Decentralized Justice in the Era of Blockchain

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Abstract

ODR that is built on blockchain technology and infrastructure is championed by supporters as being capable of revolutionizing dispute resolution. Kleros is a decentralized dispute resolution platform built on the Ethereum blockchain that uses cryptoeconomic theories and game theory to recruit and incentivize a worldwide pool of 'jurors' to decide the cases arbitrated through the platform. This article discusses some early evaluations of whether this kind of decentralized ODR is likely to succeed by viewing the model through a normative framework, including considering whether crowdsourcing of justice on a decentralized platform is a viable way to conduct ODR. The article then discusses the likelihood of the success of the subcourt model, including whether choice-of-law issues might be problematic for a worldwide, decentralized system. Finally, the article considers whether the cryptoeconomic and game theories that provide the foundation for the Kleros platform are likely to result in a jury pool, much less an actual jury, that could be considered 'fair.' The article is informed by the author's experience with the Kleros platform through participation in its interactive initial coin offering and engaging in its beta-testing phase.

Keywords: ODR, blockchain, arbitration, decentralization, crowdsourcing.

1 Introduction

The development of online dispute resolution built on blockchain technology appears to be rapid and rapidly growing. Platforms that promise to deliver blockchain-based justice include, but are almost certainly not limited to, JUR,[1] Juris,[2] Aragon,[3] Delphi,[4] Rhubarb,[5] Jury Online,[6] and OpenCourt.[7] Each of these platforms claims that it will be able to deliver some variation on fair, quick and cost-efficient dispute resolution for disputes that arise out of smart contracts entered into on the blockchain. The primary feature of each of the platforms, and one of

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[1]   *See* https://jur.io.
[2]   *See* https://jurisproject.io.
[3]   *See* https://aragon.org/network.
[4]   *See* https://delphi.systems.
[5]   *See* https://www.rhucoin.com.
[6]   *See* https://jury.online.
[7]   *See*   https://media.consensys.net/opencourt-legally-enforceable-blockchain-based-arbitration
        -3d7147dbb56f.

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the major selling points held out by their developers, is that because the system is built on blockchain technology, it will be decentralized, thus removing the necessity of courts (*i.e.* the centralized state) and likely also lawyers and professional, centrally located arbitrators.

One of the most developed of these emerging dispute resolution systems is Kleros.[8] Kleros has, as described later, already engaged in an Interactive Initial Coin Offering (IICO) to distribute its proprietary tokens, listed the tokens on several exchanges and conducted a beta-test of its systems with the use case of a curated list. The developers have begun using the information obtained from the test, which remains ongoing as of this writing, to further develop their user interface and refine the systems that will be implemented for actual initial use cases and real disputes.

This article uses Kleros as a gateway into a discussion of decentralized dispute resolution because it demonstrates many of the features that are likely to be common to the various crowdsourced dispute resolution systems. This will allow for consideration of the purported benefits of decentralized justice and the introduction of some issues that may be associated with these claims. This is an early evaluation of many of these issues, and further research will be needed in the future, particularly as the technology develops and actual use cases are, presumably, implemented on the various platforms.

The discussion in this article will be significantly informed by my own participation in Kleros's IICO process. I have also been monitoring and participating in discussions on Kleros's channel on the instant messaging app, Telegram.[9]

The article will begin by describing what Kleros is and how it works, including how jurors are selected and the incentives that are intended to maintain fairness for the parties in the dispute. The article will then discuss the reality and challenges associated with a system of dispute resolution built on emerging technological innovations, such as the blockchain, cryptocurrency and tokens. Finally, the article will consider the claims that the Kleros developers are making about the efficacy and fairness inherent in the system they have designed and examine whether these claims are likely to hold up to further scrutiny.

2 Kleros and Decentralized Dispute Resolution

Kleros is a decentralized app (Dapp) built on the Ethereum blockchain. This means that all transactions that are related to the platform must initially involve the Ethereum cryptocurrency, ETH. Kleros works by having contracting parties, using smart contracts, designate Kleros as the parties' chosen dispute resolution mechanism. Because this choice of dispute resolution is built into the smart contract, all that a contracting party has to do is to register the existence of the dispute and that dispute will automatically be referred to Kleros for determination by a panel of juror arbitrators.

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8   *See* https://kleros.io.
9   *See* https://web.telegram.org/#/im?p=@kleros.

The pool of potential jurors is composed of individuals from across the world who hold Kleros' proprietary token, the pinakion (or PNK). 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 the IICO, in which ETH could be pledged in order to receive a share of tokens being offered. Currently, PNK may be purchased directly on token exchanges, such as Bitfinex,[10] Ethfinex,[11] and IDEX.[12] Purchasing tokens on these exchanges also requires transacting in ETH, rather than in standard currency. Further PNK may be awarded to jurors as an incentive for voting 'correctly,' as described below. The total number of existing PNK is fixed at 1,000,000,000 units.[13]

2.1 Kleros Arbitration

The juror decision-making process that takes place through Kleros is meant to be guided by a combination of cryptoeconomic and game theories. In particular, arbitration in an individual case should coalesce around what is known as a 'Schelling Point.'[14] As described in Kleros's whitepaper, the Schelling Point is "a solution that people tend to use to coordinate their behaviour in the absence of communication, because it seems natural or relevant to them".[15] 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. For arbitration procedures, the concept of the Schelling Point is combined with game theory to incentivize jurors to take their role as adjudicators seriously, or risk suffering a penalty. As described by the Kleros founders, "[w]e expect agents [*i.e.* jurors] to vote the true answer because they expect others to vote the true answer, because they expect others to vote the true answer .... In this simple case, the Schelling Point is honesty".[16]

The Kleros system is designed to incentivize coherent juror voting that aligns with truth. In a basic case, the smart contract would stipulate that any dispute that arises is going to be determined by three jurors. The party registering the dispute deposits a certain amount of ETH (say, 0.3) into the contract as a court fee. The party contesting the dispute contributes an equal amount of ETH as its fee. These fees are held in escrow pending the outcome of the dispute. Prospective jurors then pledge PNK in order to express their interest in being selected as a juror for the matter, with the selection being done by random number genera-

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10   *See* https://www.bitfinex.com.
11   *See* https://www.ethfinex.com.
12   *See* https://idex.market/eth/pnk.
13   For further information on the PNK token, including the share of the 1,000,000,000 tokens that have been made available to date, *see* F. Ast & C. Lesaege, 'Kleros: Frequently Asked Questions About Peer-To-Peer Justice', *Medium*, 3 October 2017, available at: https://medium.com/kleros/kleros-frequently-asked-questions-about-peer-to-peer-justice-5a921cb76abe.
14   *See* T. C. Schelling, *The Strategy of Conflict*, Cambridge, Harvard University Press, 1960.
15   C. Lesaege & F. Ast, *Kleros: Short Paper v 1.0.5*, January 2018, p. 2.
16   *Ibid.*

tion. The more PNK that a prospective juror pledges, the greater the odds that that person will be selected. Essentially, each PNK pledged is like a ball that is placed into a bag. The more balls in the bag with your name on them relative to everyone else, the greater the chances that one of your balls will be randomly selected and you will become a juror. Following juror selection, a defined number of each juror's PNK (for this example, say 200) will be held in escrow pending juror voting. Once the jury panel is selected, the parties can then upload any evidence they wish the jurors to review and the jurors can vote on how the dispute should be resolved. Each juror will receive 0.1 ETH as an arbitrator fee, regardless of their vote, which will be taken from the deposit of the losing party, with the winning party having their deposit returned.

The incentives for voting honestly come from the redistribution of PNK amongst jurors where there is 'incoherent' voting.[17] In other words, if all three jurors vote the same way, then each juror gets back his or her 200 PNK. However, if Jurors 1 and 2 vote for Party A and Juror 3 votes incoherently for Party B, then Juror 3 loses the 200 PNK, which is redistributed in an equal 100 PNK share to Juror 1 and Juror 2. Juror identities are meant to remain unknown throughout the process so that coordination is impossible. Appeals are allowed following any decision;[18] however, the number of jurors in any appeal will be double plus one of the number of jurors in the previous vote[19] and the ETH deposit will also increase proportionately.[20]

The Kleros developers have also envisioned a structure of specialized 'subcourts', which will be designated in the smart contract as the 'forum' in which the dispute will be resolved. For example, "a software development contract will choose a software development court, and insurance company will choose an insurance court ...."[21] Prospective jurors would then only pledge PNK to adjudicate disputes in a sub-court in which they had some knowledge, expertise or experience in order to best ensure that they did not lose their PNK by voting incoherently in a dispute that they did not, or could not, fully understand.

2.2 The Doge Test

To test its platform, Kleros launched a trial on the Ethereum mainnet called *Doges on Trial*. The aim of the test is to create a master 'Doge List' that includes only pictures of 'doges.' A doge is generally defined in Internet meme-speak as a picture of a shiba inu dog, often with comic sans font writing around the picture.[22] However, the question presented in the trial was simply, 'Does the submitted image show a doge?' The trial involved submitters uploading pictures, which may or may not have been of doges, and other community members challenging sub-

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17   *Ibid.*, pp. 8-9.
18   *Ibid.*, p. 8.
19   *E.g.* if the initial jury comprised 3 members, the first appeal will have 7 jurors, followed by 15 for a subsequent appeal, then 31, and so on.
20   *I.e.* each party will have to deposit 0.7 ETH for the first appeal to go forward, followed by 1.5 ETH, etc.
21   C. Lesaege & F. Ast, January 2018, p. 3.
22   *See, e.g.*, https://knowyourmeme.com/memes/doge.

missions that did not show a doge. Economic incentives were included for both submitters and challengers.[23] For example, because the developers wanted to ensure that there would be non-doge pictures to be challenged, Kleros offered a payout policy that would compensate each of the first 10 submitters who was able to submit a picture of a cat that was accepted into the doge list.[24] The payout consists of one cryptokitty – a blockchain-based collectible[25] – and 2 ETH.

3   Issues and Observations From Participating in Kleros

Participating in the IICO, which resulted in allocation of approximately 14,000 PNK, and subsequent participation in the doge platform trial have given me some insight into several issues that Kleros is likely to face as it attempts to provide justice, particularly if justice is viewed within a normative framework. These issues require further research, particularly as this and other platforms continue to develop, and will form the basis for future work. For now, I wish to explore some of the challenges that are currently presenting, as well as some questions that, despite Kleros's efforts, remain unsatisfyingly answered at best.

3.1 Barriers to Participation
The initial complication with participating in Kleros, and likely most if not all of the other platforms developing in this space, is the need to obtain ETH in order to exchange ETH for PNK tokens. Because cryptocurrency is itself intended to be decentralized, obtaining the currency is not as simple as going to an 'ETH-TM' and withdrawing funds so you can spend them on juror tokens. Instead, obtaining ETH requires a series of steps, including creating a cryptocoin wallet with an exchange such as Coinspot.[26] Next, standard currency funds (*i.e.* dollars) need to be deposited so that ETH can be obtained, either at the current market rate or at a designated spot rate. In a sense, obtaining ETH is not significantly different from foreign exchange trading, but even that comparison may suggest a significant-enough barrier to entry for many.

It is worth noting that participation in the IICO was more complicated than merely obtaining ETH. Because funds for coin offerings cannot be directly deposited from exchanges, a separate token wallet was needed, meaning that dollars had to be exchanged for ETH, the ETH transferred to a token wallet and the IICO bid sent from that token wallet. It is true that all of this activity is reviewable on the blockchain, but that does not make the process any more comprehensible until someone has gone through it themselves. It is also true that Kleros's IICO

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23   For a more complete description of the trial, *see* F. Ast, 'Doges on Trial: Kleros' Launch on Main-net', *Medium*, 24 July 2018, available at: https://medium.com/kleros/doges-on-trial-kleros-launch-on-mainnet-f93ff88ae9a.

24   *See* S. James, 'Doges on Trial – Pilot Explainer', *Medium*, 30 July 2018, available at: https://medium.com/kleros/doges-on-trial-pilot-explainer-911492c3a7d8.

25   *See* Cryptokitties, 'What the Heck is a Cryptokitty?', *Medium*, 19 September 2018, available at: https://medium.com/cryptokitties/what-the-heck-is-a-cryptokitty-4e14752e58c.

26   *See* https://www.coinspot.com.au.

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has finished and tokens are now available on the three token exchanges referred to earlier. However, if the other platforms are also developing a token-based system, as several are, and are going to employ the IICO model, the same issues may arise.

The decentralized nature of this arbitration model also requires that centralized, that is, corporately developed and monitored browsers such as Microsoft Explorer, Firefox and Google Chrome cannot be used alone in order to conduct transactions, whether to exchange ETH for tokens or to pledge PNK to serve as a juror. Instead, someone who wants to participate in Kleros must install a Web3-enabled browser plug-in, such as MetaMask,[27] which only works with certain browsers. This is not an especially complicated process, though – like much of the crypto-world – it does require setting up passwords, storing keys and keeping a list of recovery words so that security, and anonymity, can be maintained.

It may be the case that parties that have entered into a smart contract will have an expectation that any prospective juror will be sophisticated enough to be able to utilize the Ethereum infrastructure and tools. It is possible, though, that the hurdles that have to be overcome in order to just be able to register interest in becoming a juror are substantial enough to deter people from participating. This is to say nothing of the process of actually becoming a juror, which will be addressed later. One statistic in Kleros's favour is that its Telegram channel has approximately 6,200 members, suggesting that many people are at least aware of Kleros. Less than half that number, however, actually hold PNK tokens as of this writing.[28]

3.2 Volatility of ETH

Like many cryptocurrencies, ETH has proved to be incredibly unpredictable and volatile.[29] For example, in the time since purchasing ETH to participate in the Kleros IICO, ETH has lost about 80 per cent of its value as at that time,[30] and about 90 per cent from its (very brief) 2-year high in January 2018.[31] It is hard to know whether people who may wish to become involved in Kleros are viewing their participation as a kind of investment in anything other than decentralized justice. But, considering that the tokens do have value at the time of purchase (and can be resold on the exchanges), if the developers are basing their model on jurors being incentivized to act honestly because they care about being penalized and losing their tokens, that level of care may be somewhat dissipated when once valuable tokens lose a significant amount of that value by being inextricably linked to a volatile and unpredictable cryptocurrency. Of course, the lower the price of ETH, potentially the lower the financial barrier to entry, which may provide its own incentive for more people to get involved and become jurors. The

27 *See* https://metamask.io.
28 *See*   https://etherscan.io/token/0x93ed3fbe21207ec2e8f2d3c3de6e058cb73bc04d#balances (showing 2,894 addresses holding PNK).
29 *See, e.g.*, Nellie Bowles, 'Remember Bitcoin? Some Investors Might Want to Forget', *New York Times*, 27 December 2018.
30 Approximately A$920 in mid-May and A$120 in mid-December.
31 *See* https://www.coinspot.com.au/trade/eth.

reality remains, however, that if the trends continue, early adopters are going to financially worse off than when they became involved.

Yet another financial complication, and a potential issue for Kleros going forward, is the volatility and unpredictability of gas prices on the Ethereum network. Gas is a surcharge that any person transacting on the Ethereum blockchain must pay in order for the transaction to be processed. The gas price is connected to the amount of traffic that is occurring on the network at any given time, which in turn is connected to the 'miners' that are using their computing power to run the network and process transactions over it. In short, the more traffic on the network, the higher the price of gas.[32]

There are at least two initial conclusions that follow from this. The first is that the more Dapps that are on the Ethereum network, including the other dispute resolution platforms being developed, the more traffic is likely to flow through the network, increasing the price of gas. For example, a token-based voting system created by a Chinese cryptocurrency exchange clogged the Ethereum network and significantly spiked the price of gas in July 2018.[33] From this follows the second initial conclusion: the price of gas can be unpredictable and potentially expensive, which may deter token holders from participating as jurors when the price of gas is or is likely to be high. Gas prices may even deter jurors if they are concerned that the price of gas is going to go up, especially relative to the actual value of their tokens, whether measured in ETH or in traditional currency. These are significant variables that are new to dispute resolution altogether and should be taken into consideration when trying to determine whether a platform like Kleros is capable of delivering justice to the parties utilizing it.

4   Kleros and Decentralized Justice

Part 2 of this article discussed Kleros and decentralized dispute resolution by describing the platform that had been developed and some of the claims made by the founders and developers as to how Kleros is going to be capable of resolving disputes between parties to a smart contract. With this part, I wish to move beyond merely resolving a dispute, which Kleros is clearly capable of doing in the abstract, and to consider some key issues associated with the idea of that dispute being resolved justly. These issues raise a host of normative concerns that need to be considered more carefully, particularly as these decentralized applications seem to be rapidly developing and multiplying. Here, however, I will be discussing three initial concerns that have emerged thus far. First, is the composition of the sub-courts that are meant to be the online fora for the disputes. Second, the composition of the jury pool that are meant to resolve those disputes. And finally, the cryptoeconomic theories that are meant to provide the incentives for justice to be done by those jurors.

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32   *See, e.g.*, K. Owocki, 'A Brief History of Gas Prices on Ethereum', *Medium*, 2 August 2018, available at: https://medium.com/gitcoin/a-brief-history-of-gas-prices-on-ethereum-52e278a04306.
33   *Ibid.*

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4.1 The (Pre-)Existence of Sub-courts

As discussed previously, the dispute resolution structure of Kleros is meant to be built on a series of specialized sub-courts, which will be designated in the smart contract as the forum in which an eventual dispute will arise. As described in the whitepaper (and mentioned above), the initial vision of the sub-courts appears to be very broad – for example, a software development court and an insurance court, with other possible sub-courts presumably being a web design court, a construction court and a manufacturing court. This sounds good in theory, but neither the design nor designation of the sub-court infrastructure takes into account the possibility, or more probably the likelihood, that a dispute that arises between the parties won't be one that was predicted and may no longer be suitable to be in the initially designated sub-court. Because that designation is contained in a smart contract that is on the blockchain, transferring the dispute to another sub-court is not as simple as the parties amending their agreement or designating an alternative sub-court. Even were either amendment or re-designation an option, submitting a dispute to a sub-court presupposes that an appropriate and applicable sub-court exists so that the dispute can be submitted to it.

I raised this issue with the Kleros developers on the Telegram channel to try to get a sense about whether the necessity of parties being able to adjust the appropriate sub-court had been considered. Like much of how Kleros seems to operate at present, the answer was that the developers are essentially agnostic as to how the sub-courts are created, but that they expect the process to be done by the users from the ground-up – in other words decentralized from the development work being done behind the scenes. Specifically, according to Clément Lesaege, the co-founder and CTO of Kleros, "Subcourts should preexist contracts. Subcourts are more and more specialized, if you don't find your subcourt, just take the most specilized [sic] subcourts fitting your type of contract."[34]

This would not seem to be an especially satisfying answer to a party contemplating entering into a smart contract nor contemplating a future dispute, much less engaged in an active one. The system of sub-courts seems reasonable on the surface, but only if the sub-courts exist and are capable of addressing the disputes that are raised on the platform. If an appropriate sub-court does not exist at the time of contracting or, even worse, at the time that the dispute arises, then how can the parties expect that justice will be done when it is the sub-courts that are meant to signal to jurors whether it is appropriate for them to pledge themselves to possibly serve as jurors. The interconnected nature of the sub-court infrastructure and the jurors leads into the next set of issues identified: that of juror suitability and selection.

4.2 The Jury

The sub-court system is intended to mediate the behaviour of jurors by providing a structure that ensures that jurors will adjudicate disputes only in areas in which they have some level of expertise and (self-perceived) capacity for reasoned decision-making. However, it would be impossible for Kleros to guarantee that this is

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34   *See* https://web.telegram.org/#/im?p=@kleros (discussion on 1 December 2018).

the case (save for implementing some kind of demonstration of expertise, which itself would presumably have to be adjudicated, introducing another layer of complexity and centralization to the system). This leaves the cryptoeconomic theory and the fear of punishment from being an incoherent voter as the primary mechanism to keep jurors from pledging tokens to decide disputes that they are unsuited to determining. As discussed below, this structure is likely to be problematic.

More immediately, however, as far as the jury is concerned, there is no way to determine the composition of the juror pool since all that is known about a juror is the contract address from which the tokens were sent. This means there is no way to determine juror knowledge, diversity or bias. The rules of a particular sub-court can require that jurors provide a reason for their decision,[35] but this would not tell the parties anything about who the juror is and whether there is a reason to question the decision-making process. As with the entirety of the Kleros system, any majority of jurors, no matter how each arrived at his, her or their decision, is assumed to be the correct and just result.

There is also no way to determine whether a juror understands the expectations of the parties or the actual or perceived law that is to be applied. For instance, if a contract dispute is being determined, can it be conclusively said that a juror from a common law jurisdiction like Australia will have the same conception of contract law as a juror from a civil law jurisdiction like Germany? And what if the third juror is from a jurisdiction with religiously influenced law, such as Saudi Arabia. The fact that the jurors might vote coherently with each other in this circumstance may be the product of nothing but coincidence. The result may end up being satisfying to the parties since the *dispute* seems to be resolved, but from a normative perspective it is difficult to conclude that justice has been done.

The Kleros founders' answer to this issue initially returns to the sub-court infrastructure. As stated by co-founder and CEO Federico Ast on Telegram:

> Subcourts can be specialized by cultural values. Say a freelancing court with Islamic Law and a freelancing court with Jewish Law. So parties would know in advance how jurors will evaluate the evidence .... In this sense, Kleros is no different than traditional arbitration, for example in finance parties agree what jurisdiction and law they will use for arbitrating their dispute, should it happen.[36]

This response once again assumes, at a minimum, that these sub-courts pre-exist the smart contract, that the parties to the smart contract have designated the appropriate sub-court for resolving their dispute and that the jurors are representing themselves accurately when pledging to serve as a juror in that sub-court. The lack of certainty of any of these variables should give some pause in the consideration of whether Kleros is providing justice for its parties.

The rules of the sub-courts also need to be especially well-defined in order to provide accuracy of decision-making by the jurors. One example of this arose dur-

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35   *See* C. Lesaege & F. Ast, January 2018, p. 8.
36   *See* https://web.telegram.org/#/im?p=@kleros (discussion on 30 November 2018).

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ing the doge pilot trial. An embedded assumption by the developers was the users would understand, on the basis of the announcements and materials released at the time of the pilot, that the doge list was only to contain images representative of the shiba inu dog meme. However, the list criteria stated only, 'does this image show a doge.'[37] One user submitted an image of Leonardo Loredan, a Doge of Venice c. 1501. This image was initially rejected as not being a doge, resulting in a great deal of Telegram discussion since the list criteria did not specify that the image had to be based on the doge meme. Eventually, the image was accepted into the list. This points to the possibility of precedent emerging from a system such as Kleros, but also points to the difficulty of anticipating issues in a decentralized system.

One response to this issue could be that because Kleros has essentially unlimited appeals (unless limited by the rules of a particular sub-court), if a party believes that jurors have come to a wrong decision based on, perhaps, an incorrect application of some law or principle, that party is free to appeal. However, as discussed earlier, because the arbitration fee increases with each appeal, there may be a point at which it is too expensive for a party to risk a loss and will not appeal a decision. Moreover, even though a lost appeal may suggest that the initial decision was correct, as described above, there is little that stands in the way of a majority or even unanimous decision being the product of coincidence.

The other main response relies on the cryptoeconomic and game theories on which the PNK tokens rest. These theories contain their own related issues for consideration.

4.3 Cryptoeconomics, Game Theory and Decentralized Justice

Many of the essential premises of Kleros are based upon a claim that a combination of cryptoeconomic principles and game theory will provide necessary incentives to keep jurors honest, thus administering fairness of decision-making.[38] Honesty is linked to a juror's desire to maintain her holdings of tokens and not to have any redistributed to other jurors due to incoherent voting. Redistribution following incoherent voting is meant to have a dual effect: it punishes the juror for voting outside of the majority and it makes it more difficult for that juror to be selected in a future dispute without purchasing more tokens (or having tokens redistributed in that juror's favour in another dispute with incoherent voting). These claims may prove viable as the platform develops. In conception, however, they present issues both in theory and in practicality.

Kleros has attempted to explain its claims that cryptoeconomic theory will provide the necessary juror incentives, but does so in a way that seems circular and self-justifying.[39] This explanation draws significantly from the research of Daniel Dimov, whose PhD thesis explored fairness in Crowdsourced Online Dispute Resolution (CODR) and identified several indicators of procedural fair-

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37   *See* S. James, 30 July 2018.
38   *See* C. Lesaege & F. Ast, January 2018, p. 8.
39   *See* F. Ast & D. Dimov, 'Is Kleros a Fair Dispute Resolution System?', *Kleros Blog*, 18 October 2018, available at: https://blog.kleros.io/is-kleros-a-fair-dispute-resolution-system.

ness in CODR systems.[40] One such indicator is expertise, defined by Dimov (citing to the EU Directive on ADR)[41] as the neutral third party providing for a determination in ADR possessing "(1) the necessary knowledge and skills in the field of alternative or judicial resolution of consumer disputes as well as (2) a general understanding of law".[42]

This definition is used by Kleros to reason that its jurors will be self-designated experts, whose expertise, it seems, is determined by their pledging themselves to be jurors in particular sub-court matters.

> Kleros jurors self-select into the subcourt where they wish to conduct arbitration. Kleros does not ask for the jurors' real identity or to prove they are qualified to arbitrate disputes in the subcourt where they want to work. The expertise requirement is conducted via economic incentives. Kleros generates for users the incentive to self-select for the subcourts where they have expertise. Users who self-select into the courts for which they have the right skills will, on average, make money over time. Users who self-select into courts where they don't have the right skills will lose money and tend to abandon the system.[43]

This is just one example of how the reliance on cryptoeconomic theory provides its own justifications: expertise is necessary to provide procedural fairness; Kleros provides incentives so that only people who possess expertise will put themselves forward to determine disputes; thus, only experts will be determining disputes on Kleros; therefore, Kleros provides procedural fairness. Kleros compares this state of affairs to that of Wikipedia, where editors of articles may not have 'expertise' in the subject area of the article, but may still edit it, subject to sanctions by Wikipedia if misinformation is added.[44] Not only does this not seem to be an apt analogy in general, it also entirely misses the point that the purpose of procedural fairness is to ensure that the decision-making process is fair for the parties *and* that those parties have legitimate grievances that deserve to be determined in a fair and reasonable manner.

The game theory incentives also presume that a majority decision is, per se, the correct one, since the economic incentives are intended to ensure that jurors will vote honestly in order to retain their tokens. There is, again, reason to doubt that this is an acceptable method of providing fairness for parties engaged in a dispute. The justification thus far offered reverts back to the inherent wisdom of the Schelling Point for juror decision-making as a guarantor of honest voting and

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40   D. Dimov, *Crowdsourced Online Dispute Resolution*, Leiden University Center for Law and Digital Technologies, SIKS Dissertation Series No. 2017-17, 2017, available at: https://ssrn.com/abstract=3003815.
41   Directive 2013/11/EU of the European Parliament and of the Council of 21 May 2013 on alternative dispute resolution for consumer disputes and amending Regulation (EC) No 2006/2004 and Directive 2009/22/EC.
42   F. Ast & D. Dimov, 18 October 2018, p. 109.
43   *Ibid.*, p. 4.
44   *Ibid.*

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fairness.[45] An illustration is made to the film version of *Twelve Angry Men* in order to demonstrate a Shelling Point being reached by jurors. It is then stated that even though jurors are not meant to know the identities of other jurors, communication amongst jurors is not meant to take place, and no oral or written arguments will be offered to the jurors, Kleros jurors can still be dissuaded from falling into simplistic, biased reasoning because "parties can submit evidence".[46] This comes across as a weak justification when the fairness of crowdsourced justice is at issue, as does reliance on a dramatization of a fictional jury debating fictional evidence in a fictitious case.[47]

Practicalities present problems for the provision of justice as well, particularly when the pledging of tokens is the mechanism by which jurors register their interest in being selected. As of this writing, the current highest holder of PNK tokens has a little more than 23 per cent of the available tokens. The next highest has approximately 17.5 per cent, followed by a holder with 7.4 per cent.[48] This demonstrates an outsize share of tokens held by certain prospective jurors, which could result in one juror being selected more than once to adjudicate the same dispute, resulting in essentially a majority of one. This could be a particular problem in a highly specialized sub-court in which few prospective jurors possess the desired expertise (assuming, again, that this is taken by jurors to be a necessary pre-requisite for service) or have particular fear that they will be on the losing end of incoherent voting (again, assuming this is a real concern). Kleros has claimed that the use of random number generation in the selection of jurors should make this a rare event,[49] but the fact that it is a possibility should be a cause for concern where the fairness of an outcome is at issue.

Similarly, Kleros believes that its system can protect against attacks such as a 51 per cent attack in which one entity controls over half of the token supply and could decide all results[50] and the bribing of jurors by parties.[51] Bribing was tested during the doge pilot trial and all attempts at juror bribes did fail.[52] However, given the innovative nature of this technology and the sophistication of its likely users, if juror bribing is a real possibility, then it needs to be seriously considered as well.

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45 W. George, 'Kleros and Mob Justice: Can the Wisdom of the Crowd Go Wrong?', *Medium*, 5 June 2018, available at: https://medium.com/kleros/kleros-and-mob-justice-can-the-wisdom-of-the-crowd-go-wrong-ef311209ea36.
46 *Ibid.*, p. 2.
47 *Cf.* V.P. Hans, 'Deliberation and Dissent: *12 Angry Men* Versus the Empirical Reality of Juries,' *Chicago-Kent Law Review*, Vol. 82, No. 2, 2007, pp. 579-589.
48 *See* https://etherscan.io/token/0x93ed3fbe21207ec2e8f2d3c3de6e058cb73bc04d#balances.
49 *See* C. Lesaege & F. Ast, January 2018, p. 5.
50 *Ibid.*, p. 9.
51 *Ibid.*, p. 10.
52 *See* W. George, 'Doges on Trial Curated List Observations Part 2 – Deep Dive Edition', *Kleros Blog*, 7 November 2018, available at: https://blog.kleros.io/cryptoeconomic-deep-dive-doges-on-trial.

5   Conclusion

This article is not intended to be a demonization of Kleros, nor a suggestion that decentralized, crowdsourced ODR is destined to fail. There are, however, serious issues with these kinds of platforms that need to be considered in order to ensure that parties with real (smart) contracts and real disputes are not naïvely utilizing an enticing new method of resolving disputes on the promise that it will be quick, cheap and most of all fair. This article has used Kleros as a test case for these rapidly emerging platforms and has attempted to raise some important issues that deserve further scrutiny.