

THE CURRENT LANDSCAPE OF BLOCKCHAIN-BASED, CROWDSOURCED ARBITRATION

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Online dispute resolution ('ODR') is in a state of rapid change and development. ODR platforms, such as British Columbia's Civil Resolution Tribunal, have been granted expanding mandates and the types of disputes that are being referred to these platforms has been increasing. To date, the existing platforms have been largely centralised; that is, either associated with the court system or organised by a centralised authority or administrator. More recently, however, many platforms have begun to emerge that promise to use blockchain technology to decentralise dispute resolution by crowdsourcing the adjudication of disputes to a worldwide pool of willing juror-arbitrators.

This article seeks to survey the current landscape of these blockchain-based, crowdsourced arbitration platforms, in order to explain how each intends to operate, the similarities and differences amongst them and the conception of 'justice' that each one promotes. The goal of this overview is to achieve a better understanding of the promises of dispute resolution that each platform aims to produce. This kind of understanding is necessary to advance further discussion and consideration of the likely realities, including the normative limitations, of using these technologically-based solutions for the resolution of disputes.

I INTRODUCTION

Online dispute resolution ('ODR') has been a significant and growing part of legal and dispute resolution systems for almost twenty years.¹ Broadly considered, ODR describes an ever-widening 'array of online procedures and technological tools that disputants and neutrals use to resolve disputes.'² Some of the earliest ODR platforms were developed by private companies in order to address small-scale consumer disputes in the e-commerce space. One of the best known of these platforms is the eBay Resolution Centre, which is generally cited as resolving at least 60 million disputes per year.³ Other private forms of ODR can be found on platforms such as net-arb.com, SettleToday.com and from the e-commerce website Alibaba.⁴

More recently, ODR has begun to be integrated to work more directly with state and national court systems, with platforms such as the developing United Kingdom Online

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¹ See Orna Rabinovich-Einy and Ethan Katsh, 'The New New Courts' (2017) 67(1) *American University Law Review* 165, 188.

² Ayelet Sela, 'The Effect of Online Technologies on Dispute Resolution System Design: Antecedents, Current Trends, and Future Directions' (2017) 21(3) *Lewis & Clark Law Review* 633, 634.

³ See, eg, Colin Rule and Chittu Nagarajan, 'Leveraging the Wisdom of Crowds: The eBay Community Court and the Future of Online Dispute Resolution' (Winter 2010) *ACResolution Magazine* 4, 5; See also Sela (n 2) 636.

⁴ See Sela (n 2) 651-2.

Solutions Court,⁵ and the now defunct Rechtwijzer, which facilitated separation and divorce arrangements in the Netherlands.⁶ Probably the most developed of these court-integrated ODR platforms is British Columbia's Civil Resolution Tribunal ('CRT'),⁷ which has been in operation since 2016.⁸ The CRT has mandatory jurisdiction over small claims up to CAD \$5,000, strata property claims,⁹ and, as of 1 April 2019, motor vehicle accident injury disputes for damages claims up to CAD \$50,000.¹⁰ The intention of the British Columbia Parliament is for the CRT to increase the monetary threshold until it becomes the mandatory forum for all small claims disputes, the current jurisdictional limit for which is CAD \$35,000.¹¹

Amongst the factors that these private ODR and court-integrated ODR platforms have in common is that both are centralised; in other words, established and operated by a singular, central authority. In the case of the eBay Resolution System or Alibaba's e-commerce resolution platform, it is the company itself that provides the service and issues the decision, with the courts as a potential backup source of dispute resolution if there is a reason to escalate the dispute beyond the ODR mechanism.¹² For the court-integrated platforms, the centralised authority is the State, the laws of which establish the system of justice that the ODR platforms facilitate.

More recently, private developers have begun to create ODR platforms that seek to use blockchain technology to decentralise the delivery of dispute resolution to disputing parties in any location through a worldwide network of self-selecting juror-arbitrators, all of whom interact through decentralised apps ('dApps') built on top of the blockchain. The ostensible goal of these emerging platforms is to provide a new kind of access to justice, which is necessary because, as the founders of one of these platforms put it, '[e]xisting dispute resolution technologies are too slow, too expensive and too unreliable for an online real-time world. A fast, inexpensive, transparent and decentralised claim adjudication system will be a key institution for the Internet Age.'¹³ Each of these platforms, in some way, seek to remove dispute resolution from centralised authorities and organisations by creating a streamlined, technologically-based solution that, in the eyes of the creators, will dramatically reduce costs and delays whilst still providing disputing parties with a fair and considered decision.

⁵ See Dorcas Anderson, 'The Convergence of ADR and ODR Within the Courts: The Impact on Access to Justice' (2019) 38(1) *Civil Justice Quarterly* 126, 133–5.

⁶ See generally Michael Legg, 'The Future of Dispute Resolution: Online ADR and Online Courts' (2016) 27(4) *Australasian Dispute Resolution Journal* 227, 230. The government and court-supported Rechtwijzer platform has now been privatised and is being operated as Justice42. See *Justice42* (Website).

⁷ See 'Welcome to the Civil Resolution Tribunal' *Civil Resolution Tribunal* (Website) <<https://civilresolutionbc.ca>>.

⁸ Shannon Salter, 'Online Dispute Resolution and Justice System Integration: British Columbia's Civil Resolution Tribunal' (2017) 34(1) *Windsor Yearbook of Access to Justice* 112, 122.

⁹ *Ibid*; *Civil Resolution Tribunal Act*, SBC 2012, c 25, pt 10.

¹⁰ See 'Motor Vehicle Accidents and Injuries' *Civil Resolution Tribunal* (Website) <<https://civilresolutionbc.ca/how-the-crt-works/getting-started/motor-vehicle-accidents-and-injuries>>.

¹¹ Citing to then current maximum small claim of \$25,000: Salter (n 8) 122; See BC Reg 120/2017, sch 1. Increasing the jurisdiction of the Small Claims Court to CAD \$35,000.

¹² Centralised alternative dispute resolution ('ADR') is also a possibility for these disputes which might involve the use of a mediator or arbitrator operating within an acknowledged common framework.

¹³ Federico Ast and Clément Lesaege, 'Kleros: A Protocol for Decentralized Justice' in *Dispute Revolution: The Kleros Handbook of Decentralized Justice* (2019).

The ability of these platforms to provide this kind of result leads to many normative questions relating to conceptions of justice and fairness and whether decentralised dispute resolution platforms are genuinely capable of providing either.¹⁴ These questions revolve around such issues as to the integrity of the platforms generally and, more specifically, the integrity of the juror recruitment and selection process; the sufficiency of game theory and crypto-economic principles to provide a system of fairness that can underpin the platforms' design and operation; and whether the incentives and penalties that are designed to ensure honest juror participation are likely to be effective. Before these normative issues can be sorted out, however, it is both useful and necessary to obtain a more comprehensive picture of the basic landscape of these decentralised, blockchain-based platforms to understand better how many currently exist in various stages of implementation and development and how each intends to provide justice for disputants once they are actually operating. This article aims to provide just this picture.

Part II of the article will set out an overview of the blockchain and decentralised justice mechanisms in general. Part III will then describe the current state of the dApp development by identifying the platforms that currently exist, explaining what stage of development each seems to be at, and how each intends to deliver justice to the disputants through the platform design. It should be noted that it is reasonably easy to post a plan for starting work on a dApp, so the list may not be entirely complete as new platforms emerge with a great deal of speed. Part IV will offer some concluding remarks and will look ahead at some of the challenges and normative questions that will (or should) likely face the purported providers of this new form of justice.

II DECENTRALISED JUSTICE ON THE BLOCKCHAIN

Central to these platforms being able to provide the kind of dispute resolution promised is the existence of blockchain technology, which in turns allows for the creation of smart contracts, and finally the ability for programmers to develop the dApps that work on top of and in conjunction with the blockchain. The aim of this Part of the article is to explain each of these concepts with an eye toward understanding how each is necessary for the operation of the platforms that will be discussed in the next Part.

'A blockchain is, in the simplest of terms, a time-stamped series of immutable record [sic] of data that is managed by cluster computers not owned by any single entity. Each of these blocks of data (i.e. block) are secured and bound to each other using cryptographic principles (i.e. chain).'¹⁵ These records, especially when a cryptocurrency like Bitcoin or Ethereum is involved, may consist of information such as credits and debits, or might record the ownership of property by providing a record of the deed.¹⁶ One way that blockchains are often described is as a distributed ledger that contains all of these records in ways that are independently verifiable.

¹⁴ For an introduction to some of these normative questions see James Metzger, 'Decentralized Justice in the Era of Blockchain' (2018) 5(2) *International Journal of Online Dispute Resolution* 69.

¹⁵ See Ameer Rosic, 'What is Blockchain Technology: A Step-By-Step Guide for Beginners' *Blockgeeks* (Website, 1 March 2019) <<https://blockgeeks.com/guides/what-is-blockchain-technology/>>; See also Max Raskin, 'The Law and Legality of Smart Contracts' (2017) 1(2) *Georgetown Technology Law Review* 305, 318.

¹⁶ Raskin (n 15) 318.

One method for verifying the information contained on the blockchain is that – so far as the blockchains that will power the dispute resolution dApps discussed below are concerned – all of the information recorded is publicly available.¹⁷ As explained by Vitalik Buterin, the founder of the Ethereum blockchain:

[A] public blockchain is a blockchain that anyone in the world can read, anyone in the world can send transactions to and expect to see them included if they are valid, and anyone in the world can participate in the *consensus process* – the process for determining what blocks get added to the chain and what the current state is. As a substitute for centralized or quasi-centralized trust, public blockchains are secured by *cryptoeconomics* – the combination of economic incentives and cryptographic verification using mechanisms such as proof of work or proof of stake, following a general principle that the degree to which someone can have an influence in the consensus process is proportional to the quantity of economic resources that they can bring to bear [sic].¹⁸

Thus, all that is required to view the transactions that have taken place across the entirety of the blockchain in an internet connection.¹⁹

Although the digital records listed and stored on the blockchain are public, the identities of the parties that are engaging in those transactions remain private and, at least in theory, impossible to trace to an identifiable person. Instead, blockchain transactions are recorded using public keys – essentially random strings of numbers and letters – that correspond with a user's public account. The user will also have a private key – a separate string of numbers and letters – that allows account holders to access their own cryptocurrency from their own digital wallets.²⁰

The other method of verifying the recorded information, as well as ensuring that the information is safe and reliable, is related to the decentralised nature of the blockchain. Each block of information passes through a series of networked computers, called 'nodes', each of which is verifying the transaction that has been made on the blockchain.

Blockchain technology removes fraudulent transactions. Compared with existing methods of verifying and validating transactions by third-party intermediaries, blockchains' security measures make blockchain validation technologies more transparent and less prone to error and corruption. While blockchains' use of digital signatures helps establish the identity and authenticity of the parties involved in the transaction, the completely decentralized network connectivity via the Internet allows the most protection against fraud. Network connectivity allows multiple copies of the blockchain to be available to all participants across the distributed network. The decentralized, fully distributed nature of the blockchain makes it practically impossible to reverse, alter, or erase information contained in it.²¹

¹⁷ See Wulf Kaal and Craig Calcaterra, 'Crypto Transaction Dispute Resolution' (2017) 73(1) *Business Lawyer* 109, 114.

¹⁸ Vitalik Buterin, 'On Public and Private Blockchains', *Ethereum Blog* (Blog Post, 6 August 2015) <<https://ethereum.github.io/blog/2015/08/07/on-public-and-private-blockchains/>>. Also explaining that private blockchains are possible.

¹⁹ Kaal and Calcaterra (n 17) 111.

²⁰ See *ibid* 111 stating that blockchain users enjoy 'absolute privacy' within the blockchain ecosystem.

²¹ Kaal and Calcaterra (n 17) 115 (citations omitted).

Put another way, the decentralised network uses a set of shared rules to verify each piece of information that is recorded in the chain. ‘Information already contained in a verified blockchain cannot be overwritten without reaching consensus with the entire network to propagate the altered information. So, while this is not to say that . . . invalid data cannot be posted, a strong effort is needed to do so.’²²

Because the blockchain has these independent, but interrelated, verification mechanisms – public view and decentralisation – the promise is that transactions carried out on the blockchain will be safe and reliable because they can be easily and definitively verified, with very little ability for bad actors to manipulate, falsify or change the records. Of course, the reality of safety and trust on the blockchain is still being determined, especially in light of high-profile cryptocurrency thefts,²³ such as the hack of cryptocurrency exchanges Mt Gox,²⁴ Poloniex,²⁵ and Bitfinex,²⁶ as well as the hacking of mobile phones that allowed for access to user’s cryptocurrency wallets.²⁷

Blockchain technology has also facilitated the creation of ‘smart contracts’ that allow for peer-to-peer agreements to be arranged over the blockchain. In essence, a smart contract is a piece of code that is embedded in the blockchain infrastructure.²⁸ The code allows for the translation of ‘legal prose into an executable program.’²⁹ The result is the creation of an algorithm that ‘carr[ies] out one or several pre-established operations, according to the ‘if...., then...’ principle. In other words, as soon as the necessary execution conditions are met, the operation is automatically carried out.’³⁰ Examples of smart contracts are Apple’s iTunes built in agreement that purchased songs can only be played on a limited number of devices;³¹ an automated banking transfer that is set to occur following a defined event;³² or the payout of a sports wager that occurs immediately following the outcome of the match.³³ Each of these examples

²² Raskin (n 15) 318 (citation omitted).

²³ See generally Mike Orcutt, ‘Once Hailed as Unhackable, Blockchains Are Now Getting Hacked’, *MIT Technology Review* (News Article, 19 February 2019) <<https://www.technologyreview.com/s/612974/once-hailed-as-unhackable-blockchains-are-now-getting-hacked/>>.

²⁴ See Robert McMillan, ‘The Inside Story of Mt. Gox: Bitcoin’s \$460 Million Disaster’, *Wired* (News Article, 3 March 2014) <<https://www.wired.com/2014/03/bitcoin-exchange/>>.

²⁵ Pete Rizzo, ‘Poloniex Loses 12.3% of its Bitcoins in Latest Bitcoin Exchange Hack’, *Coindesk* (News Article, 5 March 2014) <<https://www.coindesk.com/poloniex-loses-12-3-bitcoins-latest-bitcoin-exchange-hack>>.

²⁶ Reuters, ‘Bitcoin Worth \$72M Was Stolen in Bitfinex Hack in Hong Kong’, *Fortune* (News Article, 3 August 2016) <<http://fortune.com/2016/08/03/bitcoin-stolen-bitfinex-hack-hong-kong/>>.

²⁷ Kate Rooney, ‘Hacker Lifts \$1 Million in Cryptocurrency Using San Francisco Man’s Phone Number Prosecutors Say’, *CNBC* (News Article, 21 November 2018) <<https://www.cnn.com/2018/11/21/hacker-lifts-1-million-in-cryptocurrency-using-mans-phone-number.html>>.

²⁸ See, eg, Primavera De Filippi and Aaron Wright, *Blockchain and the Law: The Rule of Code* (Harvard University Press, 2018) 74; Laila Metjahic, ‘Deconstructing the DAO: The Need for Legal Recognition and the Application of Securities Laws to Decentralized Organizations’ (2018) 39(4) *Cardozo Law Review* 1533, 1538–39; Olivier Hari and Ulysse Pasquier, ‘Blockchain and Distributed Ledger Technology (DLT): Academic Overview of the Technical and Legal Framework and Challenges for Lawyers’ (2018) *International Business Law Journal* 423, 434; Raskin (n 15) 309–10; Kaal and Calcaterra (n 17) 116.

²⁹ Raskin (n 15) 309.

³⁰ Hari and Pasquier (n 28) 434 (emphasis in original).

³¹ Wulf and Calcaterra (n 17) 116.

³² Raskin (n 15) 310.

³³ Metjahic (n 28) 1539.

demonstrates how the programming of a smart contract can have ‘control over the physical and digital objects needed to effect execution.’³⁴

This automatic execution is key to the operation of smart contracts as it allows for the smart contract to be decentralised. Rather than requiring human intervention to execute, the contract executes itself following the occurrence of some defined, possibly real-world, event.³⁵ ‘A smart contract does not rely on the state for enforcement, but is a way for contracting parties to ensure performance.’³⁶ The contents of the smart contract, like all other information recorded on a public blockchain, is available to be viewed by anyone with an internet connection.³⁷ However, even though the terms of the contract are publicly accessible, the identities of the contracting parties are still represented by the random string of numbers and letters that comprise the user’s public key. This means that parties could enter into a smart contract on the blockchain without ever knowing who is on the other side of that contract.³⁸ Because the contract is self-executing, there is not necessarily a need to know the identity of the counterparty because performance and execution is guaranteed through the automation built into the code.

What is still largely undetermined is how parties, particularly when those parties are unknown to one another, are to settle disputes that arise following the automatic execution of a smart contract. It is possible that parties can still rely on traditional and existing courts and ADR processes such as mediation and arbitration to address smart contract issues.³⁹ But, reliance on these institutions may not be so simple. In the first instance, there may be complications regarding whether and how a court has jurisdiction over the dispute or over one or all of the parties to the smart contract.⁴⁰ Even if a court had jurisdiction over known parties, issues of contract interpretation may arise, especially because the contract is not written in plain language, but rather in the language of executable computer code.⁴¹ The code may not be capable of straightforward interpretation, even by other computer programmers,⁴² and may not be flexible enough as a language to represent the parties’ intent in forming the contract or defining their relationship that is to be governed by it.⁴³

A further issue with respect to contract terms is that courts will necessarily be addressing issues that have arisen after the self-execution of the smart contract. In other words, rather than the likely usual circumstance where a party to a contract does not perform some obligation, whether taking action or making payment, and the court can address the issues of breach prior to the execution of the performative terms of the contract, a court addressing issues on smart contracts will be looking at the circumstances after the contract has already executed itself.⁴⁴ It is unclear how a court

³⁴ Raskin (n 15) 309–10.

³⁵ The information about real-world events can be imported into the contract code through the use of ‘oracles’, or external, possibly centralised sources (eg, information from the New York Stock Exchange): See Metjahic (n 28) 1540.

³⁶ Raskin (n 15) 310.

³⁷ See Metjahic (n 28) 1539.

³⁸ Ibid.

³⁹ See Filippi and Wright (n 28) 74; Wulf and Calcaterra (n 17) 136.

⁴⁰ See Wulf and Calcaterra (n 17) 135–36 (citing sources on jurisdictional issues).

⁴¹ See Filippi and Wright (n 28) 84; Wulf & Calcaterra (n 17) 136.

⁴² See Wulf and Calcaterra (n 17) 136.

⁴³ See Filippi and Wright (n 28) 84–85; Hari and Pasquier (n 28) 444.

⁴⁴ See Raskin (n 15) 311.

would be able to unwind, much less stop, smart contract execution since that step is built into the code and cannot, easily or altogether, be altered.⁴⁵ Further, however, it is unclear how a court is to deal with circumstances that were not obviously contemplated by the parties because the specific circumstance is not written into the code and the contract has already executed itself. An example of this situation is if a traveler entered into a smart contract with a travel insurer for a payment to be made in the event that the traveler's flight arrived late.⁴⁶ The smart contract would execute itself and make payment to the traveler even if the flight was late because the traveler was solely responsible for the flight delay.

The use of voluntary ADR could be one method of working around these complications, but traditional ADR may not be an ideal solution for at least a couple of reasons. First, the problem of anonymity remains an issue. A party wishing to engage in mediation or arbitration offline would have to know with whom they have been dealing in order to arrange the proceedings.⁴⁷ Compounding the problem is that even if the identity of the party is known, or can be discovered, all parties would have to agree to participate in the process in order for it to work.

More fundamental to the use of the blockchain, however, is that any of these resolution mechanisms, whether the courts or traditional ADR, are centralised procedures that defeat the proffered benefits of transacting on an entirely decentralised system within a decentralised network. Those that are using the blockchain may want to ensure that they are never forced to interact with the centralised world once they have engaged with the decentralised blockchain. Thus, it may be preferable to have an online, on-blockchain protocol of dispute resolution that can be written into the smart contract that would avoid the issues associated with identification, jurisdiction and centralisation of the dispute resolution process.

III DISPUTE RESOLUTION ON THE BLOCKCHAIN

The platforms discussed below are offered by their developers as the solution to the problems just described. Each platform promises to provide a method of resolving disputes that gives parties to a smart contract an option to include an automatically available dispute resolution mechanism that can be encoded directly into the contract. The smart contract itself would still ultimately be self-executing, but the dispute resolution mechanism would allow for the automation of the execution to be suspended pending the outcome of the dispute. How that outcome is determined is one of the factors that differentiate these platforms from one another. Understanding the similarities and differences amongst the platforms may help to determine if one or another contains elements that might be more desirable to support, on either a practical or normative analysis. Understanding the platforms may also assist in identifying the normative questions that should be further considered in terms of the procedural fairness that can be offered by decentralising dispute resolution in the way that these platforms propose.

⁴⁵ Ibid.

⁴⁶ Hari and Pasquier (n 28) 443.

⁴⁷ See Filippi and Wright (n 28) 85.

A *OpenLaw*

At the most basic end of the spectrum are platforms that merely facilitate the drafting and implementation of a smart contract, without also providing a dispute resolution protocol. One example of this is OpenLaw.⁴⁸ OpenLaw presents itself as primarily a resource for the legal industry as it is pitched toward lawyers who are engaged in advising clients on smart contracts. As explained on its website, ‘Using OpenLaw, lawyers can more efficiently engage in transactional work and digitally sign and store legal agreements in a highly secure manner, all while leveraging next generation blockchain-based smart contracts.’⁴⁹ OpenLaw is an open source repository for smart contract templates, with more than 500 currently available.⁵⁰ OpenLaw also provides what it calls ‘Legal Markup’ language, which allows drafters to modify the existing templates with plug-in code to enable features such as ‘if → then logic, aliasing, multi-variable expressions, hidden variables, and . . . basic calculations.’⁵¹

This is hardly the only source for smart contract templates,⁵² but does demonstrate a still reasonably early effort to disseminate smart contract drafting principles to the greater legal community. The issue of resolving disputes related to those contracts is, however, not addressed.

B *Mattereum Protocol*

A further step toward blockchain-based dispute resolution has been made by the developers of the Mattereum Protocol (‘Mattereum’), which describes itself as a way of ‘turning law into code.’⁵³ The foundation for the Mattereum is the use of what is known as a Ricardian contract, which was invented in 1995 by Mattereum’s Chief Scientist, Ian Grigg.⁵⁴ A Ricardian contract is a method of converting a plain-language document, including a natural language contract, into a digital, computer-readable format that can also be electronically signed by the parties and recorded on the blockchain.⁵⁵ The advantage of the Ricardian contract is that even after it is digitised, it still retains its natural language format, so it can still be read by people without needing expertise in programming languages and computer code.⁵⁶ This goes some way toward alleviating the issue referred to above of misunderstanding and complexity of interpretation that come from the rigidity and limitations of using code to express basic contract and relational terms.

⁴⁸ *Open Law* (Website) <<https://openlaw.io>>.

⁴⁹ *Open Law* (Website) <<https://openlaw.io/faq>>.

⁵⁰ *Open Law* (Website) <<https://app.openlaw.io/templates>>.

⁵¹ *Open Law* (n 50).

⁵² See, eg, *Contract Vault* (Website) <<https://www.contractvault.io>>; *GitHub* (Website) <<https://github.com/topics/smart-contract-template>>; Arjuna Kok, ‘Write a Simple Contract On Top of Ethereum’ *Coinmonks* (Blog Post, 2 May 2018) <<https://medium.com/coinmonks/write-a-simple-contract-on-top-of-ethereum-92b543594e84>>.

⁵³ See *Mattereum* (Website) <<https://mattereum.com>>.

⁵⁴ See Vinay Gupta et al, ‘Smart Contracts Real Property’ (Working Paper, Matereum) 2, 2 <https://mattereum.com/upload/iblock/af8/mattereum_workingpaper.pdf> (‘Mattereum Working Paper’); Iftikhar Alam, ‘What Are Ricardian Contracts? A Complete Guide’ *101 Blockchains* (Website, 28 Oct 2018) <<https://101blockchains.com/ricardian-contracts/>>.

⁵⁵ Gupta et al (n 54) 9; Alam (n 54).

⁵⁶ Gupta et al (n 54) 9.

Mattereum's focus is on using these Ricardian contracts as the basis for creating an infrastructure within which property ownership, tokenisation of property and eventually full transfer and sale of property can occur entirely on the blockchain. As explained in late 2018 in its Summary White Paper, Mattereum has taken the initial concept of using Ricardian contracts and has begun to apply it to an actual piece of owned property – a Stradivarius violin worth USD \$9,000,000.⁵⁷ To build the infrastructure that allows for asset management and governance and to bridge the gap between the blockchain and the real-world (in which the physical violin actually exists), Mattereum has instituted what it calls a 'governing committee' that will have 'legal decision-making powers over the instrument, protecting and curating it on behalf of the token holders and posterity, in accordance with a written constitution.'⁵⁸ This concept of the 'governing committee' seems (though it is unclear exactly how since the governing committee is never mentioned again in the Mattereum White Paper) to intersect with the related concept of the 'automated custodian',⁵⁹ which is to be created for each asset managed by the smart contract.⁶⁰ The automated custodian is the term given to the entity that is designated the 'legal owner and *registrar*, maintaining the authoritative register of interests in the asset.'⁶¹ As legal owner at least for the duration of the smart contract, the registrar is able to enter into sub-contracts, including licenses, or subdivide ownership of the asset through the use of shares or digital tokens, so long as such sub-agreements are in accordance with the governing constitution.⁶²

To use the example of the violin, the constitution might provide that the violin cannot merely remain in a vault appreciating in value, but instead has to be played publicly.⁶³ The constitution might specify that the violin must be played in no fewer than six concerts per year in no fewer than three countries.⁶⁴ The registrar of the asset would then be obligated to ensure that no subsidiary agreements were made that would defeat this governance requirement.⁶⁵ The governance structure could also establish a 'curatorial board' to make decisions such as which violinists should have priority to play the instrument, which concerts and countries are to be preferred and when and how the instrument should be serviced and maintained.⁶⁶

The conditions that are placed on the violin can be administered through the use of digital 'tokens', the creation of which is available on blockchains such as Ethereum.⁶⁷ Mattereum envisions the use of two separate kinds of tokens related to the assets – financial benefit (or security) tokens and right of use (or utility) tokens.⁶⁸ The financial

⁵⁷ The Mattereum Team, 'Mattereum Protocol: Turning Code into Law' (Summary White Paper, Mattereum) 1, 1 <https://cms.mattereum.io/upload/iblock/784/mattereum-summary_white_paper.pdf> ('Mattereum White Paper').

⁵⁸ Ibid 1.

⁵⁹ Ibid 3.

⁶⁰ See *ibid*.

⁶¹ Ibid (emphasis in original).

⁶² Ibid.

⁶³ See *ibid* 3, 11.

⁶⁴ Ibid 3.

⁶⁵ Ibid 11.

⁶⁶ Ibid.

⁶⁷ See, eg, Daniel Frumkin, 'What Are Ethereum Tokens? ERC-20, ERC-223, ERC-721, and ERC-777 Tokens Explained' *Invest in Blockchain* (Blog Post, 30 July 2018) <<https://www.investinblockchain.com/what-are-ethereum-tokens/>>.

⁶⁸ Mattereum White Paper (n 57) 10.

benefit tokens would essentially represent an investment interest in the asset and grant the holder a right to be paid a portion of the asset's value upon sale or to receive a portion of the income generated through licensing. The right to use token could be granted to give a token holder the right to 'access, possess, play, remix, display, or otherwise interact with the asset.'⁶⁹ As with all public blockchain records, all contract and governance terms, the register of assets and the list of holders of tokens would be publicly available, though the identities of any individuals would not be.

The Mattereum White Paper claims that the focus as it has been developing this infrastructure has been on dispute avoidance rather than on dispute resolution,⁷⁰ which may explain why very little mention is made about the actual plan to resolve disputes. Interestingly, the Mattereum Working Paper does address initial ideas about resolving disputes that may arise regarding the assets, but these ideas are all framed in terms of a vaguely defined arbitration process.⁷¹ The Mattereum Working Paper makes several references to the decentralised nature of the enterprise,⁷² yet the introduction of arbitration as the means to resolve disputes first refers to the necessity of a 'body of law' to be applied,⁷³ as well as a reference to the Convention on the Recognition and Enforcement of Foreign Arbitral Awards.⁷⁴ The main reference to arbitration then refers to the use of 'arbitration associations',⁷⁵ which are described in terms that suggest that the authors are contemplating centralised, existing arbitration providers (though the ultimate meaning is unclear and never fully defined).⁷⁶

This does not necessarily mean that there is a failure in not providing fully decentralised dispute resolution, and as the normative questions around decentralised dispute resolution continue to evolve, it may be that decentralised dispute resolution is not a good idea at all,⁷⁷ but it does point to a lack of clarity as to where Mattereum's priorities lie. The Working Paper does provide a clue as to Mattereum's priorities as an investment vehicle and property management business rather than as a developer interested in advancing blockchain-based dispute resolution. In the Business Model section, the Mattereum Working Paper states:

We believe that the correct approach to this space is not to directly intermediate any of the value flows (this is, after all, meant to be a decentralization exercise!) but rather for Mattereum to have a dual nature: setting up the infrastructure, and then acting as a (lead) investor in the companies that are coming into the space to build businesses in the ecosystem [sic].⁷⁸

If Mattereum is intended to be more of an investment and property management platform, rather than a dispute resolution oriented one, it should not be that much of a surprise that its approach to resolving blockchain-based disputes is fairly rudimentary. Still, it is a step forward in attempting to use the technology to address disputes that arise on the blockchain.

⁶⁹ Ibid.

⁷⁰ Ibid 2.

⁷¹ See Gupta et al (n 54) 20.

⁷² Ibid 8, 18, 45.

⁷³ Ibid 8.

⁷⁴ Ibid.

⁷⁵ Ibid 20.

⁷⁶ Ibid.

⁷⁷ See Metzger (n 14).

⁷⁸ Gupta et al (n 54) 18.

C *Rhubarb Fund*

Many of the remaining platforms to be discussed use some form of crowdsourcing of decision-making by putting disputes to a public vote. One of the simpler of these kinds of platforms is Rhubarb Fund ('Rhubarb') which presents itself as a kind of hybrid dispute resolution and investment vehicle. As described in its White Paper, 'Rhubarb . . . is changing the way disputes are resolved by developing, funding, and promoting rapid distributed consensus mechanisms (RDCM's) that make faster, cheaper, and more democratic forms of civil justice possible'.⁷⁹ To provide this consensus-based dispute resolution, Rhubarb is going to be issuing its own proprietary digital token, the RHUCoin.⁸⁰ Holders of RHUCoin, or at least those that obtain RHUCoins through the Initial Coin Offering ('ICO'), are described as investors in Rhubarb, who will 'share in future appreciation derived from expanding usage of, and demand for, new forms of distributed dispute resolution, legal settlement administration, and other evolutions in decentralised law that Rhubarb develops and/or invests in.'⁸¹ Rhubarb is positioning itself not just as a contract administrator or provider or as a dispute resolution platform, but rather states that it will serve 'both as an investor in legal tech and a developer and promoter of 'new law' innovations using blockchain, cryptocurrency, and other distributed processes.'⁸²

The RCDM method of dispute resolution being provided and facilitated by Rhubarb takes the form of a 'poll verdict' which is simply the result of a poll of all RHUCoin holders who submit votes as jurors.⁸³ The mechanism for resolution of disputes through Rhubarb is relatively straightforward: the party raising the dispute posts it on Rhubarb's dispute portal, along with proposed resolution options. The example provided by Rhubarb is that an insured has a dispute with her insurer over an auto insurance claim.⁸⁴ The insured posts the dispute and proposes three solutions on which jurors can vote: the insurance company pays the full amount of the claim; the insurance company pays half the amount of the claim; or the insurance company pays nothing. Jurors may also be given an option to suggest further resolution options. The party registering the dispute can then decide the maximum number of jurors that can register votes and the distribution of the background and experience of those jurors. For example, if the insured was a New South Wales resident, she could designate that the matter be decided by a maximum of 1000 jurors, with 400 of them to be consumer advocates, 250 insurance professionals and 350 NSW consumers. The parties can then agree as to the effect of the decision reached by the jury – the outcome can be treated as arbitral and binding; mediative and non-binding; or as a form of expert opinion for the parties to consider.⁸⁵

In order to register a vote, the jurors deposit one of their RHUCoins and submit their decision. It is unclear whether or how Rhubarb intends to prevent the parties from

⁷⁹ 'Rhubarb Fund ICO: Pre-Sale White Paper' (White Paper, RHUbarb Fund, 1 November 2018) 2, 2 ('Rhubarb White Paper').

⁸⁰ Ibid.

⁸¹ Ibid 3.

⁸² Ibid.

⁸³ Ibid 8.

⁸⁴ See 'How Poll Verdicts Work' *RHUBarb* (Website) <<https://www.rhucoin.com/how-rhu-works.aspx>>; See also Rhubarb White Paper (n 79) 8–9.

⁸⁵ Rhubarb White Paper (n 79) 9.

holding RHUCoins and deciding their own cases or whether and how jurors will be restricted from voting more than once. This lack of clarity speaks to the necessity of further inquiry into normative questions related to the integrity of the platforms and the integrity of juror voting.

The end result of the voting is a set of consensus decisions – the overall consensus of all jurors and the consensus decision of each designated group of jurors, each of which may provide the parties with useful information, particularly where the overall result is non-binding.⁸⁶ Jurors who do not vote with the overall consensus will forfeit their deposited RHUCoins, which will be redistributed pro-rata to the jurors in the consensus group.⁸⁷ Incentives are also provided for jurors who suggest resolution options that become the consensus. Those jurors must deposit more than the standard 1 RHUCoin in order to suggest an option but will receive a five-times bonus return if their suggested option achieves overall consensus.⁸⁸ In this way, the RDCM process is described by Rhubarb as ‘self-funding.’⁸⁹

As of this writing, Rhubarb has 22 cases open for voting,⁹⁰ each of which allow voters to earn RHUCoins, which are not yet generally available either through the ICO or direct purchase on a token exchange.⁹¹ In addition, three cases are listed as closed and one as having been settled by the parties. The ICO is scheduled to take place sometime in the first half of 2019.⁹²

D *Jury.Online*

Jury.Online, which has been in operation since September 2018,⁹³ is another hybrid platform, combining the ability for consumers to invest in ICO projects with a dispute resolution mechanism for issues associated with those investments.⁹⁴ Jury.Online contains fairly specific requirements for deal offerors who are posting deals, in the form of smart contracts, to the platform. Primarily, any deal offered through Jury.Online must include a set of ‘Milestones’ that are intended to give investors guidance as to whether the terms of the deal are being fulfilled and to serve as the basis for any disputes that may arise.⁹⁵ The smart contract must also include a method for dispute resolution, which may include identifiers for the pool of judges that will be used to resolve the dispute.⁹⁶

The actual dispute resolution process is not entirely clearly described at present. The process is referred to both as arbitration (in text under the heading ‘Refund’)⁹⁷ and as

⁸⁶ See *ibid.*

⁸⁷ *Ibid.*

⁸⁸ *Ibid.* 10.

⁸⁹ *Ibid.*

⁹⁰ *RHUbarb* (Website) <<https://www.rhucoin.com/active-polls/>>.

⁹¹ See, eg, ‘Professional Trading Now Open to Everyone’ *Bitfinex* (Website) <<https://www.bitfinex.com/>> (‘Bitfinex’).

⁹² See *RHUbarb* (Website) <<https://www.rhucoin.com/our-story.aspx>>.

⁹³ *Ibid.*

⁹⁴ See *Jury.Online* (Website) <<https://jury.online>>.

⁹⁵ See ‘Jury.Online White Paper’ (White Paper, No 2.5, Jury.Online, 15 March 2019) <https://about.jury.online/images/Jury_Online_V2_5_Whitepaper.pdf> (‘Jury.Online White Paper’) 5.

⁹⁶ *Ibid.* 4.

⁹⁷ *Ibid.* 7.

mediation (in the heading ‘Mediation Decision-Making Procedure’),⁹⁸ suggesting there may be some confusion about the effect of process and terminology. The intent from the description seems to be that Jury.Online will be providing a binding resolution, but this is not clear either, pointing again to questions surrounding the integrity of the platform and the decision-making process that is being utilised. A party that wishes to initiate a dispute will have to do so within the parameters, including time-frame, established by the terms of the smart contract (e.g. within three days of a Milestone).⁹⁹ Initiating the dispute will then automatically trigger the process for appointing the judges who will decide the outcome. The judges will come from a ‘pool’, also recorded on the blockchain, that is a constantly-updating list of active judges, any of which may be selected to resolve the dispute.¹⁰⁰ It appears that the current mediator/judge pool can be viewed on Jury.Online’s website.¹⁰¹

The pool of judges could come from this set of ‘mediators’ who are registered by Jury.Online, but the smart contract could also designate that the judges be selected from a third-party service provider.¹⁰² The judges remain anonymous from the parties and anonymous from each other. Though the parties do not know the identities of the judges, the competence of the judges is revealed to the parties, though the Jury.Online White Paper does not specifically state how this is to be communicated.¹⁰³ The parties could also agree to appoint a known judge, rather than anonymous random judges,¹⁰⁴ though it is not clear if this choice would have to be designated in the smart contract or could be addressed when the dispute arises. Judges are incentivised to participate in the process, and to render reasoned decisions, because they are rated based on the judgments they make and receive compensation for rendering decisions. According to the Jury.Online White Paper, these incentives should cause judges to resolve disputes ‘fairly and correctly, rather than to randomly pass their verdicts,’¹⁰⁵ but nothing is provided to indicate how the developers of the platform are conceiving of gauging or measuring either fairness or correctness. These issues point to further normative concerns regarding the effectiveness of incentives being provided to decision makers.

E *Aragon Network*

Aragon Network (‘Aragon’) describes itself as ‘the world’s first digital jurisdiction.’¹⁰⁶ It purports to provide dispute resolution solutions for decentralised autonomous organisations (‘DAOs’), which can be defined as ‘a set of smart contracts that encode the bylaws of the entire organisation’ and that are ‘designed to run autonomously on a blockchain and ... solely controlled by code, without any need for human involvement.’¹⁰⁷ The human side of DAO operation is, of course, that these organisations have real-world utility and facilitate transactions between people, possibly resulting in disputes. Aragon proposes to offer a means to resolve these disputes through its network.

⁹⁸ Ibid.

⁹⁹ Ibid.

¹⁰⁰ Ibid 6, 8.

¹⁰¹ See *Jury.Online* (Website) <<https://about.jury.online/mediators>>.

¹⁰² *Jury.Online White Paper* (n 95) 8.

¹⁰³ See *ibid*.

¹⁰⁴ Ibid.

¹⁰⁵ Ibid.

¹⁰⁶ See *Aragon Network* (Website) <<https://aragon.org/network>>.

¹⁰⁷ Metjahic (n 28) 1543–44.

First, Aragon states that agreements entered into between a person and the DAO will be in some kind of human-readable, natural language form, as well as a computer-readable one.¹⁰⁸ This human-readable agreement appears as if it will differ in some respect from the Ricardian contract promoted by Mattereum, since Aragon is not adopting Mattereum's protocol, which it describes as not suitable for 'blockchain-native' entities that do not have a physical, real-world analogue, such as a piece of property.¹⁰⁹ The parties to each side of the agreement will have to deposit collateral in the form of an Aragon Network Token ('ANT') that will remain deposited for the life of the contract in case a dispute arises.¹¹⁰ The disputes related to these agreements will then be adjudicated in Aragon's network courts, which operate as arbitral forums.¹¹¹ Following the initiation of the dispute, Aragon's system will randomly select five jurors who have 'activated' their reputation, which is earned by having previously been in the majority of deciding judges in prior disputes.¹¹²

Aragon's courts operate on two related game-theory principles. The first, which is used by other platforms discussed below, is the Schelling Point.¹¹³ A Schelling Point assumes that there will be a consensus result that independent actors would arrive at because it is a logical outcome.¹¹⁴ For example, a simple Schelling Point would be that if a person was to be meeting a stranger in Sydney and neither party had previously suggested a meeting time and place, both parties might independently suggest meeting at noon at Town Hall because that would be a natural and common time and place. The assumption that jurors will arrive at a Schelling Point, and that that Schelling Point will necessarily be the 'correct' outcome for the dispute, is further established through the system of reputation debits and credits that are associated with the jurors' decisions. Any juror that is part of the Schelling Point consensus will earn reputation, whilst any juror who is outside of the consensus will be penalised with a deduction of reputation. The ability of the Schelling Point to provide for a normatively justified 'correct' result is another issue related to platforms such as Aragon that requires further consideration.

Aragon adds another layer of game theory meant to deter or eliminate the possibility of juror bribery by requiring that all jurors agree to a code of conduct that defines their responsibilities as jurors.¹¹⁵ The sample code provided in the Aragon White Paper includes terms such as that a juror will flag their case for review if either party attempts to bribe the jury, and will vote for the non-bribing side, or that the juror will dismiss any case in which both parties seek to bribe the jury.¹¹⁶ This mechanism is described as a 'metagame with a Nash equilibrium that favours honest jurors over malicious agents and dishonest jurors attempting to influence court decisions.'¹¹⁷ Fees have to be

¹⁰⁸ See 'Aragon Network' (White Paper, Aragon Network, 29 August 2018) <<https://github.com/aragon/whitepaper>> ('Aragon White Paper').

¹⁰⁹ Ibid.

¹¹⁰ Ibid 1.

¹¹¹ Ibid.

¹¹² Ibid 2–3; See also Tatu Karki and Aragon, 'Aragon Network Jurisdiction Part 1: Decentralized Court' *Aragon Network* (Website, 18 July 2017) <<https://blog.aragon.org/aragon-network-jurisdiction-part-1-decentralized-court-c8ab2a675e82/>>.

¹¹³ See generally Aragon White Paper (n 108).

¹¹⁴ See Thomas Schelling, *The Strategy of Conflict* (Harvard University Press, Cambridge, 1960).

¹¹⁵ Aragon White Paper (n 108) 3.

¹¹⁶ Ibid.

¹¹⁷ Ibid.

staked by the parties to the dispute, which are distributed to the jurors.¹¹⁸ This again raises issues regarding the ability of incentives, particularly game theory-based incentives, to moderate juror behaviour.

Appeals are available following the adjudication of a dispute, but judges will be limited to those with the highest reputation and the fees that the parties will have to stake will also increase.¹¹⁹ Aragon's hierarchical court structure also includes a supreme court, which 'enforces and encodes the community values of the Aragon Network.'¹²⁰ The supreme court will have final appellate review over any disputes that escalate to that level and the supreme court jury will be composed of the top nine judges who received the most payouts based on their prior decisions within the network.¹²¹

F *Jur*

Jur similarly promises to provide a solution for parties to create and enter into smart contracts that can include a built-in dispute resolution mechanism via Jur's platform.¹²² Jur also uses a system of game theory incentives, supported by its token also called 'Jur' to encourage participation and honest, considered decision-making. In Jur's system, the parties to a contract can designate the dispute resolution mechanism as either open or closed.¹²³ If open is selected, then any Jur token holder may serve as a juror. If a 'Closed Hub' is chosen, only a subset of vetted jurors who meet designated conditions may decide a dispute.¹²⁴ No fee is charged to either party in the dispute and the jurors are compensated solely by the redistribution of tokens from non-majority jurors to the majority ones.¹²⁵ The parties are required to propose a resolution option, which the jurors will consider when voting.¹²⁶

Jur's redistribution of tokens to the majority is unique amongst the existing platforms. Rather than distributing tokens pro-rata to all jurors in the majority, Jur will only redistribute tokens to those jurors that were *necessary* to comprise the majority, in other words the first votes cast on what ends up as the majority side.¹²⁷ For example, if 15 tokens were voted in a dispute of A v B, 10 for A and five for B, the five tokens that were voted for B would be forfeit as B lost the dispute. However, only 5.1 votes were needed to establish the majority for A. So, the five tokens forfeit by the B voters will be redistributed pro-rata only to those 5.1 voting jurors who voted for A first. The number of votes on each side will also always be visible to all jurors.¹²⁸

According to the Jur White Paper, this system should incentivise jurors to vote for the minority at the time of vote-casting if they believe the minority has the right position and will ultimately prevail (rather than simply voting with the then-majority to ensure retention of tokens), since a juror will only be rewarded with more tokens if enough of

¹¹⁸ Ibid 4.

¹¹⁹ See *ibid.*

¹²⁰ Ibid 2.

¹²¹ See Karki and Aragon (n 112).

¹²² See *Jur* (Website) < <https://jur.io> >.

¹²³ Jur, 'Decentralized Dispute Resolution Infrastructure' (White Paper, V.0.3, Jur) 8, 15 <<https://jur.io/content/uploads/2018/07/JUR-WhitePaper-v0.3-eng.pdf>> ('Jur White Paper').

¹²⁴ Ibid.

¹²⁵ Ibid 20.

¹²⁶ Ibid 45.

¹²⁷ Ibid 21, 44.

¹²⁸ Ibid 44.

the other jurors side with the minority to make that juror's majority vote 'count'.¹²⁹ Jur's system will also restrict voting for the majority when the majority votes exceed that of the minority vote by 200%, so as not to allow for an insurmountable advantage for the then-majority. These innovations may address some of the issues associated with platform design and operational integrity. The effectiveness of any incentives in this area, however, still requires further consideration.

G OATH Protocol

OATH Protocol ('OATH') seeks to provide a dispute resolution mechanism that can be incorporated into any smart contract,¹³⁰ rather than seeking to provide smart contract drafting as well.¹³¹ OATH assumes that any community user with blockchain experience has both common sense and sufficient knowledge to be able to evaluate evidence and make reasoned decisions to decide disputes.¹³² This seems to be another way of expressing reliance on consensus decision-making to support the claims of fairness in resolving these blockchain disputes.

OATH makes specific reference to the selection of common law juries as a point of comparison for its eventual jury pool, since juries are an initially random collection of community members who come together to resolve disputes in court. OATH claims, without providing additional proof of the claim, that where a jury makes a decision '[a]ll community members share the consensus that underlies the verdict ...'¹³³ OATH, therefore, describes its model as essentially transporting the jury system onto the blockchain. The blockchain technology, in turn, is described as being able to 'ensure the authentication of smart contract agreements and immutability of the evidence provided by the parties.'¹³⁴ No further proof is offered to support the claim that evidence should be considered 'immutable' merely because it is related to an agreement that is on the blockchain, since that evidence is likely to relate to real-world activities and real-world actions rather than existing entirely on the network.

OATH's most unique feature seems to be its commitment to a diverse set of jurors that will be selected from its pool by its algorithm. OATH states that whilst the identity of all jurors will remain anonymous, any juror that registers will have to provide information such as 'age, gender, nationality, occupation and education level.'¹³⁵ OATH's algorithm will then select most of the jurors to decide a particular dispute based on those categories. Rather than redistributing tokens, OATH will assign each juror a credit level, with increased credit given to jurors who vote in a majority decision and credit being deducted from those who render 'serial wrong judgments.'¹³⁶ A higher credit rating results in higher rewards and increased odds of being selected for future disputes. Jurors will also earn arbitration fees, to be paid out of tokens deposited by the disputing parties. This system seems to be an attempt to address some issues of the integrity of the juror recruitment process, though questions surrounding the

¹²⁹ Ibid.

¹³⁰ See *Oath Protocol* (Website) <<https://oaths.io/en/>>.

¹³¹ See Yin Xu, 'OATH Protocol: Blockchain Alternative Dispute Resolution Protocol' (White Paper, No 2.5.0, Oath Protocol) 2 <<https://oaths.io/files/OATH-Whitepaper-EN.pdf>>.

¹³² Ibid 7.

¹³³ Ibid 8.

¹³⁴ Ibid.

¹³⁵ Ibid.

¹³⁶ Ibid 9.

effectiveness of incentive structures once those jurors are chosen to determine a matter still remain.

The parties to a smart contract that designates OATH as the dispute resolution protocol will include a resolution plan in the smart contract code. This plan can consist of specifics such as the number of jurors, the percentage of votes needed to prevail, and the category requirements of the jurors to be selected.¹³⁷ Once a dispute is initiated, OATH sends out notifications to the prospective juror pool, with information including the arbitration fees and other ‘key details of the case.’¹³⁸ Jurors can then decide whether they wish to participate in the decision. It is possible that not enough jurors will elect to decide the case, in which case OATH will ‘reject’ the parties’ resolution plan and require that they amend it to further incentivise juror participation, such as by increasing the award to jurors or decreasing the number needed.¹³⁹ This suggests that market forces may be dictating, at least to some degree, the dispute resolution processes available to the parties. OATH, however, states that the revision of the resolution plan ‘allows the parties to control and manage the cost of resolving their dispute.’¹⁴⁰

Jurors are incentivised to participate in the process actively by taking part in deliberation discussions about the evidence submitted by the parties. Jurors may earn bonus payouts and additional credit if they address ‘critical points’ and participate in the discussion.¹⁴¹ Just who is to identify a critical point and how it is to be assessed is not disclosed or otherwise explained. Appeals may be initiated for additional fees to the parties and the smart contracts are programmed to accept up to two appeals.¹⁴²

H *Juris*

Juris is the most structured of the current set of blockchain-based, dispute resolution options.¹⁴³ Juris also uses its own token, the ‘JRS’, to incentivise juror behaviour, but before jurors are even necessary, the mechanism for resolving disputes is based more on a staged ADR strategy than an immediate referral to resolution by jury.¹⁴⁴ Juris refers to this staged approach as the ‘Juris Protocol Mediation and Arbitration System.’¹⁴⁵ Juris also incorporates what it describes as a ‘novel reputation system based on prior certification, ongoing community activity, machine learning, and graph analysis.’¹⁴⁶

Juris’ materials include a mission statement with three goals: ‘(1) To make smart contracts on any blockchain safe, robust, human, legally enforceable, and open source; (2) To make access to civil justice and legal help as widely and publicly available as The Internet; (3) To bring effective, peaceful, fair and balanced dispute resolution to the

¹³⁷ Ibid 10.

¹³⁸ Ibid 11.

¹³⁹ Ibid.

¹⁴⁰ Ibid.

¹⁴¹ Ibid 14.

¹⁴² Ibid 15.

¹⁴³ See *Juris* (Website) <<https://jurisproject.io>>.

¹⁴⁴ See Adam Kerpelman et al, ‘Justice Everywhere, From Nowhere’ (White Paper, No 2, Juris, 18 September 2018) 3, 3 <<https://drive.google.com/file/d/1318klGEYL4go2VudL-C-BCnvpKujTnbF/view>> (‘Juris White Paper’).

¹⁴⁵ Ibid.

¹⁴⁶ Ibid.

billions underserved and overcharged by established legal infrastructure.¹⁴⁷ To accomplish this mission, Juris has devised its Protocol, which consists of three dispute resolution steps.

The first is named ‘SELF Mediation’ which occurs on an embedded layer of Self-Enforced Library Functions (‘SELF’).¹⁴⁸ The SELF Mediation provides the parties with a ‘range of popular mediation tools and techniques intended to facilitate resolution of any conflicts.’¹⁴⁹ These tools are available on Juris’ platform through its user dashboard. Use of the SELF Mediation tools does not require the deposit of any JRS, so there is effectively no additional cost to the parties.

Should the parties not be able to resolve their dispute using these mediation tools, the dispute moves to the next stage: SNAP, or Simple Neutral Arbitrator Poll, judgment.¹⁵⁰ Proceeding to a SNAP judgment will require that the parties stake JRS as a fee to be paid to the poll participant voters. The Juris platform will provide all ‘Jurists’, or those people who are registered with Juris, the opportunity to view information regarding the dispute and to register their opinion. The parties will receive the result of the poll, as well as a ‘brief opinion from the [voting] group.’¹⁵¹ The parties may then use this polling information to return to the SELF Mediation layer and resolve the dispute without further cost.

If the parties still fail to resolve their dispute, the final stage is a binding PANEL, or Peremptory Agreement for Neutral Expert Litigation, judgment.¹⁵² This determination, which Juris states will be enforceable according to United Nations treaty, will be made by a panel consisting only of Jurists with the highest reputation level, known as ‘High Jurists.’¹⁵³ As explained in the Juris White Paper, ‘This panel will be selected by UN mandated rules, and convene virtually through the Juris Platform. They will have a pre-determined amount of time to hear additional arguments from the parties, request, collect, and review additional evidence, consider arguments, etc.’¹⁵⁴ The panel can ask questions of either party and may seek to hold video-based hearings.¹⁵⁵ A presiding High Jurist will render a decision on behalf of the panel, which will be binding on the parties.¹⁵⁶

The initial pool of Jurists is to consist of ‘existing, certified, arbitrators and legal professionals.’¹⁵⁷ As the Jurist pool grows, Jurists will be classified in one of three tiers. High Jurists are those with the highest reputation and can make PANEL judgments. Good Standing Jurists are experienced with the platform and have contributed to prior decisions, and therefore are able to fully participate in SNAP poll judgments. Finally, Novice Jurists are those that are new to sign up and are able to contribute to

¹⁴⁷ Ibid 7.

¹⁴⁸ Ibid 17.

¹⁴⁹ Ibid.

¹⁵⁰ Ibid.

¹⁵¹ Ibid.

¹⁵² Ibid.

¹⁵³ Ibid.

¹⁵⁴ Ibid.

¹⁵⁵ Ibid 34.

¹⁵⁶ Ibid.

¹⁵⁷ Ibid 18.

discussions during the SNAP poll period and register a vote, but that vote will not be included in the vote tallies communicated to the parties.¹⁵⁸

There is also a structure for Jurists to increase their reputation (or have it decreased).¹⁵⁹ Reputation can be enhanced by contributing to discussions during the SNAP polls. The usefulness of a participant's contributions can be measured by soliciting ratings from other participants, similar to GitHub or Reddit. Juris also anticipates a system of peer review amongst the High Jurists that take part in PANEL judgments, which can produce a set of endorsements that can be fed back into the Juris reputation platform. These endorsements can then be used as 'the raw data for a directed weighted graph', which in turn will produce a 'trust metric' for each Jurist.¹⁶⁰ Here, again, some issues of juror integrity seem to be implicated by Juris' reputation-based structure, but the broader issues about fairness and overall platform integrity require further analysis.

I *Kleros*

The final platform to discuss is the most developed, and perhaps the most ambitious, of the dispute resolution providers to emerge to date – Kleros.¹⁶¹ Kleros is thus far the only dispute resolution platform to have a functioning dApp, which is currently in operation for an actual, ongoing use case. The current dApp follows from an earlier beta test of the platform that commenced in July 2018.¹⁶²

Kleros uses its own token, the Pinakion ('PNK') as the game theory mechanism to incentivise jurors to act reputably. As with Aragon, OATH and other platforms, Kleros relies on the Schelling Point to prevent jurors from making random, arbitrary determinations.¹⁶³ The Schelling Point is administered by requiring that jurors put some of their holdings of PNK into escrow whilst the dispute is being determined. As with the other platforms, jurors who are in the decision majority will have their escrowed tokens returned and any jurors who are in the minority will forfeit their tokens for pro-rata redistribution to the majority jurors. The expectation is that jurors will make reasoned, informed decisions and will 'vote the true answer, because they expect others to vote for the true answer. . . In this simple case, the Schelling Point is honesty.'¹⁶⁴

Kleros operates through a system of hierarchically arranged sub-courts, with the deeper levels of court requiring more expertise of the members who elect to serve as jurors in that sub-court.¹⁶⁵ More general levels of court likely require less knowledge and expertise. People who want to serve as jurors in any Kleros court must hold PNK. This is because staking PNK is the means by which jurors will be selected to be part of a jury panel. The parties will designate in their smart contract the sub-court in which a dispute will be decided and how many jurors are to comprise the initial jury panel

¹⁵⁸ Ibid.

¹⁵⁹ Ibid 45.

¹⁶⁰ Ibid.

¹⁶¹ See *Kleros* (Website) <<https://kleros.io>>.

¹⁶² For a description of the beta test, see Metzger (n 14) 72–3.

¹⁶³ See Clément Lesaege and Federico Ast, 'Kleros' (Short Paper, No 1.0.6, Kleros, November 2018) 1, 2 <<https://kleros.io/assets/whitepaper.pdf>>.

¹⁶⁴ Ibid (emphasis in original).

¹⁶⁵ See generally *ibid* 10.

for a first-level dispute. In a simple example, the parties might provide that the initial jury is to be a panel of three. The jurors will then be chosen based on how many jurors have staked how many tokens in the sub-court. For example, if Person A stakes 500 tokens and Person B stakes 1000 tokens and Person C stakes 2000 tokens, then the odds of B being selected as a juror are twice as great as A and the odds of C being chosen are four times as great as A (and twice as great as B). PNK could initially be obtained by receiving an ‘airdrop’ of tokens, available only to those who registered an early interest in Kleros, or by participating in Kleros’ Interactive Initial Coin Offering. Currently, PNK may be purchased directly on token exchanges, such as Bitfinex,¹⁶⁶ Ethfinex,¹⁶⁷ and IDEX.¹⁶⁸

This system is currently in operation with the ongoing use case, which is a curated list of trusted tokens listed on the Bitfinex exchange.¹⁶⁹ Anyone can submit a token for inclusion on the list, though it is likely that the token developers or backers will be the ones to submit.¹⁷⁰ Once submitted, anyone in the community may challenge the inclusion of a token on the list for failure to meet specified criteria.¹⁷¹ A challenge requires depositing Ethereum currency (‘ETH’) as an arbitration fee, which will have to be matched by the submitter for the matter to proceed (and not be forfeited by the submitter).¹⁷² Following a challenge, the Kleros dispute resolution protocol is activated and PNK holders who have staked tokens in the curated list sub-court and been chosen to serve as jurors can access the court dashboard to view evidence uploaded by the parties and register their determination on whether the inclusion criteria are or are not satisfied.¹⁷³ Appeals can be brought following a decision, but an appeal will always require double the number of jurors plus one (i.e. an initial panel of three will have an appeal panel of seven) with a proportionate increase in the arbitration fee.¹⁷⁴ Theoretically, there could be an unlimited number of appeals (unless limited by contract terms), but appeals may become too expensive for the parties to continue. As of this writing, 45 tokens have been submitted with 36 tokens having been accepted onto the list.

IV CONCLUSION

It should be apparent that the ongoing development of these blockchain-based dispute resolution platforms open up a host of normative questions that deserve consideration before we should feel comfortable that the parties in dispute can actually receive the kind of ‘justice the platforms promise. As raised above, a primary issue for consideration is whether the Schelling Point is a satisfactory mechanism on which to base the assumption that a group of unidentifiable, dispersed people who may have different legal and cultural understandings of a particular dispute will be able to

¹⁶⁶ See Bitfinex (n 91).

¹⁶⁷ *Tokinex* (Website) <<https://www.ethfinex.com>>.

¹⁶⁸ See *Idex* (Website) <<https://idex.market/eth/pnk>>.

¹⁶⁹ Viewing the dApp requires use of a Web3 browser, such as Metamask, so links will not be provided since the page is not immediately publicly accessible. More information can be found at ‘The Blockchain Dispute Resolution Layer’ *Kleros* (Website) <<https://kleros.io>>.

¹⁷⁰ See Stuart James, ‘Kleros x Ethfinex TCR: A Deep Dive Explainer’ *Kleros* (Blog, 7 March 2019) <<https://blog.kleros.io/kleros-ethfinex-tcr-an-explainer/>>.

¹⁷¹ See Stuart James, ‘The Ethfinex Listing Guide’ *Kleros* (13 March 2019) <<https://blog.kleros.io/the-ethfinex-listing-guide/>>.

¹⁷² Lesaage and Ast (n 163) 7.

¹⁷³ James (n 171).

¹⁷⁴ Lesaage and Ast (n 163) 8.

coalesce around a ‘correct outcome.’ Related to these fundamental issues of game theory and crypto-economics are issues about the likely effectiveness of particular incentive structures to protect against jurors making arbitrary determinations or trying to game the system solely to avoid penalties. There are further issues associated with the juror pool, since the prospective jurors are initially a self-selecting group who are comfortable using blockchain technology, potentially limiting the general availability of jurors, which in turn reflects on the integrity of the jury system and the integrity of the platform. Beyond the limitation of juror participation that is dictated by the familiarity with technology, juror participation may be further limited as there may also be an economic barrier to entry. For example, the Kleros curated token list court currently requires that prospective jurors stake 80,000 PNK, with a value as of this writing of over \$600 AUD,¹⁷⁵ for the possibility of being selected as a juror.¹⁷⁶ Even though the majority of that stake is likely to be returned to any juror (whether in the majority or minority of a decision), it is still a large investment in tokens that must precede participation.

The landscape of blockchain-based dispute resolution is new and rapidly changing. Some of the platforms described in this article may not succeed, but others may point the way forward not only for disputes that arise on the blockchain, but perhaps for some that begin in the physical world. The descriptions provided and questions raised in this article are intended to give a sense of the current state of the landscape and to set the stage for further exploration and research into the new world of resolving disputes that these platforms are creating.

¹⁷⁵ See Bitfinex (n 91).

¹⁷⁶ James (n 171).

