves the purpose of providing trust online so that users have a mechanism to fall back on when there are conflicts. ODR enhances user trust in the business environment provided by the e-commerce platform by minimizing the risk of denial of justice.[5] It fosters cross-border commerce.[6] A reliable ODR mechanism, therefore, ensures that the digital society, economy, and engagements continue smoothly. Restoring or building trust is challenging because it takes time and requires taking a risk.[7] In addition to trusting the overall system, users should trust that the ODR providers will design rules to create a level playing field and that the neutrals/decision-makers, such as mediators, arbitrators or jurors, will ensure confidentiality and remain impartial.[8]

Earlier studies have highlighted users' need for more trust in ODR systems. This distrust primarily arises from issues such as anonymity,[9] insufficient enforcement mechanisms,[10] limited communication or awareness of the process,[11] and concerns regarding the security and fairness of the system.[12] Blockchain technology has introduced innovative solutions to address some of these challenges to restore trust, albeit it does not completely remove the need for additional safeguards.

In this nascent type of ODR called blockchain dispute resolution (BDR), blockchain facilitates the dispute resolution process. BDR platforms still rely on human decision-makers but utilize smart contracts for different stages of the procedure, including the selection of the decision-makers and enforcement of outcomes. By means of including human decision-

[1] European Parliament and the Council Regulation (EU) 2022/2065 of the of 19 October 2022 on a Single Market For Digital Services and amending Directive 2000/31/EC (Digital Services Act) [2022] OJL 277, 1.

[2] European Parliament and the Council Regulation (EU) 2022/1925 of the 14 September 2022 on contestable and fair markets in the digital sector and amending Directives (EU) 2019/1937 and (EU) 2020/1828 (Digital Markets Act) [2022] OJL 265, 1.

[3] UNCITRAL Technical Notes on Online Dispute Resolution (2017) ["Technical Notes"].

[4] Colin Rule and Larry Friedberg, 'The Appropriate Role of Dispute Resolution in Building Trust Online' (2006) 13(2) AI&L 193, 204.

[5] Florence Guillaume and Sven Riva, 'Chapter 20: Blockchain Dispute Resolution for Decentralized Autonomous Organizations: The Rise of Decentralized Autonomous Justice' in Andrea Bonomi, Matthias Lehmann and Shaheeza Lalani (eds), *Blockchain and Private International Law* (Brill 2023) 597.

[6] Maxime Hanriot, 'Online Dispute Resolution (ODR) as a Solution to Cross Border Consumer Disputes: The Enforcement of Outcomes' (2016) 2(1) McGillJDispRes 2, 15.

[7] Rule and Friedberg (n 4) 195.

[8] ibid.

[9] Orna Rabinovich-Einy and Ethan Katsh, 'Blockchain and the Inevitability of Disputes: The Role for Online Dispute Resolution' (2019) 2 JDR 47, 52.

[10] Hanriot (n 6) 4.

[11] Fahimeh Abedi, John Zeleznikov and Emilia Belluci, 'Universal Standards for the Concept of Trust in Online Dispute Resolution Systems in E-Commerce Disputes' (2019) 27(3) International Journal of Law and Information Technology 209, 215.

[12] See generally Noam Ebner and John Zeleznikow, 'Fairness, Trust and Security in Online Dispute Resolution' (2015) 36(2) Hamline JPubLPol'y 143.

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makers, BDR is different from automated or algorithmic decision-making (ADM). Due to the blockchain's systematic features, democratized and decentralized decision-making procedures are adopted.

In BDR, decentralized and distributed participants remove the courts or traditional/central/off-chain ADR/ODR providers, creating a trustless, peer-to-peer network. It is trustless because strangers can transact as the system provides security so that transactions cannot be tampered with, and each step is recorded. The participants trust the blockchain more than their anonymous counterparts.[13] BDR platforms such as Kleros, Aragon, and Jur claim to resolve disputes related to transactions carried out on blockchain and disputes arising out of traditional contracts. These platforms assert the hypothesis that there is a strong correlation between the blockchain as a technology of trust and procedural and substantive fairness.

The 'shape of blockchain trust' impacts how the system interacts with the law.[14] The technical aspects are also intertwined with establishing governance structures to ensure fair processes. The chaos with the terminology and definitions makes it problematic for law practitioners to understand and for regulators to appreciate the possible legal implications of using these technologies.[15] There is no agreed-upon definition of 'trust' within dispute resolution or blockchain.[16] The definition and facets of 'trust', particularly concerning blockchain-based systems, are subject to criticism for lack of coherence, and accounts of trust in blockchain research are called for in previous studies.[17] Thus, the working mechanism of BDR, including the concept of trust embedded in the blockchain, is crucial to define and address legal issues.

In this light, the article discusses different definitions and interpretations of blockchain and smart contracts from the perspective of their contribution to enshrining trust into ODR, as we believe that it is vital for the procedural fairness, legitimacy, and sustainability of dispute resolution and digital society. Section 2 explains how BDR can increase trust and how fairness is perceived as a component of trust by analysing blockchain. Section 3 explores smart contracts, how they change our approach to dispute resolution by automating execution, and how they may enhance trust while simultaneously creating fairness concerns.

In an offline setting, the confidence is built on the 'traditional points of reference' that are used to 'assess trustworthiness'.[18] These traditional points may include legal rules, codes of ethics, guidelines, or the reputation of a particular structure or authority. For building confidence and trust, governance or some formality is required in an online setting, including blockchain-based systems. In this vein, Section 4 proposes governance solutions for blockchain and smart contracts to ensure procedural fairness and, hence, trust in the system. Section 5 concludes that blockchain and smart contracts may help build trust with the dispute resolution systems, but there is still a need to import rules for procedural fairness into the design because trust in the architecture is insufficient. With governance decisions following procedural guidelines, trust in the mechanism can be genuinely established, which is mandatory for the sustenance of ODR systems that will have to be adopted more widely in the future.

[13] Kevin Werbach, *The Blockchain and the New Architecture of Trust* (MIT Press 2018) 96.
[14] ibid.
[15] Angela Walch, 'Blockchain's Treacherous Vocabulary: One More Challenge for Regulators' (2017) 21(2) Journal of Internet Law 9, 10.
[16] Sophie Nappert, 'Twenty first century arbitration: The question of trust' (SSRN 2021) <https://ssrn.com/abstract=3956155> accessed 6 August 2024.
[17] Mattis Jacobs, 'How Implicit Assumptions on the Nature of Trust Shape the Understanding of the Blockchain Technology' (2021) 34(3) Philosophy & Technology 573.
[18] Thomas Schulz, 'Does Online Dispute Resolution Need Governmental Intervention – The Case for Architectures of Control and Trust' (2004) 6(1) North Carolina JOLT 71, 77; Abedi and others (n 11) 215.

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BUILDING TRUST: BLOCKCHAIN AND DECENTRALIZED LEDGER TECHNOLOGY

A sound dispute resolution mechanism is an essential tool for sustaining trust in any market. Blockchain has been marketed as a structure that alters our need to trust in the counterparty or the intermediary, with trust in the technology. Section 2.1 discusses the trust, its components, and how it relates to fairness and BDR. Section 2.2 draws attention to the working mechanism of blockchain, its vulnerabilities, and how it establishes trust through technology. Section 2.3 further delves into the types of blockchain and BDR to explain the importance of fairness in the system, the requirement of governance to ensure procedural fairness, and the challenges that the blockchain creates.

Interpreting components of trust for ODR

ODR has been seen as an essential forum for addressing the booming e-commerce disputes.[19] The ODR has become an alternative to courts throughout the years and gained wide use in 'civil, commercial and family disputes' alongside e-commerce disputes.[20] As blockchain transactions like trading digital assets such as cryptocurrencies, non-fungible tokens (NFTs), and digital identities have increased, a dispute resolution mechanism native to the blockchain structure, ie, BDR, has been perceived to be essential.[21] Similar to ODR, which was resorted to for traditional disputes as a result of 'a natural evolution' of technology and dispute resolution,[22] BDR is considered to be an appropriate tool for emerging disputes. Such evolution is indeed natural as it derives from the need for a grievance mechanism to fall back on when the transactions do not occur on their expected course.[23]

Among other factors, the availability of ODR in the electronic marketplace increases trust among users.[24] The growth of e-commerce heavily relies on the trust and confidence of stakeholders, which can only be achieved by meeting their legitimate legal expectations.[25] Alongside expectations and confidence, the belief in the system plays a role in understanding the notion of trust.[26] These components had been found in international arbitration but have now shifted their form to an online setting.[27]

This applies to all activities, whether regulated, supervised, legal, or *vice versa*. The Dark Web provides such an example. The Dark Web refers to a part of the Deep Web, which is one of the layers of the Internet next to the Surface Web. The Surface Web consists of sites that are accessible via traditional search engines; the Deep Web includes sites that are not indexed on traditional search engines and contain 'private intranets' or 'commercial databases like LexisNexis and Westlaw'.[28] The Dark Web is intentionally hidden and can be accessed via special software. The Dark Web is being used for various legal and illegal activities by those who wish to minimize the risk of detection.[29] It has been reported that the Dark Web has a

[19] Frank E Sanders and Stephan B Goldberg, 'Fitting the Forum to the Fuss: A User-Friendly Guide to Selecting ADR Procedure' (1994) 10 NegJ 49.
[20] Ebner and Zeleznikow (n 12) 144.
[21] Janet K Martinez, 'Designing Online Dispute Resolution' (2020) 1 JDR 135, 136; Scott A McKinney and others, 'Smart Contracts, Blockchain, and the Next Frontier of Transactional Law' (2018) 13 WashJLTech&Arts 313, 331.
[22] Ebner and Zeleznikow (n 12) 146.
[23] Rule and Friedberg (n 4) 202.
[24] ibid.
[25] Pablo Cortés, *Online Dispute Resolution for Consumers in the European Union* (Routledge 2011) 17.
[26] Nappert (n 16).
[27] ibid.
[28] Kristin Finklea, 'Dark Web' (*Congressional Research Service*, 10.03.2017) 2, 3 <https://a51.nl/sites/default/files/pdf/R44101%20(1).pdf> accessed 6 October 2024.
[29] ibid.

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BDR mechanism to resolve the disputes arising between its users.[30] The users in need of their own court on the Dark Web is evidence of the potential trust that BDR can establish within a community of strangers that do not have other identification or trust mechanisms.

In other words, in our transactions, we need a system to rely upon in case of a problem. Despite among strangers and regardless of the medium or the nature of the exchange, we feel that transacting within a community is secure as we expect 'regular, honest and cooperative behaviour'.[31] This is because the communities create a social context.[32] This social context helps us to rely on other's reputations for future transactions.[33] Communication is the key element to spreading the word and building a reputation based on previous actions.[34] In pseudonymous or anonymous environments like cyberspace, reputation tools, ranking systems, media switching, and questions directed at the counterparty are used for communication.[35] Availability of information and records or indications of the success of previous transactions are crucial for trusting the counterparty in an online setting.[36]

Trust has different dimensions in the context of ODR. Trust, alongside fairness and security, is a core element of ODR. The users should trust the neutral and the counterparty, the platform and communications should be secure, and the user should not be concerned that the technological platform is programmed in a way that results in unfairness.[37] BDR operates on a blockchain that relies on cryptographic keys and tamper-proof architecture, which increases trust as a more secure mechanism, especially in a digital era when individuals are concerned with data protection, privacy, and confidentiality, and digital platforms are under strict obligations.[38]

There have been some efforts to define and measure the trust in ODR universally to increase fairness and consistency.[39] ODR itself can be the apparatus to increase the trust in the system, which means that if there is an appropriate dispute resolution, there will be more users willing to transact within that structure.[40] However, more is needed. The users should be convinced that the technology used in ODR is benevolently designed or neutral.[41] There should be trust among the conflicting parties, as well as between the parties and the neutrals.[42] Similarly, in an e-commerce setting, trust has three aspects: *the ability* of the site to conduct the expected actions, *the integrity* of the site that will act in an honest, reliable, and credible manner, *and benevolence* by the trusted site with the intent of doing good.[43] All in all, trust in an ODR mechanism depends on the availability of knowledge about the process or its transparency, the expectations of the users, and the codes of ethics adopted within the structure.[44]

[30] Pablo Cortés, 'Dispute Resolution in the Dark Web' in F Kongoli, H Carter, Y Hayakawa, B Jedlickova, M McNeil, M Nolan, ES Pana, D Shanley (eds) (*Sustainable Industrial Processing Summit Volume 3 Dibra Intl. Symp/Laws & Their Applications*, 2024).
[31] Francis Fukuyama, Trust: The Social Virtues and the Creation of Prosperity (Hamish Hamilton 1995) 26.
[32] Schulz (n 18) 83.
[33] Schulz (n 18) 82; Daniel B Ferreira and others, 'Arbitration Chambers and Trust in Technology Provider: Impacts of Trust in Technology Intermediated Dispute Resolution Proceedings' (2022) 68 TechSoc 1, 2.
[34] Schulz (n 18) 82.
[35] Monica Whitty and Adam N Joinson, *Truth, Lies and Trust on the Internet* (Routledge 2009) 101.
[36] Hanriot (n 6).
[37] Ebner and Zeleznikow (n 12) 2.
[38] ibid 155.
[39] Abedi and others (n 11) 211.
[40] Ebner and Zeleznikow (n 12) 155.
[41] ibid.
[42] ibid.
[43] Whitty and Joinson (n 35) 98.
[44] Abedi and others (n 11) 237.

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Regarding BDR, whether a platform is benevolently designed to promote neutrality, which is related to the elements of procedural fairness such as independence and impartiality, depends on the implementation of technology and cryptoeconomics. The users also need to trust that the outcome results from a fair process.[45] Trust in technology is crucial to render an award in accordance with due process and fairness.[46] Finally, the outcomes should be enforceable to increase trust.[47] Smart contracts, in this respect, fill an important gap by automating the execution of outcomes, but smart contracts should also be aligned with the elements of due process requiring governance solutions, as discussed in Section 3. The next sub-section addresses the interplay between the idea of trust (or lack thereof in blockchain systems) and the fairness of an ODR mechanism.

Relationship between blockchain's mechanism and trust

Building trust in the structure requires the establishment of mechanisms such as governance, regulations, and reputation-building tools. This is done by exerting control over the architecture.[48] Central and vital establishments may be easier to trust as they accumulate knowledge, create and enforce rules, and adjudicate disputes.[49] With this respect, traditional dispute resolution, which is conducted or supervised by a central authority such as state courts, provides procedural rules that are known to parties in advance and a certain level of precedence that increases the foreseeability of the process.

Nevertheless, the central bodies are expensive and are open to abuse.[50] Regarding ODR, it is not easy to establish trust, even though it is less formal and more flexible than court litigation. It is argued that for trust in ODR, there should be a way to ensure communication among the users and develop a history of transactions to consult.[51] Such history must certify the consistent behaviour and integrity of transactions, showing that the previous transactions were unchanged.[52] Blockchain may satisfy these cravings while limiting the intervention from central authorities that would abuse the process.

Blockchain is 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, including any trusted authority such as banks, courts, and registries, to eliminate the negative impacts of central power.[53] Distributed ledgers that are referred to as the 'technology of decentralization' hold a copy of the same information around the globe and update the ledger when a piece of new information is added.[54] Decentralized systems do not require an intermediary or a central governing body to validate or conduct the transactions.

Blockchain technology was initially recognized through a payment system named Bitcoin and introduced by pseudonymous Satoshi Nakamoto's white paper.[55] Bitcoin is the first

[45] Ebner and Zeleznikow (n 12) 156.
[46] Ferreira and others (n 33) 2.
[47] Cortés, *Online Dispute Resolution* (n 25) 83.
[48] Schulz (n 18) 83.
[49] Sinclair Davidson, Primavera De Filippi and Jason Potts, 'Economics of Blockchain' (Public Choice Conference, May 2016, No 1-24) 3 <https://hal.archives-ouvertes.fr/hal-01382002> accessed 2 January 2024.
[50] ibid 3.
[51] Colin Rule, *Online Dispute Resolution for Business: B2B, E-Commerce, Consumer, Employment, Insurance, and Other Commercial Conflicts* (Jossey-Bass 2002) 105.
[52] Ioanna Danidou, 'Trusted Computing or Trust in Computing? Legislating for Trust Networks' (PhD Thesis University of Edinburgh 2015) 65.
[53] See Maxime Chevalier, 'From Smart Contract Litigation to Blockchain Arbitration, a New Decentralized Approach Leading Towards the Blockchain Arbitral Order' (2021) 12(4) JIDS 558, 558.
[54] See Davidson and others (n 49) 670.
[55] Satoshi Nakamoto, 'A Peer-to-Peer Electronic Cash System' (*Bitcoin*, 2008) <https://bitcoin.org/bitcoin.pdf> accessed 20 September 2024.

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example of a cryptocurrency that works without an intermediary or a central financial body. Over the years, many other cryptocurrencies have been developed using varying protocols. However, the potential of blockchain technology is far beyond cryptocurrencies.[56] Blockchain is used in processes requiring validation and record-keeping, such as know-your-customer procedures[57] and education information (for instance, diplomas and transcripts).[58] Other uses include increasing security in the supply chain,[59] transfer of smart properties,[60] capital markets, and securities servicing,[61] validating evidence submitted to a court,[62] verification of court judgments for cross-border enforcement,[63] and resolving disputes and automatically executing them through BDR without the need to resort to judicial authorities.

Central authorities that ensure cooperation through negotiation, litigation, enforcement or coercive means per established rules and regulations aim to substitute the trust with legal tools, increasing the transaction costs.[64] Nakamoto's article discusses that the need for trust in an intermediary should be replaced by cryptography to allow parties to transact directly with each other, reducing transaction costs and allowing both 'small casual' and big transactions.[65] The primary purpose of Nakamoto's system was to prevent double-spending in a decentralized way without a trusted third party.[66] In computer science, the double-spending problem is referred to as the Byzantine Generals' problem,[67] which asks whether it is possible to reach a consensus among decentralized and distributed participants (computers or nodes) without any central authority's verification.[68] In this hypothetical problem, the core issue is that several Byzantine generals are surrounding a city and need to agree on whether to attack or retreat. They can only communicate through messengers, but some of the generals are traitors, and the exact number or identity of these traitors is unknown. For the loyal generals to succeed, they must have a majority over the traitors. The solution that Nakamoto came up with to this problem was to 'publicly announce' all transactions and a mechanism where all nodes can agree on the exact history of transactions.[69] Therefore, on blockchain, the data are time-stamped, indicating that they existed at a certain point in time, and their hash, which is a fixed-length function securing the contained information, is published.[70] A previous timestamp is included in the hash of the next one.[71] This forms a chain of blocked information.

[56] Charlotte Ducuing, 'How to Make Sure My Cryptokitties Are Here Forever? The Complementary Roles of Blockchain and the Law to Bring Trust' (2019) 10(2) EJRR 315, 315; Davidson and others (n 49) 2.
[57] Pradnya Patil and M Sangeetha, 'Blockchain-based Decentralized KYC Verification Framework for Banks' (2022) 215 Procedia Computer Science 529, 529.
[58] Massachusetts Institute of Technology, '*Registrar office - Digital diplomas*. Massachusetts Institute of Technology' <https://registrar.mit.edu/transcripts-records/diplomas/digital-diplomas> accessed 2 August 2024.
[59] Vishal Gaur and Abhinav Gaiha, 'Building a Transparent Supply-Chain' (May–June 2020) HarvBusRev <https://hbr.org/2020/05/building-a-transparent-supply-chain> accessed 26 October 2024.
[60] Goran Sladić and others, 'A Blockchain Solution for Securing Real Property Transactions: A Case Study for Serbia' (2021) 10(1) ISPRS Int'lJGeo-Inf 35.
[61] Oliver Wyman and Euroclear, 'Blockchain and Capital Markets: The Prize and the Journey' (*OliverWyman*, February 2016) <https://www.oliverwyman.com/content/dam/oliver-wyman/global/en/2016/feb/BlockChain-In-Capital-Markets.pdf> accessed 26 October 2024.
[62] China Supreme Court, Judicial Interpretation [2018] No 16 (7.09.2018) <https://www.court.gov.cn/zixun-xiangqing-116981.html> accessed 14 October 2024.
[63] DiFC, 'Courts of Blockchain' <www.courtsofthefuture.org/#courts-of-blockchain> accessed 14 October 2024.
[64] Fukuyama (n 31) 27.
[65] Nakamoto (n 55).
[66] ibid.
[67] Davidson and others (n 49) 2.
[68] 'Byzantine Generals' Problem' (*CoinMarketCap*) <https://coinmarketcap.com/alexandria/glossary/byzantine-generals-problem> accessed 2 January 2024.
[69] Nakamoto (n 55).
[70] ibid.
[71] ibid.

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To explain further, when a party initiates a transaction, it is cryptographically represented as a block of information. The transaction is broadcast to all nodes, and new transactions are added to a block by each node. Each node or participant works on solving the proof-of-work. Proof-of-work is a consensus mechanism that is an 'extensive guessing and checking' puzzle conducted by the participants.[72] Participants (nodes) race against each other to solve this puzzle to get the reward.[73] The node solving the puzzle broadcasts the block to all nodes. The nodes verify whether all transactions in the block are valid and have not been previously spent, and then approve the block based on that. This approval is demonstrated by the nodes beginning to work on adding the next block, utilizing the information from the approved block. Essentially, the nodes achieve consensus, allowing the chain's data to be updated by adding new blocks once at least 51 per cent of the nodes approve.[74] The process is considered to be democratic because a majority decision is needed to add a new block.

Modifying or tampering with older blocks becomes more complicated when new blocks are added.[75] This enables users to trust the old information that is transparently published on the chain. If there are any conflicts about the new block, established rules, or the protocol, decide whether or not to add the next block.[76] Thus, the mechanism ensures communication and builds a link for them to trust the information to proceed with their transactions. However, immutability is not absolute, as the blockchain can be altered by the developers or the majority of nodes by changing the protocol, ie, forking.[77] Hence, immutability is criticized for creating false confidence in the technology, as there is an option to update the chain.[78] This has been the case in the so-called decentralized autonomous organization (DAO) attack on Ethereum, after which there was a hard fork.[79] Although some users did not switch to the new version, the possibility of meddling with the blockchain structure raised concerns regarding the trustworthiness of the system with respect to its complete decentralization and democracy.[80] Since then, there have been several forks in Ethereum's history.[81]

The nodes that are computing to add the blocks get rewards in the form of transaction fees or as the created (mined) coin. The system envisions that the incentives or rewards allow nodes to stay honest.[82] Another consensus mechanism, proof-of-stake, requires users to invest in cryptocurrencies, and the possibility of adding a new block is linked to the amount of staked cryptocurrency; in the end, the users receive transaction fees.[83] The incentivization structure is based on game theory principles.

This mechanism of blockchain supports trust in several ways. First, it creates a log of past transactions that people may rely upon. As described above, people trust each other based on past experiences or the reputation built within society. Being a member of a community increases trust as others believe that their member will behave in accordance with the

[72] European Securities and Markets Authority [ESMA], 'Advice: Initial Coin Offerings and Crypto-Assets' ESMA50-157-1391 (9.01.2019) 42.
[73] ibid.
[74] Primavera De Filippi, Samer Hassan, 'Blockchain Technology as a Regulatory Technology: From Code is Law to Law is Code' (2016) 21(12) First Monday.
[75] Dylan Yaga and others, 'Blockchain Technology Overview' NISTIR 8202 (2019) 1.
[76] Nakamoto (n 55).
[77] Werbach (n 13) 104.
[78] ibid.
[79] Ethereum, 'The History of Ethereum' (14.05.2025) <https://ethereum.org/en/history/> accessed 30 May 2025.
[80] B Arruñada, L Garicano, 'Blockchain: the Birth of Decentralized Governance' (2016) Econ Work Pap Ser 1608, Universitat Pompeu Fabra.
[81] Ethereum (n 79).
[82] Nakamoto (n 55).
[83] Yaga and others (n 75) 21. Note that there are other consensus mechanisms that have not been explored further in this article.

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established norms.[84] In the blockchain context, the participants are anonymous and come from different backgrounds. Users do not necessarily know their counterparts when they make transactions.[85] However, with the explained mechanism and the cryptographic keys, blockchain allows a large number of strangers to transact with each other by eliminating the need to trust the counterparties or institutions.[86] As a result, the users trust the technology[87] or the computation.[88] The use of entrusted technology for dispute resolution is helpful to deal with the issues created by anonymity in other online applications where there are no grounds to establish trust.

Trusting the technology also promotes decentralization and is considered the goal of blockchain.[89] On the other hand, neither democratization by game theory principles nor decentralization is sufficient to ensure trust in a blockchain-based system such as a BDR platform.[90] There are other actors, such as programmers, crypto exchanges, experts, and entrepreneurs, who should be counted in building trust.[91] This becomes apparent with the aforementioned forking exercise and the developers' decisions regarding the platform's structure. Within the context of BDR, this includes the designer of the platforms, which may or may not reach a certain level of quality that disputants would otherwise have before traditional fora. The following sub-section delves further into the blockchain and its relation to trust in a dispute resolution system.

Impact of blockchain in establishing trust in BDR

The incentive mechanism in the consensus models is also relied upon by many other blockchain applications, including the BDR platforms. As an application of blockchain, BDR is built on the idea that strangers will trust the system because honesty will be reached through incentives, participants will be anonymous (so there is no bias), and information will be updated globally and kept secure through cryptography. The majority consensus is to add new information and confirm the previous transactions, which is the working mechanism of the crowdsourced BDR, one of the procedures offered by BDR platforms. In crowdsourced BDR, anonymous people who wish to act as jurors come together on a blockchain platform. Each juror stakes cryptocurrencies to be selected as part of the crowd that will decide the dispute. The jurors are asked a yes or no question, and they are incentivized to decide what the majority of the jurors will vote. If they can vote coherently with the majority, they get their initial stake back and an additional reward that is split among the winning jurors. They do not apply law or expertise but merely try to reach the outcome through game theory principles as per the platform's design. Kleros and Aragon are examples of platforms offering crowdsourced BDR.[92]

Off-chain international arbitration succeeded because the confidence and trust confided in the system met the stakeholders' expectations. The trust and confidence were generated by the

[84] Schulz (n 18) 7.
[85] Wulf A Kaal and Craig Calcaterra, 'Crypto Transaction Dispute Resolution' (Winter 2017-2018) 73(1) The Business Lawyer 109, 111.
[86] De Filippi and Hassan (n 74); Michéle Finck, *Blockchain Regulation and Governance in Europe* (CUP 2018).
[87] See Finck (n 86).
[88] Marcella Atzori, 'Blockchain Technology and Decentralized Governance: Is the State Still Necessary?' 6(1) Journal of Governance and Regulation 45, 46.
[89] Ducuing (n 56) 316.
[90] Jacobs (n 17) 580.
[91] ibid.
[92] Clément Lesaege, William George and Federico Ast, 'Long Paper v.2.0.2' (*Kleros*, 2021) <https://kleros.io/static/yellowpaper_en-8ac96b06f39f19a6a28106cf624e3342.pdf> accessed 30 May 2025; Aragon, 'Aragon Court' <https://legacy-docs.aragon.org/products/aragon-court> accessed 30 May 2025.

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belief that the processes were 'firmly anchored in due process and procedural fairness'.[93] This confidence is also 'crucial for building trust in the blockchain-based economic environment', which requires the 'ability to render fair decisions'.[94] Therefore, the trust will be geared towards procedural fairness and fair outcomes. Whether the outcomes of the BDR procedures will be substantively fair requires empirical study, and currently, we need more data to reach any conclusions, and this article leaves it for a future study.

Regarding procedural fairness, particularly the objective procedural and due process rights, BDR has its shortcomings. Although the need for trust in third parties is eliminated by blockchain, the need for trust in the blockchain architecture remains.[95] This means that users still need to trust that the blockchain works fairly and according to the law. For BDR, the reflection of this concern is ensuring procedural fairness. A set of legal requirements for fair procedures needs to be attached to BDR platforms through governance strategies.[96] This depends on the implementation of the technology and its impact on the users. The types of blockchain are also important in identifying the users and governance models needed to resolve these problems.

A public (permissionless) blockchain, such as Bitcoin, allows anyone to read, transact, and validate the blocks.[97] In a public blockchain, anyone can review the protocol because it depends on open-source collaboration, and nobody owns the network.[98] A public blockchain is considered to be truly decentralized.[99] On the other hand, a private blockchain (permissioned) is controlled by an organization and is considered a new method of internal bookkeeping.[100] Permissioned blockchain participants may collude and tamper with the blockchain, harming others.[101] The type of blockchain also impacts determining the legal obligations the platform needs to comply with.[102] Some permissioned blockchains operate among authorized, non-anonymous users and enable the detection of the location of incorporation, as well as the available legal remedies and procedures within that judicial system.[103]

The dispute resolution platforms on blockchain utilize both methods depending on the processes they offer. For instance, Kleros, although it has not yet fully delegated governance decisions to its users, provides an open-source platform and is a public blockchain, whereas SmartJustice, which was open to the users of the BANKEX payment system, could be described as a private one. This means that a BDR platform on a private blockchain could mostly resolve consumer disputes arising due to the use of a specific service and have a central point of contact to determine the rules of conduct. In contrast, a BDR platform on a public blockchain may attract consumer and/or commercial disputes and be more difficult to govern as a decentralized community adopts its rules. The risks of forking and developers' design choices remain for the public blockchain. Kleros specifically addresses this issue and considers that the ability to fork adds a layer of protection in case of an attack.[104] Any rule or governance

[93] Nappert (n 16).
[94] Guillaume and Riva (n 5) 631.
[95] Ducuing (n 56) 321.
[96] Gabriela Cosio Patino, '*Lex Cryptographia* Guidelines for Ensuring due Process in Transnational Blockchain-Based Arbitration: Study on the Kleros Model' (2022) 5 TDM 38.
[97] McKinney and others (n 21) 320.
[98] Atzori (n 88) 47; Ducuing (n 56) 322.
[99] McKinney and others (n 21) 320.
[100] ibid.
[101] Primavera De Filippi and Aaron Wright, *Blockchain and the Law: The Rule of Code* (Harvard University Press 2018) 32.
[102] European Law Institute (ELI), 'Principles on Blockchain Technology, Smart Contracts and Consumer Protection' (2022) ["ELI Principles"], Principle 3, Explanatory Note.
[103] Yaga and others (n 75) 6.
[104] Kleros, 'Dispute Revolution: The Kleros Handbook of Decentralized Justice' <https://blog.kleros.io/content/files/ipfs/QmZeV32S2VoyUnqJsRRCh75F1fP2AeomVq2Ury2fTt9V4z/dispute-resolution-kleros.pdf> accessed 30 May 2025.

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model should consider the type of blockchain, as it defines the users, applicable rules, and procedural guarantees to adjust the level of trust.

ENHANCING TRUST: SMART CONTRACTS AND AUTOMATIC EXECUTION

A smart contract is an element that makes BDR unique, as it triggers the dispute resolution process and executes the outcomes. Increased enforceability gains more trust from the users. Traditionally, the agreements for an alternative or online dispute resolution (ADR/ODR) mechanism that restricts an individual's access to courts are subject to certain requirements. This means that smart contracts must be coded with fundamental fairness concerns in mind. To facilitate further arguments on the legal implications of coding ODR/BDR agreements on smart contracts, Section 3.1 explains the technical aspects of smart contracts and how they assist in establishing trust by automating enforcement. Section 3.2 focuses on smart legal contracts (SLC), their difference from traditional contracts, and their dissonance with current legal rules.

Smart contract: automating the trust

Smart contracts have been reintroduced by blockchain architectures developed after Bitcoin, such as Ethereum.[105] Originally, smart contracts aimed to code the contracts to eliminate the need for trust and ensure self-enforcement.[106] As envisioned by Szabo, smart contracts would increase efficiency and remove textual ambiguity.[107] Some examples of early, non-blockchain smart contracts include vending machines, telecom providers locking phones, and automated speed limits in cars.[108]

A modern, re-defined smart contract is self-executing code that automatically performs functions.[109] These functions are protocols or 'snippets of code' that work on a blockchain and are employed by nodes in the network in a decentralized way.[110] The code itself is called a 'contract' and works on an 'if' and 'then' basis.[111] Once the conditions of the code are met, the contract enforces itself without any additional steps. Smart contracts do not require third parties to validate, facilitate, or enforce a contract.[112] Smart contracts on the blockchain allow parties to be certain that the other party will not change the conditions since the blockchain is tamper-resistant.[113] As envisioned by Szabo, they are useful in reducing the negotiation, validation, and enforcement costs and increasing the performance of the contracts.[114] They are considered useful, particularly for cross-border transactions, as they ensure self-enforcement without trusting the other party.[115] For instance, smart contracts are used in day-to-day cross-border payment systems.[116]

[105] Vitalik Buterin and others, 'Ethereum: A Next-Generation Smart Contract and Decentralized Application Platform' (*Ethereum* 2014) <https://ethereum.org/content/whitepaper/whitepaper-pdf/Ethereum_Whitepaper_-_Buterin_2014.pdf> 21.08.2024.

[106] Nick Szabo, 'Smart Contracts: Building Blocks for Digital Markets' (1996) 18(2) EXTROPY: The Journal of Transhumanist Thought 28.

[107] De Filippi and Hassan (n 74); Aaron Wright and Primavera De Filippi, '*Decentralized Blockchain Technology and the Rise of lex cryptographia*' (SSRN 2015) 25.

[108] De Filippi and Hassan (n 74).

[109] Garrick Hileman and Michel Rauchs, '2017 Global Blockchain Benchmarking Study' (*Cambridge Centre for Alternative Finance* 22.09.2017) 11.

[110] De Filippi and Hassan (n 74).

[111] McKinney and others (n 21) 324.

[112] De Filippi and Hassan (n 74); Crypto-Currency Act of 2020, H.R.6154, 116th Cong. Section (2), 10 (2020).

[113] McKinney and others (n 21) 317.

[114] De Filippi and Hassan (n 74).

[115] McKinney and others (n 21) 316.

[116] Marcos Allende Lopéz and Antonio Leal Batista, 'Cross-border Payments with Blockchain' (Inter-American Development Bank 2021).

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Ethereum is the best-known blockchain architecture that allows smart contracts to code any type of business logic, making it attractive 'in all industries and subject areas'.[117] Smart contracts can be combined as a DAO[118] to interact with each other and also with humans.[119] DAOs are open-source, fully autonomous, decentralized mechanisms that can be changed only by the consensus of their users.[120] It uses cryptography to store the data, incentivize the users, and prove the value of the node's contribution.[121] BDR platforms such as Kleros, Aragon and Jur are established as DAOs on blockchain that automate the procedure.[122]

Smart contracts and DAOs need 'interfaces or sensors', namely oracles, to interact with the physical world.[123] Oracles allow the introduction of real-world information to the blockchain.[124] If smart contracts execute without any interaction with the real world or lack information through oracles,[125] the agreement will be enforced regardless.[126] This is key to the digitalization of legal transactions as blockchain needs to engage with the physical world both to function and be truly impactful. For instance, exchanging a digital asset such as a cryptocurrency like Bitcoin or Ether could easily be carried out without a real-world interaction, whereas conducting a real estate transaction on a blockchain would be challenging.[127] The availability of information was one of the obstacles before the digitalization of traditional transactions through smart contracts. The other one is the so-called oracle problem, which refers to a lack of insurance about the trustfulness of the information coming from the physical world. Therefore, the source of the information retrieved into smart contracts is another intermediary that requires the user's or the coder's trust.

A smart contract, as a piece of code, may include legal agreements; however, this may not always be the case. Smart contracts may act as a means to automate the execution of legal agreements that exist off-chain; they may constitute a legally binding offer or acceptance or a binding agreement; they may co-exist with an off-chain agreement.[128] Smart contracts containing legally binding agreements defining some or all of the legal obligations and allowing a computer program to perform these obligations automatically are called SLCs.[129]

A smart contract would include a simple and direct code saying what will happen if a condition occurs, such as in the case of a legal agreement for the performance of services. The code replaces the 'relationships and contractual security' in promoting trust.[130] For instance, if Alice is to pay Bitcoin in exchange for Bob's development of her website, the funds will be released to Bob upon his performance. The smart contract itself cannot evaluate whether the website is as expected or within acceptable standards. Hence, self-execution will no longer be an advantage and even cause disputes to be resolved in accordance with contract law principles.

[117] Kaal and Calcaterra (n 85) 111.
[118] De Filippi and Hassan (n 74).
[119] McKinney and others (n 21) 316.
[120] Philip Boucher, 'How blockchain technology could change our lives' (*European Parliamentary Research Service* 2017) 20 <https://op.europa.eu/en/publication-detail/-/publication/9964fbfd-6141-11e7-8dc1-01aa75ed71a1> accessed 8 January 2025; Ducuing (n 56) 318.
[121] ibid.
[122] Federico Ast and Bruno Deffains, 'When Online Dispute Resolution Meets Blockchain: The Birth of Decentralized Justice' (2021) 4(2) Stanford Journal of Blockchain Law and Policy.
[123] De Filippi and Hassan (n 74).
[124] De Filippi and Hassan (n 74); Chevalier (n 53) 559.
[125] De Filippi and Hassan (n 74); Kaal and Calcaterra (n 85) 111.
[126] Jeff Lingwall, 'Should Code Be Law: Smart Contracts, Blockchain and Boilerplate' (2019) 88 (2) UMKCLRev 285, 294.
[127] ibid 289.
[128] ELI Principles (n 102) Principle 2; Lingwall (n 126) 299.
[129] UK Law Commission, 'Smart Legal Contracts: Advice to Government' (November 2011) No 401 ["SLC Advice"] 11.
[130] Martinez (n 21) 138.

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The legal rules are much more flexible, leaving gaps to cover many other circumstances 'that might not have been precisely foreseen'; therefore, they are not easily transcribed as code.[131] Smart contracts require formal and direct formulation to address exact scenarios in advance.[132] Consequently, smart contracts, for the time being, are considered less suitable to encode imperfect (incomplete) contracts rather than complete contracts.

For a contract to be complete, all possible contingencies that may arise must be foreseen and described, must be identified after they occur, and parties should be able to respond to these contingencies effectively.[133] These conditions are difficult to satisfy, making all traditional contracts incomplete.[134] Incomplete contracts raise transaction costs due to uncertainty, unforeseen circumstances, and drafting and enforcing contracts.[135] Smart contracts would decrease the transaction costs related to incomplete contracts by decreasing information asymmetry (hence increasing certainty) and drafting costs.[136] They could largely eliminate opportunistic behaviour.[137] Increased certainty and elimination of such behaviours would, in return, increase trust.

On the other hand, smart contracts may also add to the incompleteness of the contracts.[138] This is because foreseeing contingencies is impossible; linguistic limitations and ambiguous contractual wording are difficult to reflect in a code; observing outcomes when the contingencies occur is a challenge; parties cannot decide every possible course of action for each contingency in a code, and there are no strict incentives for compliance.[139] Smart contracts, hence, may not reflect real-world contracting and could better work to avoid ambiguities and boilerplate provisions created in long-distance contracting, where parties are not at arm's distance or able to negotiate the terms properly.[140]

SLCs can take three main forms. It may include a code only for automation of the performance of a separate contract in natural language, it may contain all contractual obligations defined in the code without any natural language contract, or it may be a hybrid containing obligations both in code and natural language, or comments in natural language attached to the code that defines the obligations.[141] All three forms of SLC are currently used, with the possibility that hybrid contracts will become more prevalent.[142]

The hybrid SLC can be achieved by Ricardian contracts. A Ricardian contract serves as an interface that transforms a natural language document into a format that computers can understand.[143] Enhancing Ricardian contracts and their connection to real-world applications could resolve interpretation issues and the challenges posed by the inflexibility and constraints of code.[144] For example, the blockchain platform Mattereum seeks to use Ricardian contracts

[131] De Filippi and Hassan (n 74); Wright and De Filippi (n 107) 25.
[132] De Filippi and Hassan (n 74).
[133] Kristen L Howell and Ernest E Badway, 'Arbitrating in the Cyber World of Cryptocurrency and Blockchain Regimes' (2019) 74 (4) DispResJ 75.
[134] BE Howell and PH Potgieter, 'Governance of smart contracts in blockchain institutions' in *Blockchain: Innovation in Distributed Governance in the Cryptosphere* (Workshop on the Ostrom Workshop (WOW6) Conference, Indiana University Bloomington 2019) 3-4.
[135] Davidson and others (n 49) 9; Howell and Potgieter (n 134) 4.
[136] Davidson and others (n 49) 9; Lingwall (n 126) 286.
[137] Davidson and others (n 49) 9; Howell and Potgieter (n 134) 4.
[138] Howell and Potgieter (n 134) 3-4.
[139] ibid 4-5.
[140] Lingwall (n 126) 308.
[141] UK Law Commission (n 129) 22; ELI Principles (n 102) Principle (2)(a)2-4.
[142] UK Law Commission (n 129) 30.
[143] Ian Grigg, 'The Ricardian Contract' (*iang.org*) <https://iang.org/papers/ricardian_contract.html> accessed 14 January 2024.
[144] James Metzger, 'The current landscape of blockchain-based, crowdsourced arbitration' (2019) 19 Macquarie Law Journal 81.

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to create an interface for property transfers on blockchain.[145] Thus, Ricardian contracts can potentially bridge the gap between traditional and smart contracts.

Smart contracts, due to their features automating the transactions, were expected to take over the place of traditional contracting and particularly become mainstream in financial services.[146] This has not been realised because of the legal uncertainty in relation to the legal enforceability of code provisions, interpretation of the terms, and parties' option to recourse in an undesired situation.[147] These concerns signal the need for a 'legal foundation' and dispute resolution mechanism that can create a dependable market[148] or, in other words, aid in establishing trust in the system.

Automatic execution through SLCs and challenges to fairness

Most ODR procedures require the losing party to comply with the outcome of the process voluntarily. Execution or imposing outcomes without waiting for voluntary compliance would increase trust in the ODR mechanism and the market.[149] Therefore, agreeing to a BDR process that issues a final, binding, and self-enforced decision may allow for fast and satisfactory dispute resolution. Outcomes that are automatically executed through smart contracts can be seen as an opportunity to effectively remedy the winning party, especially when the parties are satisfied with the result and the process. Automatic execution could also be a problem. Immediate enforcement may violate the fundamental rights of the debtor as automatic enforcement does not require guarantees such as attachment or asset forfeiture from the creditor during the enforcement phase.[150]

Self-enforcing BDR decisions may lack fairness in terms of 'formal due-process' requirements.[151] The marginalization of states comes to the fore as it is pointed out that states try to balance enforcement and the protection of debtors' rights.[152] The enforcement and recognition procedures act as a guarantor of procedural rights in off-chain mechanisms. The state's audit over fairness is bypassed through private enforcement.[153] Self-enforcement and consenting to dispute resolution do not automatically bring fairness or provide support for 'formal due process standards.'[154]

Despite self-enforcement, the legal standing of the BDR outcomes depends on the process. They could be contractually binding or binding as an arbitral award. This creates questions with respect to the recognition of BDR outcomes before the courts, the legal standing of the outcomes, and the possibility of *res judicata* effect. It is emphasized that there is a need for recognition by state courts to give *res judicata* effect to blockchain arbitration, essential state involvement for interpretation when there is a defective contract, interim measures during blockchain arbitration, and scrutiny for public policy considerations.[155] When the

[145] ibid.
[146] Geoffrey Vos, 'End-to-End Smart Legal Contracts: Moving from Aspiration to Reality' in Jason Allen, and Peter Hunn (eds), *Smart Legal Contracts: Computable Law in Theory and Practice* (OUP 2022) 56.
[147] ibid 57.
[148] ibid 56.
[149] Guillaume and Riva (n 5) 601; Riika Koulu, 'Blockchains and Online Dispute Resolution: Smart Contracts as an Alternative to Enforcement' (2016) 13(1) SCRIPTed 40, 90.
[150] Pietro Ortolani, 'The Impact of Blockchain Technologies and Smart Contracts on Dispute Resolution: Arbitration and Court Litigation' (2019) 24 UnifLRev 430, 437.
[151] Riika Koulu and Kalle Markkanen, 'Chapter 19: Conflict Management for Regulation-Averse Blockchains?' in Rosa Maria Ballardini, Petri Kuoppamäki, Olli Pitkänen (eds), *Regulating Industrial Internet Through IPR, Data Protection and Competition Law* (KLI 2019) 21.)
[152] Chevalier (n 53) 579; Ortolani (n 150) 437.
[153] Koulu (n 149) 47.
[154] Koulu and Markkanen (n 151) 21.
[155] Chevalier (n 53) 580.

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unsatisfied parties are not anonymous (for instance, users are not anonymous in some of the processes provided by Juris, CodeLegit, and Rhubarb), and despite the automatic execution, they may want to litigate, arbitrate, or appeal the same dispute. If the legal standing of BDR outcomes is considered to have a *res judicata* effect or even without such legal depiction because of the practical projection of automatic execution as such, the disputes cannot be resolved in court.

In case the parties are not satisfied with the result or consider that the process is not fair, there is no option for the parties to seek redress internally. There is no option for a review process when there is a major due process breach. In some crowdsourced processes, if not all, there is an option for a so-called appeal, which is a repetition of the same process rather than a review of a decision made in the first instance.[156] These appeal processes, which can be repeated for a given number as determined by the providers, allow more jurors to recast votes. The jurors are not directed to consider due process, but rather, they lead to 'fair' outcomes through the implemented code. Confirmation of results may be considered as a manifestation of fairness, but the due process is not scrutinized through these appeal processes either. On top of that, arriving at the same results could also indicate bias in the code that leads to the same outcome regardless of the number of repetitions. Although seeking formal judicial review outside the BDR mechanism is theoretically possible, the automatic execution of outcomes, anonymous parties, lack of courts' expertise, and difficulties of court-blockchain interoperability hamper the enjoyment of this right from technical and practical points of view. Thus, there is a need for a legal formation to ensure trust in the system's fairness. This is addressed in the next section.

NEW RULES FOR TRUSTING BDR

BDR, as a blockchain-based application, may appear to function beyond the control of any central authority. However, as previously discussed, decentralized, distributed, and seemingly democratized structures alone are not enough to ensure trust. In reality, BDR platforms still act as trusted intermediaries, with the nature of intermediation simply shifting onto the blockchain. BDR lacks sufficient elements to inspire trust in the system, particularly due to concerns surrounding fairness.

Despite these mishaps, BDR remains the most practical and effective solution, especially for disputes involving blockchain or cryptocurrencies. While the justice they provide may not align with procedural standards set by states and may not qualify as fair justice in the traditional legal sense, BDR still delivers a form of justice that is fair within the context of cryptoeconomics.[157] Whether this crypto justice satisfies the needs of the users, establishing trust is a matter of further study. However, if BDR platforms can adopt objective measures as a result of governance decisions, there is a greater chance of improving fairness, hence the trust in the system.

The majority perspective calls for some type of control over the ODR mechanisms. On the one hand, rules, which may be established by the platform itself, providing substantive consistency to regulate user behaviour have been found essential to maintain users' trust.[158] On the other hand, there are strong opinions that it should be the government that exerts control on the architecture to 'induce' trust.[159]

[156] Kleros is one of the platforms with repeated 'appeal' structure. Leseage, George and Ast (n 92).
[157] Guillaume and Riva (n 5) 640.
[158] Orna Rabinovich-Einy and Ethan Katsh, 'Lessons from Online Dispute Resolution for Dispute System Design' in M Abdel Wahab, D Rainey and E Katsh (eds.), *Online Dispute Resolution: Theory and Practice* (Eleven International Publishing 2021) 67.
[159] Schulz (n 18) 72.

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The type of control in ODR has some parallels with blockchain governance, which has been a matter of debate, particularly due to the decentralization arguments. Whether rules should come within the blockchain community or should be exerted by an external central authority like a state has been at the centre of that debate. Similarly, the questions raised by the smart contracts and the endeavour to align them with the legal practice created two perspectives. The first one argues that the existing contract law principles are well-suited for smart contracts and do not require any statutory reform. For instance, the Law Commission opines that the legal principles in England and Wales can accommodate even novel legal issues and factual scenarios.[160] European Law Institutes (ELI) Principles takes a similar approach, stating that blockchain transactions are subject to the law that applies to equivalent off-chain acts.[161]

The second perspective posits that new rules seem necessary because although the contract law may 'foster trust in liberal market societies', it does not work the same for the dynamic networks.[162] In case of the contingencies of an incomplete contract, the real world offers solutions such as the opportunity to renegotiate, develop and rely on the reputation of the counterpart, contract law principles, and interpretation to overcome incompleteness, traditional dispute resolution mechanisms like court litigation and arbitration.[163] Smart contracts are not open to renegotiation. Due to the anonymity of the parties on the blockchain, it seems unlikely to build and act upon reputation; the contract law safeguards, and interpretation methods are not available as the smart contracts have a strict code that would already self-execute. In the same vein, it is considered that blockchain will not affect bargaining and negotiation costs, as enforcement costs depend on the extent of human discretion,[164] with the automatic execution enforcement costs may be reduced.

As technology tries to fit real-world contract laws, it is envisioned that laws that are flexible and ambiguous could 'evolve' in a way that better reflects code.[165] That evolvement could be at a national or international level. The first option would not be preferable as smart contracts bring parties from different jurisdictions.[166] International developments can be in the form of conventions, model laws, or amendments to the sources of *lex mercatoria*, such as Principles of International Commercial Contracts (PICC) or Principles of European Contract Law (PECL).[167]

Another option is that smart contracts and the resolution of disputes arising thereof require a fresh set of rules created only for blockchain, namely, *lex cryptographia*.[168] This would be like *lex mercatoria*, 'a semi-independent decentralized enforcement system for exchanges and dispute resolution' created by mediaeval merchants to overcome 'legal inadequacies'.[169] The users would develop the set of rules and operate without any third party's or authority's intervention. This will be mainly caused by the ineffectiveness of blockchain regulation, which will lead to the protection of fundamental rights by the blockchain itself.[170]

[160] UK Law Commission (n 129) 5.
[161] ELI Principles (n 102) Principle 4.
[162] Danidou (n 52) 263.
[163] Howell and Potgieter (n 134) 5-7.
[164] Davidson and others (n 49) 9.
[165] De Filippi and Hassan (n 74).
[166] Nataliia Filatova, 'Smart Contracts from The Contract Law Perspective: Outlining New Regulatory Perspectives' (2020) 28(3) International Journal of Law and Information Technology 217, 242.
[167] ibid.
[168] Wright and De Filippi (n 107) 4; see Chevalier (n 53).
[169] Lingwall (n 126) 292; Alessandro Palombo, Raffaele Battaglini, and Luigi Cantisani, 'A Blockchain-Based Smart Dispute Resolution Method' in Larry A DiMatteo and others (eds), *The Cambridge Handbook of Lawyering in the Digital Age* (CUP 2021).
[170] Thibault Schrepel, 'Anarchy, State and Blockchain Utopia: Rule of Law Versus Lex Cryptographia' (SSRN 2019) 367-368.

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The new type of *lex mercatoria* (namely, *lex cryptographia*) can only develop given that the system is designed to provide a fair process.[171] Widespread adoption of this mechanism requires satisfaction of fundamental due process elements 'enshrined into our shared understanding of the rule of law'.[172] As much as *lex cryptographia* strives for fairness to revive, the other perspective is that *lex cryptographia* can also develop to encapsulate elements of fairness.[173]

We believe that existing legal rules, rights, and values must be balanced with the evolving needs of the community as shaped by technology. While the foundation should come from legal rules or guidelines, they should be adapted to the community's needs, considering the specific characteristics of the technology. Instead of opposing technology, we should focus on understanding its tension points and identifying areas where it can support or enhance trust. Despite the decentralized nature of technology and the radical idea that any external rules might not apply,[174] there are times when a central authority, such as governments or international organizations that already have the trust of users, can intervene to strengthen that trust.

We argue that the intervention of central authorities can play a role in establishing basic rules in the form of soft law or industry standards, and in the long run, hard law, for designing fair procedures *ex ante* and then supervising compliance.[175] At minimum, rules should be established for the smart contract as an ADR agreement, including their validity, interpretation, and applicable rules. Execution of outcomes through smart contracts should be subject to rules to ensure procedural fairness.

Governments and organizations are exploring their regulation strategies for BDR. Mexico has amended its ADR legislation to include decentralized entities that provide dispute resolution.[176] The legislation does not provide comprehensive procedural or substantive rules, but it is progressive in listing BDR among other procedures. UK's Jurisdictional Taskforce has created Digital Dispute Resolution Rules (DDRR), which define a procedure for decentralized dispute resolution, to 'facilitate the rapid and cost-effective resolution of commercial disputes, particularly those involving novel digital technology such as cryptoassets, cryptocurrency, smart contracts, distributed ledger technology, and fintech applications.'[177] DDRR applies if parties have agreed to it in writing and describes an arbitration-like procedure without restricting its applicability to other types of processes. Most importantly, DDRR provides for binding decisions and gives power to the tribunal to 'at any time to operate, modify, sign or cancel any digital asset relevant to the dispute using any digital signature, cryptographic key, password or other digital access or control mechanism available to it. The tribunal shall also have the power to direct any interested party to do any of those things', addressing the main enforcement concerns.[178]

On the other hand, there is no list of criteria for BDR platforms to comply with, although there are provisions—particularly in the EU—for the accreditation and certification of ADR/ODR platforms. Based on the EU example, accreditation requirements also contain certain

[171] Palombo (n 169) 137.
[172] Ast and Deffains (n 122).
[173] Patino (n 96) 25.
[174] Schulz (n 18) 106.
[175] See Cemre C Kadioglu Kumtepe, 'The Need for Governance in Blockchain Dispute Resolution (BDR): Institutional Possibilities Frontier Perspective (IPF)' (2025) International Review of Economics (*forthcoming*) (for discussion on the need for governance structures and detailed examination of regulation strategies from law and economics perspectives).
[176] Camara de Disputados del H Congreso de la Union, Ley General de Mecanismos Alternativos de Solución de Controversias, DOF 26-01-2024 arts 83, 85, 87(iv).
[177] UK Jurisdictional Taskforce, 'Digital Dispute Resolution Rules' (2021) ["DDRR"].
[178] ibid.

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procedural safeguards, including independence and impartiality of decision-makers, reasoned decisions, notification, and transparency requirements.[179] Being accredited and certified may grant the platforms the privilege of being listed on government websites as recognised ADR/ODR mechanisms within the judicial system. BDR platforms can be included in the existing regulation and certification system for consumer ADR and ODR bodies, with adjustments to the criteria considering the features of the technology.

It is not easy to ensure international cooperation in the form of treaties and hard law, given the divergent perspectives towards the blockchain and cryptoassets in different jurisdictions. The discrepancy can be seen between China, which completely bans cryptoassets for payments and Tanzania, which treats cryptoassets as equivalent to its fiat money.[180] There are also differing views on how to categorize the technology and cryptoassets. In this conjuncture, it is difficult to gather states with various agendas around a table. Yet, there are international organizations that try to establish best practices or guidelines in the field.

For instance, the ELI Principles on Blockchain and Smart Contracts offer soft rules to guide users and regulators, treating smart contracts as equivalent to traditional contracts.[181] The International Institute for the Unification of Private Law (UNIDROIT) recommends that national procedural laws be adapted for enforcement procedures involving digital assets.[182] These recommendations include ordering the transfer of the digital asset or enabling access to the asset if the obligee refuses to comply by transferring the password or possession of the digital asset;[183] ordering interim measures and freezing orders, including allowing a public authority the control the asset.[184]

As one of the stakeholders, dispute resolution institutions are coming up with their rules to tackle specific challenges, such as JAMS Smart Contract Draft Rules.[185] Although these are in their infancy, they foreshadow possible developments in the field. Similarly, non-governmental standardization organizations may also bring their expertise to the table. ISO, which already has ODR guidelines,[186] may consider becoming involved in BDR as well, to improve its guidelines and form standards. Based on the framework created in the EU following the digitalization packages with DSA-DMA, regulation of the digital sector will mainly fall upon standardization, guidelines, and codes of conduct.[187] Within this context, stakeholder institutions may want to explore the BDR field, and as a result, compliant platforms may be given trustmarks as a sign of quality and reliability.

Of course, voluntary compliance by BDR platforms remains central to these strategies. BDR platforms need to feel incentivized to meet certain standards. Doing so would build user trust, attract more participants, and create opportunities to collaborate with other online

[179] European Commission Directive (EU) 2013/11 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 [2013] OJL 165/63; DSA (n 1).

[180] 'China Declares All Crypto-currency Transactions Illegal' (*BBC* 24.09.2021) <https://www.bbc.com/news/technology-58678907> accessed 30 May 2025; Robert Hart, 'Tanzania Considers Crypto and Boosts Bitcoin as Nations Line up Behind El Salvador to Embrace Decentralized Finance' (*Forbes*, 14.06.2021) <https://www.forbes.com/sites/roberthart/2021/06/14/tanzania-considers-crypto-and-boosts-bitcoin-as-nations-line-up-behind-el-salvador-to-embrace-decentralized-finance/?sh=64fc2a944fc3> accessed 30 May 2025.

[181] ELI Principles (n 102).

[182] UNIDROIT, 'Draft Principles of Digital Assets and Private Law' (2023) C.D. (102) 6 Principle 18, Commentary.

[183] ibid Principle 18, Comment 18.3, 18.4.

[184] ibid Principle 18, Comment 18.6.

[185] JAMS, 'Smart Contract Clause and Rules (Draft)' <https://www.jamsadr.com/rules-smart-contracts> accessed 30 May 2025 ["SCDR"].

[186] ISO, 'ISO/DIS 32122: Transaction Assurance in E-Commerce - Guidelines for Offering Online Dispute Resolution Services' <https://www.iso.org/standard/84834.html?browse=tc> accessed 30 May 2025.

[187] See, for example, DSA (n 1) 44,45,46,47; DMA (n 2) Articles 47, 48. (Note that these are not specific to dispute resolution but listed to show the perspective towards regulation of digital sector.)

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services in providing dispute resolution. The *lex cryptographia,* as mentioned above, may arise out of the BDR platforms' compliance endeavours.

In the end, while hard rules might ensure stricter compliance, they can also be inefficient, costly, and slow to implement. As it is difficult to foresee the governments' strategies and international cooperation in terms of hard rules, non-governmental stakeholders and soft rules seem like a better starting point. Nonetheless, international cooperation shall not (and cannot) be avoided due to the inherent cross-border nature of the technology. The success of any regulatory framework will depend on BDR platforms' willingness to comply and on user demand. The foundation of such compliance and demand will be the trust built into the platforms—trust that can be strengthened through thoughtful governance strategies.

CONCLUSION

While the literature has consistently identified a lack of trust as a critical challenge in ODR systems, blockchain technology offers promising pathways to address this issue. Known for its role as a 'technology of trust,' blockchain can enhance confidence in ODR systems, particularly in areas like enforcement, transparency, and security. However, trust is multifaceted, and blockchain's impact varies depending on the context. The interplay between ODR and blockchain creates a reinforcing cycle: ODR fosters trust in digital transactions, and blockchain-based ODR (BDR) may increase overall trust in dispute resolution, consequently promoting trust in digital transactions.

This article has explored the key technologies and terminologies surrounding blockchain, ODR, and trust, revealing that features such as smart contracts fill critical gaps in execution and enforcement. Yet, even blockchain and smart contracts are not immune to disputes and lack traditional legal protections. Thus, while blockchain can bolster trust through enhanced security and tamper-proof processes, it falls short in addressing the fairness component, which is central to trust in dispute resolution.

For BDR to be truly effective, its design must prioritize procedural fairness, which should not rely solely on community consensus. Instead, this fairness must be guided by procedural frameworks established by a central authority, whether governmental, international, or industry-specific, considering the features and the uses of the technology. Through robust governance decisions, blockchain-based systems can better address the complexities of trust, ultimately improving the reliability and success of ODR platforms.

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