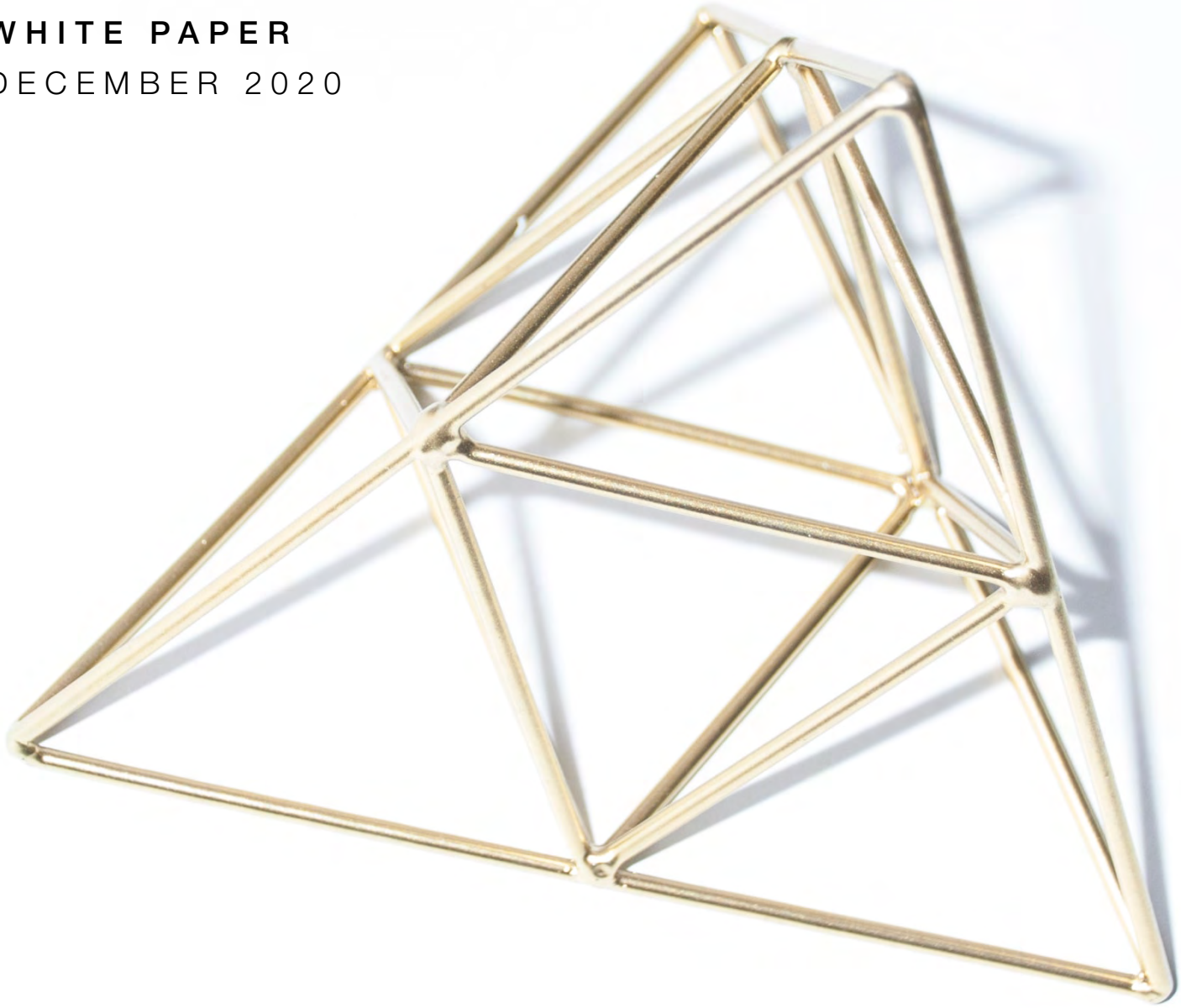
In collaboration with
Latham & Watkins

WORLD ECONOMIC FORUM

Bridging the Governance Gap: Dispute resolution for blockchain-based transactions

WHITE PAPER

DECEMBER 2020



Cover: Jesper Riknie, Unsplash

Contents

Preface

A blockchain network needs clear dispute resolution protocols and a spectrum of options is available.

Nadia Hewett
Project Lead – Data for Common Purpose Initiative and Blockchain, World Economic Forum

Jenny Cieplak
Partner, Latham & Watkins

Sheila Warren
Head of Blockchain, Digital Assets and Data Policy, and Member of the Executive Committee, World Economic Forum

Blockchain is a team sport – collaboration is needed to truly unleash the full potential and value of this technology. After a few years of proofs of concept, solutions are now set to be adopted at industry scale. The difficulties of scaling from proof of concept to industry-wide solutions have emerged as a top area of exploration – and a topic of much debate – in recent World Economic Forum publications and events, including Industry Strategy Meetings. Building on vital insights from these and other Forum meetings and research, the Forum launched an initiative to inspire blockchain collaboration and thereby increase the likelihood of success.

Through surveys and interviews with 30-plus blockchain enterprise consortia at different stages of maturity (as well as failures), we have confirmed that the core challenges in scaling blockchain solutions remain in the operational and governance space rather than on the technical side. Most of the challenges primarily revolve around setting up an effective governance framework. It is also critical that a blockchain governance framework includes a component to manage the processes by which disputes among parties are properly settled. A gap between the promise of a dispute-free environment and the inevitable reality of having to deal with disputes in the blockchain network can be bridged by a well-thought-out dispute resolution model.

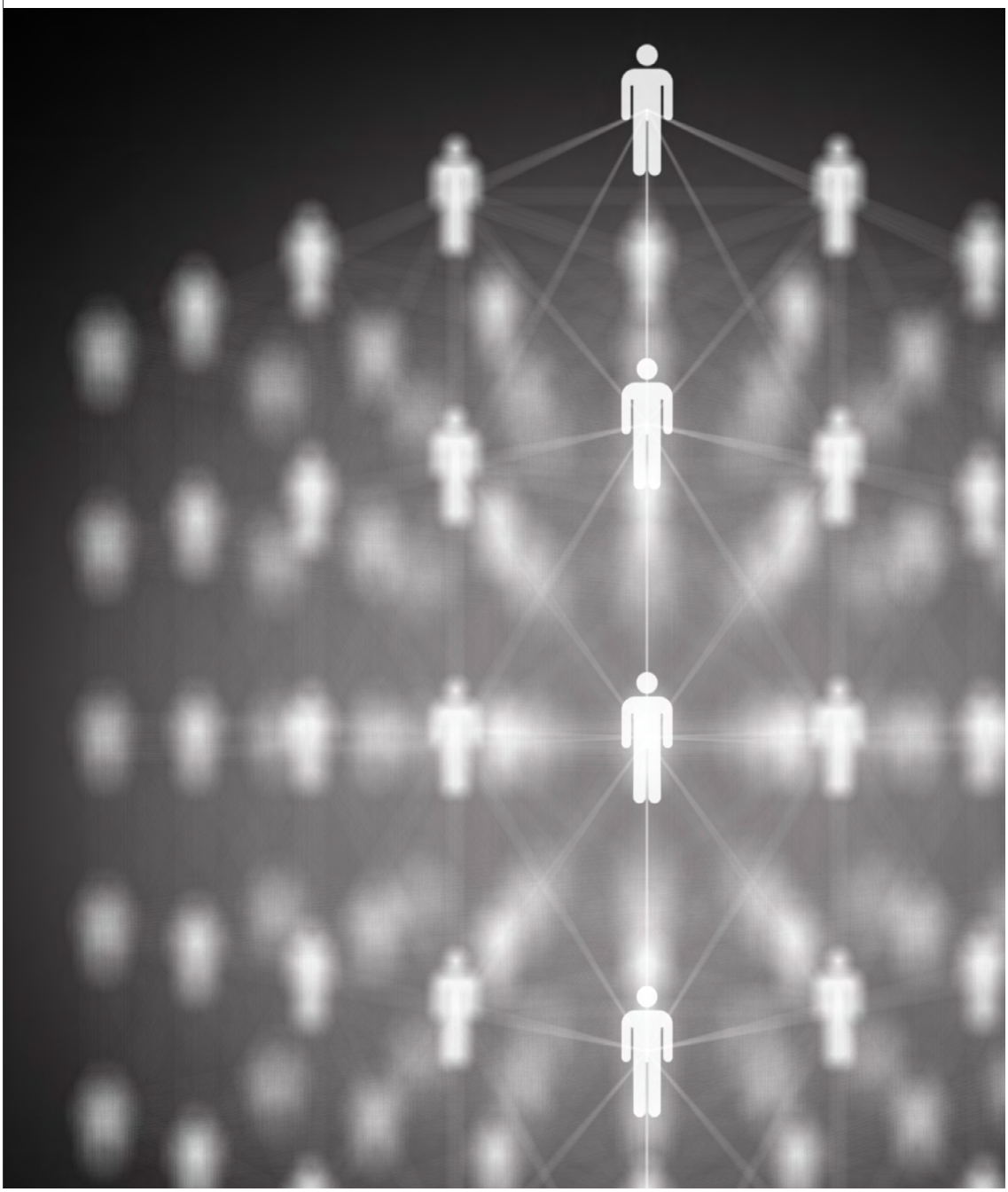
This paper explores forward-looking practical options for different dispute resolution mechanisms derived from case studies, various existing solutions and blockchain-based dispute resolution protocols. In particular, we focus on dispute resolution protocols for on-chain transactions to be used by enterprise users – that is, protocols for organizations rather than individual users.

Despite the many integral controls and features inherent in distributed ledger technology (DLT) to ensure that disputes and associated risks are minimized, parties involved in on-chain transactions are still exposed to new types of legal risk and disputes. From a legal perspective, the primary goal is to consider what happens "when things don't go as planned". Not only should we plan for disputes but we should also anticipate that, as with any new technology, disputes will arise in new and unforeseen ways. The power of technology to resolve disputes is exceeded by the power of technology to generate disputes.[1]

Sincere thanks to those who generously contributed their learnings and expertise to this paper.

Below: INchendio, Getty Images

1 Introduction



1.1 Collaborative blockchain solutions: moving towards production

In 2021 we will see more blockchain solutions move from proofs of concept to pursue real business-ready solutions. As blockchain networks continue to grow, the need for robust governance, including the selection of a dispute resolution model, becomes crucial. Network governance documents (e.g. consortia playbook, standard operating procedures and business network operation documents) should clearly document what the dispute resolution method is.

This white paper provides a practical overview of different dispute resolution mechanisms using case studies, various existing systems and blockchain-based dispute resolution protocols. In particular, it focuses on dispute resolution protocols for on-chain transactions to be used by enterprises – meaning solutions that are appropriate for the rigour and requirements of an enterprise environment.

This paper is intended for all who are interested in the governance solutions that allow blockchain networks to function – lawyers, businesspeople and technology professionals. While certain areas of the paper include in-depth treatment of legal or technical issues, we hope that doing so will encourage further learning and collaboration among blockchain professionals who specialize in these areas.

1.2 Importance of dispute resolution mechanisms

Commercial transactions rely on the availability of dispute resolution mechanisms. If a party fails to perform, or performs incorrectly, the non-breaching party needs to know that redress is available. Even when a failure of performance is due to outside circumstances and is not the fault of the party "in breach", some means of returning the parties to the status quo is necessary. Commercially minded parties may resolve such failures of performance before a dispute resolution mechanism is even invoked, but without the incentive to do so based on the availability of outside redress, it is possible that such commercial relationships would never have developed.[2]

In economic terms, any contract-based transaction is subject to a concept called *contractual incompleteness*. No matter how well-designed a transaction or business agreement is, there is always the chance that a circumstance may arise during the transaction that was not accounted for in the original terms.[3] In these circumstances, parties to the contract may wish to renegotiate or modify the contract to take into account the updated conditions.

The options available to contract participants are vital in determining the outcomes of any renegotiation or dispute.[4] Therefore, the dispute resolution tools and/or processes provided by a platform have an impact on whether and how parties may be able to resolve a dispute and also whether potential participants will feel confident conducting their transactions via the platform.

Blockchain solutions are often designed with the goal of minimizing disputes by ensuring that one party's performance is contingent on the other party's performance (often referred to as "delivery-versus-payment", "atomic" or "pay-for-performance" transactions). Many protocols use self-executing contracts written in code, called *smart contracts*, to automate the delivery of these payments based on system data. In this way, it is theoretically possible to eliminate participant discretion that might otherwise lead to a violation of contract terms. Nonetheless, failures can still arise.[5]

Dispute resolution refers to private or public processes to resolve a dispute or conflict between parties. Private dispute resolution processes can be convened among parties to a network using rules established by that network's platform, such as a rulebook. The private process can use an outside party to resolve the dispute, such as seeking out or using established mediators and arbitrators and working with rules established by an outside organization. Alternatively, parties can use a public resolution process such as litigation, where the rules are established by law with limited flexibility.

Consider the following dispute examples for blockchain-based transactions:

- An oracle fails to provide interest-rate information necessary for the calculation of loan payments, resulting in delayed or incomplete payments from borrower to lender
- A customs official fails to scan a container properly, resulting in the contents of that container not being properly recorded, which fails to trigger a payment from buyer to seller
- A party required to post margin in a transaction does not have sufficient assets in its accounts to satisfy a margin call
- A coding error in a smart contract causes a party to order 1,000 times more shares of stock than the buyer intended to purchase, resulting in the buyer seeking to reverse the transaction with the seller(s)[6]
- A party to an ongoing transaction becomes insolvent and the transaction must be terminated and closed out

Having a generally accepted method of dispute resolution is vital to network adoption. When well-functioning dispute resolution is not available, some portion of transactions on the network will have suboptimal outcomes. For example, parties may incur substantial litigation costs in the process of resolving their dispute or they may choose to forego investments, such as customization, within the agreement because there is no way to recoup them should the relationship break down. This reduces the value that the blockchain protocol creates. The network may then face adoption problems because enterprises that could benefit from business partnerships on the platform will choose not to engage with each other because they risk suboptimal outcomes.

1.3 Enterprise environment

Parties ranging from individuals to consortia to large corporations wish to capitalize on the efficiencies blockchain technology offers. This paper focuses on enterprise users, i.e. organizations that engage in complex transactions, including many that require formal negotiations and explicitly specified contracts. Enterprise users, therefore, typically have more sophisticated needs and uses for blockchain than individual or retail users.[7]

Public and private companies, as well as trade associations and non-profits, need to maintain reputations in their industries. They also typically deal with much larger financial stakes. All of this can encourage cooperative methods of dispute resolution. Enterprise users are more likely to be advised by corporate counsel and other sophisticated advisers who can anticipate many of the problems that can arise when appropriate dispute resolution is not in place. These issues, combined with the need to answer to stakeholders (whether shareholders, regulators, members, donors or a combination of these), lead enterprise users to more carefully consider the networks they join. This consideration will include careful review of how disputes are resolved.

Even within enterprise applications of blockchain, it is important to distinguish between disputes between enterprises (B2B) and disputes between an enterprise and a customer (B2C) or even between two customers (C2C). Our discussion focuses on dispute resolution for B2B transactions.

In contrast, individual consumers or users are more likely to choose to use permissionless and pseudonymous networks, because their transactions tend to be much less complex and the stakes are relatively low should something go wrong. Permissionless networks require different dispute resolution protocols geared towards the goals of these users, which often include experimental design and privacy.

While some retail users may accept the idea of evolving dispute resolution mechanisms as networks grow, it is unlikely that enterprise users will choose to implement a blockchain solution that does not have a settled dispute resolution mechanism.

In an anonymous network, participants can create multiple accounts to avoid the consequences of bad behaviour, both reputational and legal.[8] Enterprise consortia are likely to be permissioned and non-anonymous in order to avoid this issue.

Generally, enterprise users are more likely to adopt permissioned networks in which the identities of their transactional counterparts are known. Enterprise users need to consider various legal and regulatory requirements (such as sanctions compliance) and risks, and will also have to take into account the reputations of their counterparties – including the likelihood that these counterparties will maintain the confidentiality of sensitive data and that they will be motivated to find commercially beneficial solutions in the event of a dispute. This paper focuses on permissioned blockchain solutions – a common approach for enterprises – rather than permissionless blockchain solutions such as Bitcoin, though some learnings can be applied to both. While focused on dispute resolutions for permissioned blockchain solutions, this paper also looks to mechanisms and learnings from the permissionless space.

1.4 Types of blockchain disputes

A blockchain network is exposed to many types of disputes over its lifetime. Disputes among enterprise users of blockchain networks can range from disputes regarding network access and issues of compliance with network terms of use and network provider service levels, to fulfilment of transactions on the network.

- **Non-transactional disputes**: Some disputes are best addressed outside the blockchain protocol entirely since they relate not to transactions that are recorded or performed on the network but to parties' behaviour in the "real world". For example, a confidentiality provision may be included in most network terms of use, but such a provision will likely relate to information that is not stored on the blockchain at all. As another example, disputes arising in connection with a network for the sharing of medical records may be more likely to relate to off-chain use of information and/or compliance with data protection policies. While it is important to select a forum for such disputes, this forum may be different from the forum to resolve disputes about transactions conducted on the network.

- **Off-chain governance disputes**: Matters related to off-chain governance decisions are best addressed through a specific governance mechanism rather than through an adversarial dispute process. For example, decisions regarding the evolution of the blockchain network itself, such as changing access criteria, should be made through broad majority consensus rather than through an adversarial process. These types of governance decisions are necessary for any blockchain protocol, but they are more complex than disputes related to network transactions. And, in fact, these governance decisions are the types of decision that must be thought through first so that the results can lead to the selection of a dispute resolution mechanism for on-chain transactions.

- **On-chain disputes**: The focus of this paper is disputes related to on-chain transactions – that is, disputes related to transactions that are meant to be at least partially performed or recorded on a blockchain network. For example, disputes related to the timely delivery of goods or authenticity on a blockchain for supply chain, payments on a trade finance blockchain or failure to associate information with the correct hospital on a medical records blockchain. A proper dispute resolution mechanism will enable the parties to a given transaction to come to the best possible outcome within the parameters of the blockchain network.

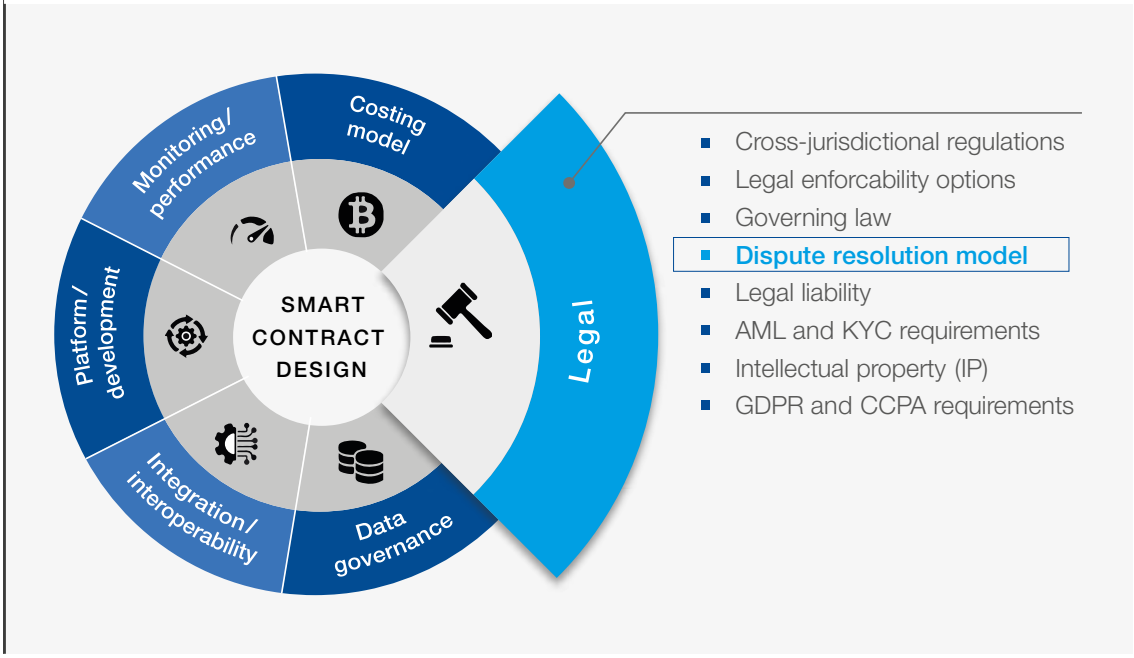
The focus of this paper is disputes related to on-chain transactions.

1.5 Smart contract and legal design considerations

Smart contracts bring novel challenges and opportunities for blockchain dispute resolution models, whether they are needed to address a dispute about the terms of a transaction, an unforeseen coding error, hacking or some other event. Smart contracts (self-executing computer programs designed to enforce parties' agreements without manual intervention) are an integral part of blockchain networks and may encompass all or part of the legal agreement between parties. While the goal of a smart contract is to ensure that neither party can default on its obligations or tamper with the process once the smart contract begins execution, as smart contracts become more complex, it becomes more likely that a non-automated dispute resolution process will be necessary.

The evaluation of smart contracts from a legal perspective requires nuanced legal considerations (Figure 1). Handling contractual disputes could be one of the main design considerations of a smart contract architecture linked to other legal and regulatory design aspects. More details about smart contract legal considerations will be included in a World Economic Forum publication planned for 2021.

FIGURE 1 **Smart contract design should include dispute resolution considerations**



1.6 Efficacy of online courts

While there are many networks testing protocols and resolution systems, there is no consensus on how to facilitate dispute resolution for on-chain transactions. Certain dispute resolution protocols may work well for some networks, but not for others.

Consider the Aragon Network, which is a permissionless network that has created a protocol to facilitate on-chain dispute resolution. The Aragon Network provides infrastructure and services for creating decentralized autonomous organizations (DAOs) and other blockchain-based agreements, and is governed by holders of Aragon Network Tokens (ANT).[9]

The Aragon Court is an opt-in protocol developed by the network to operate as a "digital jurisdiction" to resolve subjective disputes related to DAOs and other agreements that invoke the Aragon Court protocol. The idea is that these will be binary disputes that require human judgement and cannot be resolved by smart contracts – disputes that are ideal for resolution by voting.[10] The Aragon Court, like many other blockchain-based dispute resolution protocols, seeks to find the subjective truth using game theory by asking the jurors to vote on the ruling on which they think their fellow jurors are more likely to vote. Jurors who vote in favour of the consensus are rewarded with tokens, whereas jurors who vote against the consensus lose tokens.[11]

Despite having its own resolution platform, Aragon recently filed a lawsuit against its grant recipient Autark over a dispute related to Autark's use of grant funds and required deliverables under the grant.[12] Autark had previously threatened to sue Aragon in a US court and, after failed negotiations, Aragon filed the litigation in Switzerland.[13] It does not appear that the grant programme included any provisions for resolving disputes, and Aragon and Autark apparently did not agree ex ante to use any particular dispute resolution method.[14] However, Aragon's community members have questioned why Aragon chose to escalate the dispute to a traditional court system instead of relying on its Aragon Court for resolution.[15] Even without a contractual obligation to use the Aragon Court, the parties' choice to use litigation to resolve the claim, and the attendant publicity that both parties gave to the process, led potential users to question the efficacy of the Aragon Court's process.

The Aragon dispute illustrates the need for networks to provide ex ante for widely accepted, trusted dispute resolution methods or risk users quickly escalating to costly litigation.

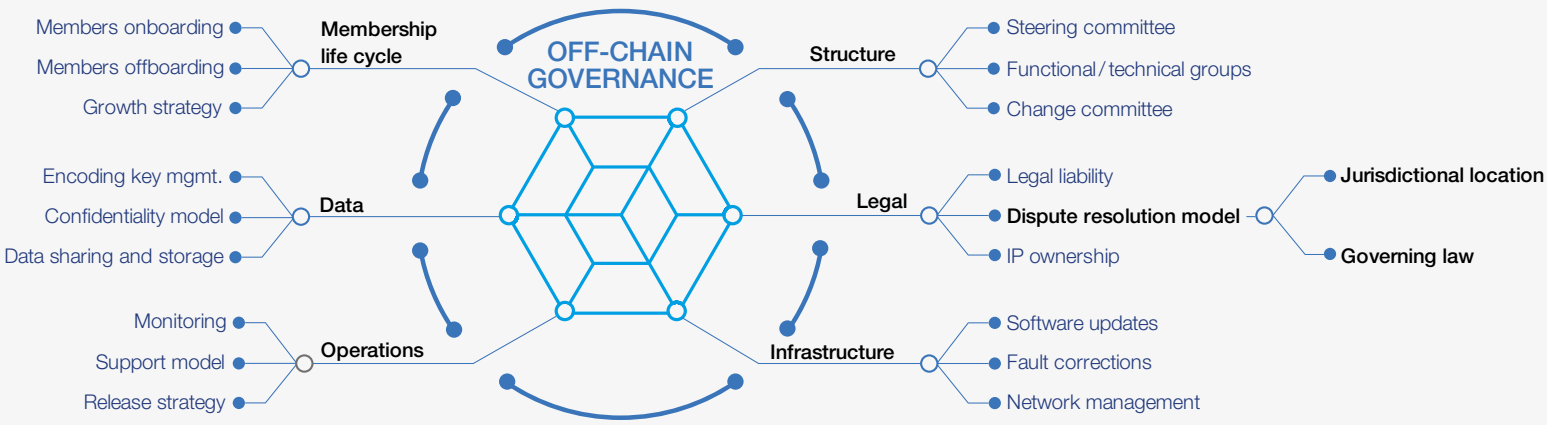
Below: Igor Kutyaev, Getty Images

2 The role of 'off-chain' governance in blockchain dispute resolution

Off-chain governance is a set of collective rules and procedures that are not embedded in the code of the protocol but are documented and deployed outside the network infrastructure. The majority of established cryptocurrencies such as Bitcoin and Ethereum adopt an off-chain governance approach, with their respective foundations playing a role in the governance process to ensure appropriate checks and balances (although users of such cryptocurrencies are not legally bound by these governance decisions, as is likely to be the case with enterprise networks).

An ideal governance model covers many operational and business dimensions. As shown in Figure 2: Facets of off-chain governance models, a dispute resolution model is an important component of the legal decisions to be made within an overall off-chain governance model.

FIGURE 2 **Facets of off-chain governance models**



Dispute resolution is distinct from the governance processes that are required for most blockchain-based enterprise projects. While the need for governance is similarly driven by contractual incompleteness, governance procedures involve a larger set of stakeholders than just the participants in a single transaction. Governance can typically be used to update and modify dispute resolution mechanisms. The governing body of a network must decide whether to provide dispute resolution, whether to stipulate a jurisdiction for on-chain transactions and whether users are able to opt out of either of these provisions. Each of these decisions has an impact on the outcomes that users can expect from conducting transactions using the network. As illustrated in Figure 2, the following are two important elements that must be considered when designing dispute resolution models:

- **Jurisdictional location**: Much has been written about the situs of blockchain transactions and blockchain-based assets.[16] Determining the location of an asset or the jurisdiction in which a contract is to be performed is important when a party needs to establish a governing law and jurisdiction. However, parties can typically avoid debates regarding the locus of online transactions, which can become somewhat philosophical in nature and could be politically fraught, by preselecting a dispute resolution forum.
- **Governing law**: It is important to choose both a governing law (which determines the laws that will be used to interpret a contract) and a forum (which determines who has the authority to resolve the dispute). For example, if the parties to a contract are located in New York and Texas, they may agree to have their disputes resolved before a court in Texas but have their contract interpreted under the laws of New York.

  Some jurisdictions, such as New York, allow parties to choose to have disputes resolved in their courts and under their laws regardless of the parties' connection to that jurisdiction, as long as the disputes meet other characteristics such as minimum amounts in dispute. And most jurisdictions allow parties to include mandatory and binding arbitration in contracts. For example, in the United States, the Federal Arbitration Act and US Supreme Court interpretations have established a pro-arbitration national policy, even over common law contract defences and ambiguous contract language.[17]

  However, some courts will not apply a party's choice of governing law if the body of law was chosen solely to avoid laws that would otherwise apply to the contract, or if the chosen law would offend public policy or otherwise infringe on human rights. For example, in Singapore if an express choice of law was made

solely to avoid a law that would otherwise apply to the contract, the court may conclude that the choice was not bona fide and may instead make a determination on its own as to the proper governing law.[18] Thus, parties should carefully consider not only whether a governing law and forum have been established for on-network transactions, but also whether the chosen law and forum will be respected if a party seeks enforcement outside the chosen methods.

While parties could encode governing law and dispute resolution provisions in all of their smart contracts, it is likely that providers of enterprise blockchain solutions will include these provisions in their network terms of use or rulebooks so that parties can avoid the inefficiencies of having to negotiate these questions with every contract. Enterprise users will need to consider whether an opt-out mechanism, where network rules require parties to submit to a governing law and dispute forum while retaining the option of resolving disputes through other means, is preferable, or whether they prefer the certainty of limiting jurisdiction to a single venue.

EXAMPLE

Dispute resolution in an industry-led consortium

The Institutes RiskStream Collaborative is a blockchain consortium focused on InsureTech and blockchain solutions (platform and applications). RiskStream has frequently engaged the dispute resolution process, though it has not officially implemented production-ready on-chain or technical remediation approaches. RiskStream's off-chain dispute resolution in action occurs through majority rule voting in the working groups, committees and advisory boards. To date, most governance-related disputes have revolved around use case choice, direction or funding.

RiskStream uses on-chain dispute resolution mechanisms for a particular use case: private passenger vehicle first notice of loss (FNOL) within insurance. This use case, which is heading towards production, addresses a shared loss event, i.e. a car accident in which a loss occurs. In that situation, many facts and opinions are expressed by those parties involved in the shared loss event. Each insurance carrier collects information about the loss event, with each party providing their own account of the facts and opinions of the loss event involving the two or more parties.

To ensure data accuracy, on-chain transactions providing information on the loss event or altering facts can be verified and confirmed only by the authoritative source of the fact. A practical example of facts would be the spelling of an insured person's name, their driving licence number or the make, model and year of their car. If Insured B reported that the last name of insured A was spelled as Smith but Carrier A's policy has it written as Smyth, the record of Carrier A, as the authoritative source on their insured's policy, would overwrite Carrier B's opinion of the spelling of Insured A's last name. Thus, even though Party B's report on Party A's information is recorded and shared with Carrier A, Carrier A is the authority of its own insured's policy details, and can correct facts expressed by Party B about Party A.

However, opinions are not controlled by either carrier, and can be entered by either party, and are aggregated and stored for further investigation by the claims adjuster at a later date. There is no formal resolution of opinions on-chain as this expands beyond the confines of the FNOL process. Examples such as loss location, who was involved and what damage occurred are simply taken into account for loss review and are not overwritten by either party.

Below: Hans-Peter Gauster, Unsplash

3 Existing 'on-chain' dispute resolution mechanisms and protocols

Common methods for dispute resolution can be characterized along a spectrum – from private methods that offer significant ability to tailor the process to public resolution in accordance with standards applicable to a broad range of disputes.

While the examples below are not all blockchain-related, they can be easily adapted to networks of blockchain participants, and each has materials publicly available for blockchain practitioners to review and consider.

3.1 Private in-network resolution

FIGURE 3 **Dispute resolution mechanisms and protocols – private**

Participants in a blockchain network may determine that the best way to resolve disputes is through the decision of the network participants themselves, potentially guided by the network operator. Network operators will be encouraged to formulate a dispute resolution process that is seen as streamlined, unbiased and low-risk. And network participants should be encouraged to adjudicate disputes fairly based on the desire for the network to continue to function and because they may be subject to judgement themselves.

Juries vs. game theory: Many of the blockchain-based dispute resolution mechanisms that have been proposed involve jurors deciding, not based on the merits of each party's position but based on a prediction of how other jurors will vote.[19] While this may be acceptable for anonymized disputes in low-risk situations, it is unlikely to be adopted by enterprise users because of the inherent uncertainties in a dispute resolution process that could be based on matters other than the merits of a case.

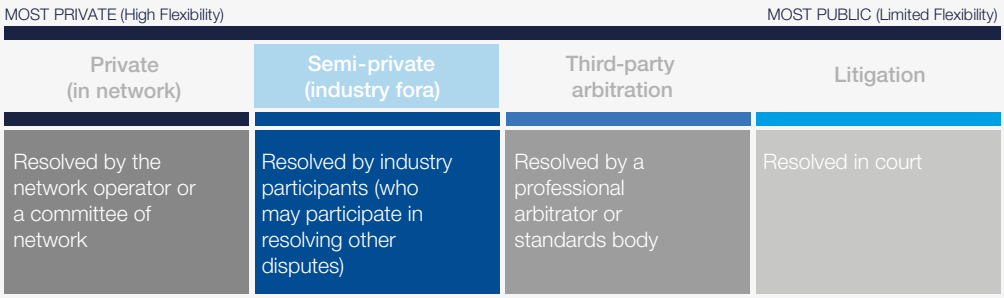
Swap execution facilities – derivatives marketplaces for institutional traders[20] – are typical networks that require participants to adhere to in-network dispute resolution protocols. For example, CME Group's swap execution facility (CME SEF) requires market participants to follow all procedures established by CME SEF, which are set forth in the CME SEF Rulebook.[21] Although CME SEF does not operate as a blockchain, blockchain network providers can learn from its internal resolution system.

By applying to trade and executing transactions on the CME SEF, parties – both themselves and any intermediaries – consent to be subject to the jurisdiction of the CME SEF and "agree to be bound by and comply with the Rules of CME SEF in relation to such transactions", including with respect to disputes among participants, intermediaries and even disputes against CME SEF itself.[22] Thus, the SEF Rulebook becomes a contract among CME SEF and all participants and intermediaries, including a choice of forum provision. All disputes are submitted to a panel composed of trading participants, with the process organized by CME SEF.[23] A panel consisting of five arbitrators and one chairman hears and decides the dispute and considers all relevant testimony and documents submitted by the parties. If the panel has doubts on questions of law, the panel may refer the question to CME SEF legal counsel for opinion. The panel then issues a written decision signed by the chairperson and at least a majority of the panel, which can then be appealed by either party to an appellate panel, whose decisions are final and binding. Records of hearings are released to the parties to the dispute only for limited purposes, and decisions related to awards are provided only to the parties to the dispute, making the process quite confidential.[24]

If low-value disputes become common on a network (such as valuation of collateral or whether a particular smart contract operated as intended), networks may look to resolution through technology support services or even artificial intelligence (AI) agents.[25] Platforms such as eBay and other online marketplaces have used these methods with some success – although there is a danger if the support service or AI agent is seen as biased.[26]

3.2 Semi-private industry fora

FIGURE 4 **Dispute resolution mechanisms and protocols – semi-private**



While the participants in a network may determine that some disputes are best resolved internally, other disputes may have industry significance that is broader than one network, such as a situation in which multiple oracles provide inconsistent information. Participants may desire the legitimacy conferred by an industry standards body. In these situations, network operators may look to semi-private industry fora for resolution. The derivatives industry has several industry fora that work to standardize contracts and resolve disputes related to those contracts.

The International Swaps and Derivatives Association (ISDA) is a trade association for participants in the over-the-counter derivatives market.[27] Among other functions, ISDA publishes the ISDA Master Agreement (the "ISDA Master"), an industry standard template agreement governing derivatives transactions. Parties to an ISDA Master enter into "confirmations" that fill in key elements of a derivatives transaction, which is then governed by the ISDA Master. Since this construct is widely used throughout the derivatives industry (including for many electronic transactions), ISDA has worked to show that confirmations can be automated, at least in part, in order to form smart contracts.[28]

ISDA also publishes standard definitions for particular derivative products, including for credit derivative transactions. In particular, ISDA has published a standard definition for "credit event", which may include filing for bankruptcy, defaulting on payments, restructuring debt, obligation defaults and obligation accelerations.[29] If the reference party in a credit default swap (CDS) undergoes a credit event, the buyer of the CDS is entitled to payment.

Because questions can arise as to whether an event qualifies as a credit event, the industry has set up five credit derivative determination committees (DCs) made up of institutional members to resolve these disputes.[30] Each DC includes 15 voting members that are market participants, as well as consulting firms and observer members.[31] A DC will make a determination as to whether a credit event has occurred upon request by a market participant or a clearinghouse.[32]

Some blockchain-based dispute resolution networks attempt to create reputations for anonymous jurors, incorporating information from their past decisions.[33] Where networks are non-anonymous, as most enterprise networks are likely to be, there is no need to create an artificial reputation system.

In order for the DC's decision to be binding, a supermajority (80%) of the DC must agree to the determination that either a credit event occurred or no credit event occurred, or that the DC will dismiss the request to review the issue. If the DC is unable to resolve the issue by a supermajority, the issue will be referred to a panel of three external reviewers, who are individuals chosen from a pool of members nominated by the firms that serve on the DCs. The external reviewers render a final decision, and a written summary of the decision will be published.[34]

This decision-making process is designed to mitigate risk, increase transparency and align markets. Also, as it is open to all members of industry, it may eventually be possible for multiple blockchain networks to draw upon and make use of information flows from committees like this in order to increase efficiency and legitimacy.

3.3 Third-party arbitration

FIGURE 5 **Dispute resolution mechanisms and protocols – arbitration**

Depending on the nature of the issue in dispute or the potential recovery involved, parties to a dispute arising from an on-chain transaction may prefer resolution by recognized and respected arbitrators, and they want to have confidence that any rendered award would be final and enforceable regardless of the jurisdiction or location of the parties to the dispute. In addition, given the potential nature of the dispute and the relative novelty of the technologies involved, speed and confidentiality of dispute resolution and limitation on discovery are important factors. At the same time, the parties may not want to bear the expenses of litigation and contend with a lengthy appeals process. These considerations would favour resolution by neutral arbitrators that understand how blockchain-based platforms and smart contracts function. Some or all of these factors would weigh in favour of using arbitration as the preferred dispute resolution mechanism.

The parties may agree in advance, via a contractual clause, that all disputes or particular disputes would be submitted to arbitration, or they may agree to have the dispute resolved by arbitration once the dispute actually arises. There are many reputable arbitral institutions located around the globe that administer commercial arbitrations. At least one of these tribunals, US-located JAMS, is working on a set of rules that would apply specifically to resolution of disputes arising from on-chain transactions – the JAMS Smart Contract Rules – a draft of which JAMS has recently made available for public comment.[35]

JAMS offers participants in on-chain transactions two versions of dispute resolution clauses that may be included in their contracts, one of which simply provides that any disputes will be resolved by JAMS mediation and if not resolved through mediation, taken to JAMS arbitration; and the other refers specifically to the JAMS Smart Contract Rules. This includes allowing the parties to select the location and language of arbitration in advance, with the default being English.[36] Of course, there are numerous other ways in which arbitration clauses may be formulated, giving the parties greater control over the arbitration process, as well as additional predictability – for example, they can agree on the composition of the arbitral tribunal and what expertise or experience the arbitrators must have, what rules will apply to the arbitration and the various deadlines that the parties must meet, as well as the manner of enforcement of the arbitral award and the responsibility for payment of the arbitration fees. The draft JAMS Smart Contracts Rules allow for a great deal of flexibility.[37]

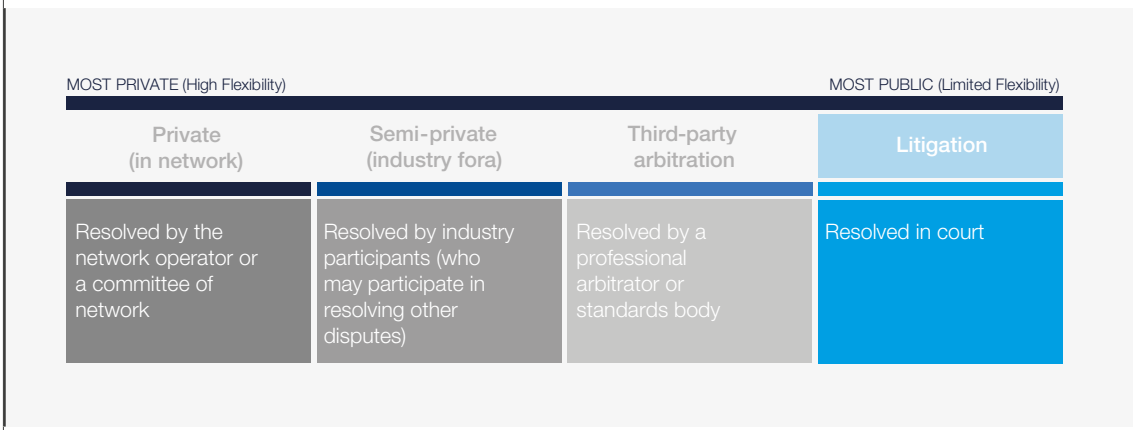
In the absence of an advance agreement, the draft JAMS Smart Contracts Rules provide a framework as to how the arbitration of disputes arising out of smart contracts[38] will be conducted. Evidence must be submitted electronically,[39] which facilitates

submission of code for review. The arbitrator has the authority to resolve jurisdictional disputes;[40] grant emergency relief, which may be particularly important for transaction-based disputes affecting the operations or the financial position of the parties (unless the parties to the dispute have agreed in writing to opt out of the JAMS Emergency Relief Procedures for Smart Contracts);[41] and impose interim relief, such as an injunction or "measures for protection and conservation of property and disposition of disposable goods".[42] Parties may be represented by counsel.[43]

In order to ensure the finality and non-appealability of the decision of a third-party arbitrator, contractual arbitration clauses usually provide that the decision of the arbitrator is final and binding on the parties. In the absence of any provision to the contrary, the draft JAMS Smart Contracts Rules provide that the JAMS arbitral award is binding and enforceable,[44] although parties desiring to enforce the arbitral award outside the country in which it is rendered would have to rely on the procedures under the New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards[45] and the implementing legislation in the relevant jurisdiction. According to the JAMS Smart Contracts Rules, parties are deemed to have consented to the fact that judgement upon the arbitration award "may be entered in any court having jurisdiction thereof".[46]

3.4 Litigation

FIGURE 6 **Dispute resolution mechanisms and protocols – litigation**



As the Aragon example demonstrates, despite the potential availability of other dispute resolution mechanisms, parties to an on-chain transaction dispute may still decide to pursue litigation. For example, as in Aragon, there may be an absence of an explicit dispute resolution provision, or a party to a dispute or a key witness may refuse to cooperate in the resolution, resulting in the need to use mechanisms available to courts to compel cooperation, such as subpoena power and the ability to grant default judgements. In addition, there may be a need for immediate interim relief, which a court may grant. Finally, it is easier to join other potential responsible parties (such as technology providers and hosting platforms) to suits brought in court.

A potential litigant should analyse a number of issues in determining whether litigation is the optimal dispute resolution method for a particular on-chain transaction. While a party may believe that choosing to bring suit in a particular jurisdiction would produce an optimal result, it should consider whether such a court will accept jurisdiction or whether the choice of that forum would survive a jurisdiction challenge, particularly in the absence of an ex ante agreement on choice of law.

If a court does accept jurisdiction, there is no guarantee that the law it would apply (whether as a result of a choice of law clause or a court's location) would deem a smart contract to be valid and enforceable. In a number of jurisdictions, the law has not caught up with technological developments, so validity and enforceability would be determined pursuant to general contractual principles. Most commentators to date appear to agree that an on-chain transaction, particularly among non-anonymous parties, would be respected as a valid and enforceable contract,[47] but the question has not yet been tested directly.

However, even if the smart contract itself is deemed valid, there may not be law or court precedents that address less straightforward scenarios – for example the impossibility of performance of a smart contract (which is, by nature, self-executing) due to changes in government regulation, someone taking advantage of a vulnerability in the code resulting in a change in the way that a smart contract is performed,[48] differences between a written agreement and the way that it is coded, and technology-related issues that have nothing to do with the smart contract itself but nevertheless affect performance by one or both parties.

Parties considering litigation should also take into account whether the court would be sophisticated enough to understand the nature of the technologies involved, whether evidence in electronic form would be accepted[49] and, since court proceedings are usually public and broader discovery is likely to be conducted, whether litigation could result in disclosure of significant proprietary technologies, methods or other intellectual property. Depending on the nature of a dispute, a party also may or may not be comfortable with the possibility of a lengthy appeals process, potentially being required to pay its own and the other side's costs, or having to enforce a court judgement in a different jurisdiction.

Below: Sven Read, Unsplash

4 Considerations in choosing a dispute resolution method

Consider where you need a quicker process and deeper knowledge of the software in order to resolve disputes.

Daniel Garrie, Co-founder, Law and Forensics, and Neutral with JAMS ADR Services

Only automate what needs to be automated and have an off-ramp from automation if transaction participants don't want to enforce an automatic remedy.

Ciarán McGonagle, Assistant General Counsel, International Swaps and Derivatives Association (ISDA)

Not every network will select the same dispute resolution method – in fact, some networks may choose different methods for different types of issues. For example:

- Disputes about whether the network's code operated correctly might be resolved by independent expert arbitration
- Disputes about whether a party properly performed under a fully automated delivery-versus-payment contract could be resolved by the network operator
- Disputes about how to deal with new regulation could be resolved by pausing smart contracts and negotiating new provisions or, if negotiation fails, arbitration or litigation

Network providers should ensure that, if they are offering in-network dispute resolution, the needs of the network do not overwhelm the available resources. Consider whether in-network arbitrators' jurisdiction should be limited to avoid involving them in needless trivial matters that could be answered by a help desk (such as lost passwords)[50] or matters that are outside their expertise. In-network arbitrators (unless they are industry participants making decisions for the good of the network) will also need funding, which is something that is handled quite well by the various Online Dispute Resolution (ODR) networks that require an upfront fee for arbitration. Finally, if in-network arbitration is the chosen method for resolving disputes and there is no opt-out provision, this must be respected – there should be clear consequences for going outside the chosen protocol.[51]

A primary role of dispute resolution for blockchain-based transactions must be to resolve any detrimental impacts of the use of automation. For that reason, the effectiveness of automating part or all of a dispute resolution process in this context will be limited. Rather, dispute resolution mechanisms should be well-defined but incorporate significant human discretion. Distributed ledger protocols have features such as oracles, smart contracts, on-chain data and zero-knowledge proofs that in some circumstances can reduce the need for dispute resolution – but they can also create unexpected results and actually cause disputes. Network providers should consider limiting the automation of complex functions that have significant probability of error or far-reaching consequences. For example, having a contract automatically terminate if one counterparty breaches the contract may not be ideal as the other counterparty may wish to waive the breach or amend the contract.[52]

Automatic lockups of assets and contract freezes may also prove problematic. As scholars Amy Schmitz and Colin Rule note, a dispute resolution process "should not allow a party to use the type of delay and hindrance tactics that currently plague litigation. In other words, parties should not thwart efficiency of smart contracts with continual and/or frivolous 'freezes'. Strict time limits must be embedded in the ODR process, and penalties applied against those who misuse the ability to freeze smart contract execution. There could also be limits on when parties are able to use a freeze."[53] Lockups and contract freezes, or automatic escrowing of assets in dispute, could also have a negative impact on parties who are subject to capital requirements.[54] In addition, automatic escrows can affect holding periods for assets such as securities, thus causing different tax treatment for assets that are forced into a dispute resolution escrow.[55]

Finally, note that any dispute resolution mechanism should provide for the parties to the dispute to reach a negotiated settlement rather than follow through with the full dispute process. As noted in the introduction, the existence of an available dispute resolution mechanism can actually provide parties with the incentive to create a negotiated settlement rather than incur the costs associated with the dispute process, but this is more likely to occur if the existing dispute process is known to produce reliable outcomes.

5 Enforcement of awards

Many blockchain-based dispute resolution protocols focus on specific enforcement of transactions – that is, ensuring that the exact assets that are subject to the dispute are transferred to the correct party – and their goal is to do so through means that are as automated as possible. However, such specific enforcement is necessary only where parties operate anonymously and their assets – other than the assets subject to the dispute – cannot be identified. The vast majority of awards in business disputes are not specific performance but monetary damages. For a network of enterprise users, all of whom are likely to be permissioned, knowing the identity of your counterparty in order to name them in a dispute proceeding and access assets to enforce the results of that proceeding will not be an issue. Of course, it is still important to choose a dispute resolution mechanism that will be respected by a court should a party need to access off-chain assets to satisfy a judgement.[56]

On-chain enforcement is still desirable from an efficiency perspective. However, any on-chain enforcement mechanism must take into account the append-only nature of blockchain networks. In many networks, simply "reversing" a transaction actually requires the parties to enter into an opposite transaction. In order to enforce the outcome of a dispute resolution process where one of the parties does not cooperate, the network provider will need a way to make the other party whole, potentially through blocking an asset of the uncooperative party and creating a new asset on behalf of the other party. Undertaking a "hard fork" and requiring all validators on a broadcast blockchain to switch to a revised version is unlikely to be practicable, as such a mechanism could be fraught with errors such as missed transactions and uncoordinated updates.

For disputes caused by coding errors, having a mechanism to update the smart contract itself will be useful. Protocols exist today for upgrading smart contracts,[57] including allowing parties to amend their own contracts or, if desired, authorizing a third-party dispute resolution provider (or potentially the network operator) to do so if one party is uncooperative.[58]

6 Conclusion

Blockchain network providers need to consider the spectrum of dispute resolution options available when creating network rulebooks and encouraging participants to join. While blockchain technology is no longer as novel as it appeared several years ago, adoption of production solutions has still lagged, in part because of uncertainties in how networks will actually operate. While many aspects of blockchain transactions can be automated, participants are acutely aware that contractual incompleteness will inevitably occur, and enterprise users will be especially reluctant to commit significant portions of their business to networks that have not planned to solve that incompleteness. A blockchain network with clear dispute resolution protocols will find it easier to onboard enterprise participants who seek certainty with respect to their operations, and a network can more easily grow when that certainty is embedded in the platform's governing and operational documents.

Glossary

Anti-money laundering (AML): A set of international laws enacted to ensure that financial services companies do not aid in criminal and/or terrorist enterprises.

Broadcast blockchain: A blockchain in which each node contains the entire database of transactions that take place on the blockchain, regardless of whether the node operator is a party to those transactions. The bitcoin blockchain is a broadcast blockchain. R3's Corda, where nodes have access only to transactions and information that are relevant to the node operator, is not a broadcast blockchain.

Business-to-business (B2B): Describes commercial transactions between businesses, such as between a manufacturer and a wholesaler, or between a wholesaler and a retailer.

Business-to-consumer (B2C): Describes commercial transactions between a business and a consumer.

Decentralized autonomous organization (DAO): An organization that operates autonomously in accordance with preset rules, using a blockchain and coordinated through a distributed consensus model.

Distributed ledger technology (DLT): Software that uses a blockchain or similar data structure shared over a network of participants.

Hard fork: A hard fork occurs when there is a change in the blockchain that is not backwards-compatible (not compatible with older versions), thus requiring all participants to upgrade to the new version in order to be able to continue participating on the network.

Off-chain: A transaction in which the value moves outside of a blockchain to take advantage of reduced network transaction fees and shorter transaction times.

On-chain: A transaction that occurs on the records of a blockchain.

Online dispute resolution: A broad set of online technologies meant to either supplement or replace ways in which people have traditionally resolved their disputes.

Oracle: Third-party service providers that supply external information to smart contracts and act as a bridge for connecting the outside world of applications and services with blockchain.

Peer-to-peer (P2P): Refers to interactions that happen between two computer systems that happen without relying on an intermediary. A P2P network can include any number of computer systems.

Permissioned: A blockchain network in which users must be admitted to the network to participate.

Permissionless: A blockchain network in which users have equal permission to use and interact with the network and in which users' permission to use and interact with the network is not set by the network itself or any central person or institution.

Smart contract: A self-executing computer protocol designed to enforce parties' agreements without manual intervention. A smart contract may be considered a complete legal contract, may represent only a component of a legal contract or may be unrelated to a legal contract. On a blockchain, smart contracts can control blockchain-based assets and transactions within the network. When triggered by a specified event, a smart contract automatically executes, and the result may result in another input to the blockchain.

Token (for a blockchain network): A digital asset used in a blockchain transaction. A token can be native to the blockchain, such as a cryptocurrency, or it can be a digital representation of an off-chain asset (known as a tokenized asset), such as the title deed to a house.

Zero-knowledge proofs: A zero-knowledge proof enables one party to provide evidence that a transaction or event happened without revealing private details of that transaction or event.

Contributors

This white paper is an output of the Blockchain is a Team Sport: Making Blockchain Consortia Work project, part of the World Economic Forum's Shaping the Future of Technology Governance: Blockchain and Digital Assets platform. It is the result of a collaborative effort led by the World Economic Forum in partnership with Latham & Watkins. Sincere thanks are extended to those who contributed their invaluable insights in workshops, subject-matter expert interviews and other feedback channels, including those not listed below. The opinions expressed herein may not necessarily correspond with those of each individual involved with the project.

Lead authors

Abdulhakim Alhabib
Systems Consultant, Saudi Aramco (and World Economic Forum Fellow)

Jenny Cieplak
Partner, Latham & Watkins

Nadia Hewett
Project Lead – Data for Common Purpose Initiative and Blockchain, World Economic Forum

Brooke Padgett
Summer Associate, Latham & Watkins

Masha Smith
Counsel, Latham & Watkins

Contributors

Cathy Barrera
Partner and Founding Economist, Prysm Group

Stephanie Hurder
Partner and Founding Economist, Prysm Group

Susan Joseph
Chief Executive Officer, SusanJoseph

Douglas Yatter
Partner, Latham & Watkins

Reviewers

Darcy Allen
Postdoctoral Research Fellow, Blockchain Innovation Hub, RMIT University

Adel Alotaibi
IT Systems Specialist, Saudi Aramco

Clarisse Awamengwi
Project Specialist – Blockchain and Digital Assets, World Economic Forum

Daniela Barat
Head of Legal and Compliance, World Economic Forum

Thomas Cox
Chief Governance Officer, StrongBlock

Satoru Hori
Senior Researcher, Hitachi (and World Economic Forum Fellow)

Aaron Lane
Lecturer, Graduate School of Business and Law; Research Fellow, Blockchain Innovation Hub, RMIT University

Ashley Lannquist
Project Lead – Blockchain and Digital Assets, World Economic Forum

Tju Liang Chua
General Counsel, The Ethereum Foundation

Denise McCurdy
Blockchain in Transport Alliance (BiTA), Blockchain Governance Advisor

Marta Piekarska-Geater
Director of Ecosystem at Hyperledger, The Linux Foundation

Angie Raymond
Associate Professor, Indiana University

Claudia Salomon
Partner, Latham & Watkins

Joseph Schweitzer
Communications Lead, The Ethereum Foundation

Punit Shukla
Project Lead – Blockchain and Digital Assets, World Economic Forum

Editing and design

Janet Hill
Head of Editing, World Economic Forum

Alison Moore
Editor

Floris Landi
Lead, Publications and Graphic Design

Bianca Gay-Fulconis
Graphic Designer

Endnotes

1. *Digital Justice: Technology and the Internet of Disputes*, SSRN, Jan. 2020: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3508311 (link as of 16/11/2020).
2. *Incomplete Contracts and Renegotiation*, Econometrica, Jul. 1988: https://www.econometricsociety.org/publications/econometrica/1988/07/01/incomplete-contracts-and-renegotiation (link as of 11/11/2020).
3. *Incomplete Contracts: Where Do We Stand?*, Econometrica, Jul. 1999: https://www.econometricsociety.org/publications/econometrica/1999/07/01/incomplete-contracts-where-do-we-stand (link as of 11/11/2020).
4. *Renegotiation Design with Unverifiable Information*, Econometrica, Mar. 1994: https://www.econometricsociety.org/publications/econometrica/1994/03/01/renegotiation-design-unverifiable-information (link as of 11/11/2020).
5. Atomic transactions are not always practicable, as requiring parties to pre-fund may put undue strain on liquidity.
6. A 2016 study found that there are 100 errors per 1,000 lines of code. See *Place of Smart Contracts in Civil Law: A Few Comments on Form and Interpretation*, SSRN, Jan. 2018: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3095933 (link as of 11/11/2020).
7. Enterprise transactions can be compared with retail users and consumers whose transactions tend to use either implicit agreements or standardized boilerplate contracts.
8. *Reputation and Feedback Systems in Online Platform Markets*, UC Berkeley, Feb. 2016: http://faculty.haas.berkeley.edu/stadelis/Annual_Review_Tadelis.pdf (link as of 11/11/2020).
9. *Aragon Chain*: https://aragon.org/chain (link as of 11/11/2020).
10. *Aragon Court*: https://aragon.org/court; See Launching Aragon Court, Aragon, Feb 2020: https://aragon.org/blog/launching-aragon-court (link as of 11/11/2020).
11. *Aragon Network Jurisdiction Part 1: Decentralized Court*, Aragon, Jul. 2017: https://aragon.org/blog/aragon-network-jurisdiction-part-1-decentralized-court-c8ab2a675e82 (link as of 11/11/2020).
12. *DAO Legal Battle: Aragon vs Autark Community Grant Dispute*, DeFi Rate, May 2020: https://defirate.com/aragon-autark/ (link as of 11/11/2020).
13. *Id*.
14. *On-Chain DAO Idealists Take Aragon Legal Dispute to "Meatspace" Court*, Decrypt, May 2020: https://decrypt.co/30413/on-chain-dao-idealists-take-aragon-legal-dispute-to-meatspace-court (link as of 11/11/2020).
15. *Aragon Grants – Openness, Decentralization, and Aragon vs Autark, Medium*, Jun. 2020: https://medium.com/@naveenmishra/aragon-grants-openness-decentralization-and-aragon-vs-autark-70822d4530e4 (link as of 11/11/2020).
16. See e.g. *Realm of the Coin: Bitcoin and Civil Procedure*, SSRN, Jun. 2015: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2620309 (link as of 11/11/2020); *Some Legal Issues Surrounding Blockchain and Cryptocurrency*, Burr, Apr. 2018: http://www.burr.com/blogs/blockchain-law/2018/09/04/some-legal-issues-surrounding-blockchain-and-cryptocurrencypart-1-a-fundamental-disconnect-dlt-vs-territorial-jurisdiction (link as of 11/11/2020); and *To Bitcoin or Not to Bitcoin: Property, Jurisdiction and a Step Closer to Global Regulation?*: Penningtons Manches Cooper, Jan. 2020, https://www.penningtonslaw.com/news-publications/latest-news/2020/to-bitcoin-or-not-to-bitcoin-property-jurisdiction-and-a-step-closer-to-global-regulation (link as of 11/11/2020).
17. See e.g. *AT&T Mobility LLC v. Concepcion*, 563 U.S. 333, Justia, Apr. 2011: https://supreme.justia.com/cases/federal/us/563/333/ (holding that the Federal Arbitration Act pre-empts state laws that disfavour arbitration agreements) (link as of 11/11/2020); *Lamps Plus Inc. v. Varela, 587 U.S.*, Justia, Apr. 2019: https://supreme.justia.com/cases/federal/us/587/17-988/ (holding that class-wide arbitration proceedings could not be compelled based on ambiguous language in a contract) (link as of 11/11/2020).
18. See *Private International Law Aspects of Smart Derivatives Contracts Utilizing Distributed Ledger Technology*, ISDA, R3, Clifford Chance, Singapore Acad. of Law, Jan. 2020: https://www.isda.org/a/4RJTE/Private-International-Law-Aspects-of-Smart-Derivatives-Contracts-Utilizing-DLT.pdf (link as of 11/11/2020). And in England a court may decide to enforce a contract under its laws even if the parties chose another governing law if the law chosen by the parties is "so discriminatory or oppressive as to offend against public policy, or otherwise represents a serious infringement of human rights" Id.
19. *Kleros Short Paper V1.0.7*, Kleros, Sep. 2019: https://kleros.io/static/whitepaper_en-8bd3a0480b45c39899787e17049ded26.pdf (link as of 11/11/2020).
20. See 7 U.S.C. § 1a(50) ("The term 'swap execution facility' means a trading system or platform in which multiple participants have the ability to execute or trade swaps by accepting bids and offers made by multiple participants in the facility or system, through any means of interstate commerce, including any trading facility, that (A) facilitates the execution of swaps between persons; and (B) is not a designated contract market.").
21. *CME SEF Rulebook*, Chicago Mercantile Exchange: https://www.cmegroup.com/content/dam/cmegroup/rulebook/SEF/cme-sef-rulebook.pdf (link as of 11/11/2020).
22. *Id*. at 33 (Rule 418).

23. Similar to litigation, parties can assert counterclaims, cross-claims and/or third party claims and may also file challenges to the arbitrability of the dispute. Disputes can be consolidated and respondents who fail to respond within a timely manner admit to the dispute. See *id*. at 52-53 (Rules 604-607).

24. *Id*. at 55–56 (Rules 615.E and 616).

25. See e.g. *RNDR Network User Manual* at 13–14, OctaneRender, 2020: https://rendertoken.com/assets/files/RNDR_User_Manual.pdf (link as of 11/11/2020).

26. *Lesson from a Doughnut Fryer Debacle: Let the eBay Seller Beware, New York Times*, Jul. 2016: https://www.nytimes.com/2016/07/31/your-money/lesson-from-a-doughnut-fryer-debacle-let-the-ebay-seller-beware.html (link as of 11/11/2020); see also *E-Bay Dispute Resolution and Revolution: an Investigation on a Successful ODR Model*, 147–148, Academia, Jul. 2018: https://www.academia.edu/37486551/E_BAY_DISPUTE_RESOLUTION_AND_REVOLUTION_AN_INVESTIGATION_ON_A_SUCCESSFUL_ODR_MODEL (link as of 11/11/2020).

27. *ISDA*: www.isda.org (link as of 11/11/2020).

28. The first ISDA Master Agreement was published in 1987, and revised versions were published in 1992 and 2002. See *Legal Guidelines for Smart Derivatives Contracts: The ISDA Master Agreement*, ISDA, Feb. 2019: https://www.isda.org/a/23iME/Legal-Guidelines-for-Smart-Derivatives-Contracts-ISDA-Master-Agreement.pdf (link as of 11/11/2020).

29. *2014 ISDA Credit Derivatives Definitions*, ISDA, 2014: https://www.isda.org/book/2014-isda-credit-derivative-definitions (link as of 11/11/2020).

30. The five DCs are regionally comprised of the Americas, Asia excluding Japan, Australia–New Zealand, Europe/Middle East/Africa (EMEA) and Japan. See *Current DC Members (effective June 19, 2020)*, ISDA, Jun. 2019: https://www.cdsdeterminationscommittees.org/about-dc-committees/current-dc-membersdc-members-june-2020-to-april-2021 (link as of 11/11/2020).

31. For more information about the processes for becoming a committee member and committee obligations, see *2018 Credit Derivatives Determinations Committees Rules*, ISDA, Sep. 2018: https://www.cdsdeterminationscommittees.org/wp-content/files_mf/1544459244ISDA_DC_RulesSeptember282018.pdf (link as of 11/11/2020).

32. *Id*. at 27 ("2.1(a) Notifying the DC Secretary"). The DCs also make factual determinations on other issues, such as whether an auction should be held, which obligations are deliverable into such auction and whether a Succession Event has occurred. See *The Credit Event Process*, ISDA: https://www.isda.org/a/cKwEE/TheCreditEventProcess.pdf (link as of 11/11/2020).

33. *Blockchain and the Inevitability of Disputes: The Role for Online Dispute Resolution, Journal of Dispute Resolution*, Jul. 2019: https://scholarship.law.missouri.edu/jdr/vol2019/iss2/6 (link as of 11/11/2020).

34. If 60–80% of the DC vote for a specific outcome, the external reviewers will confirm that outcome unless they unanimously conclude the other position is "the better answer". But if less than or equal to 60% of the DC vote for a specific outcome, the external reviewers will confirm that outcome unless two out of three conclude the other position is better. See *supra* note 31, at 58.

35. *Smart Contracts, Blockchain and Cryptocurrencies*, JAMS Mediation: https://www.jamsadr.com/smartcontracts (link as of 11/11/2020).

36. *Id*. (Draft July 2020 JAMS Smart Contracts Clause and Rules/Model Dispute Resolution Clause).

37. *Id*. (Draft July 2020 JAMS Smart Contracts Clause and Rules/Rule 2. Party Agreed Rules and Emergency Relief Procedures, clause (a)).

38. The draft JAMS Smart Contract Rules define a "smart contract" as a "computer protocol intended to digitally facilitate, verify or enforce the negotiation or performance of a self-executing contract, when the terms of the agreement between the parties are directly written into lines of computer code that exist across a distributed, decentralized blockchain network." See *id*. (Draft July 2020 JAMS Smart Contracts Clause and Rules/Rule 1. Scope of Rules, clause (d)).

39. *Id*.

40. *Id*. (Draft July 2020 JAMS Smart Contracts Clause and Rules/Rule 7. Interpretation of Rules and Jurisdictional Challenges, clause (b)).

41. *Id*. (Draft July 2020 JAMS Smart Contracts Clause and Rules/Rule 2. Party Agreed Rules and Emergency Relief Procedures, clause (b)).

42. *Id*. (Draft July 2020 JAMS Smart Contracts Clause and Rules – Rule 13. Award of the Arbitrator, clause (b)).

43. *Id*. (Draft July 2020 JAMS Smart Contracts Clause and Rules – Rule 8. Representation).

44. *Id*. (Draft July 2020 JAMS Smart Contracts Clause and Rules/Rule 14. Enforcement of the Award, clause (a)). The draft JAMS Smart Contracts Rules also provide that with respect to an arbitration rendered in the United States, "proceedings to enforce, confirm, modify or vacate and Award will be controlled by and conducted in accordance with the Federal Arbitration Act". See (Draft July 2020 JAMS Smart Contracts Clause and Rules – Rule 14. Enforcement of the Award, clause (e)).

45. *New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards*, 23.1 U.S.T. 2517. The list of contracting states is available at: http://www.newyorkconvention.org/countries (link as of 11/11/2020).

46. *Id*. (Draft July 2020 JAMS Smart Contracts Clause and Rules – Rule 14. Enforcement of the Award, clause (e)).

47. See *supra* note 18; and *Smart Contracts: Is the Law Ready?*, Chamber of Digital Commerce, Sep. 2018: https://digitalchamber.s3.amazonaws.com/Smart-Contracts-Whitepaper-WEB.pdf (link as of 11/11/2020).

48. *What to Expect When Litigating Smart Contract Disputes*, Law 360, Apr. 2018: https://www.law360.com/articles/1028009/what-to-expect-when-litigating-smart-contract-disputes (link as of 11/11/2020).

49. See *supra* note 18.

50. Thomas Cox notes that the EOS network arbitration forums were deluged with password-related claims as there was no other way for users to recover lost passwords. See: ISSDG Meeting #005 "EOS Mainnet – Blockchain Governance Lessons Learned": https://youtu.be/XZpCMux9nTg (link as of 11/11/2020).

51. *Id*.

52. *Legal Guidelines for Smart Derivatives Contracts: The ISDA Master Agreement*, ISDA, Jan. 2019: https://www.isda.org/a/MhgME/Legal-Guidelines-for-Smart-Derivatives-Contracts-Introduction.pdf (link as of 11/11/2020).

53. *Online Dispute Resolution for Smart Contracts*, University of Missouri School of Law, Jun. 2019: https://scholarship.law.missouri.edu/facpubs/726 (link as of 11/11/2020).

54. Companies such as banks are required to maintain risk-based levels of capital. If assets are locked up in a dispute resolution protocol, it is unclear whether these assets will constitute "good" capital or not. This issue is outside the scope of this paper but should be explored further.

55. Assets such as securities are, at least in the United States, taxed differently depending on whether they are held for the "long term" or "short term". While the tax impact of putting assets into escrow for dispute resolution purposes is also outside the scope of this paper, it should be considered before an escrow mechanism is implemented.

56. See e.g. *Enforcement of Foreign Arbitral Awards in U.S. Courts*: https://www.wilsonelser.com/writable/files/Speaking_Engagement/171003-foreign_arbitral_awards_sandzawallace_rev1-speakingengagement.pdf (link as of 11/11/2020).

57. See *supra* note 33, at 19.

58. *Id*. at 20.

WORLD ECONOMIC FORUM

COMMITTED TO IMPROVING THE STATE OF THE WORLD

The World Economic Forum, committed to improving the state of the world, is the International Organization for Public-Private Cooperation.

The Forum engages the foremost political, business and other leaders of society to shape global, regional and industry agendas.

World Economic Forum
91–93 route de la Capite
CH-1223 Cologny/Geneva
Switzerland

Tel.: +41 (0) 22 869 1212
Fax: +41 (0) 22 786 2744
contact@weforum.org
www.weforum.org