

Kleros: A Socio-Legal Case Study Of Decentralized Justice & Blockchain Arbitration

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Abstract

Kleros—a decentralized blockchain-based arbitration solution that relies on smart contracts and crowdsourced jurors—was conceived to bridge the trust gap that separates e-commerce participants, as in the paradigmatic example of “Alice and Bob.” Previous studies have mainly focused on describing blockchain-based arbitration solutions such as Kleros, and at least one has warned about the potential risks to essential procedural safeguards presented by anonymous and economically-incentivized jurors. Using Kleros as a socio-legal case study of a token-based business providing cutting-edge decentralized blockchain arbitration services, we paint the “big picture” of how Kleros works and analyze its efficacy to improve on traditional online dispute resolution. We also report the results of our exploratory, observational user survey and a series of interface trials. We make a number of contributions to the literature. First, our case study introduces the concept of the “decentralized sheriff,” which we use to refer to the crowd-based compliance mechanism implemented by Kleros to certify crypto tokens. We argue that Kleros’ “decentralized sheriff” contributes to the public good by filling a regulatory hole with respect to the crypto market. Second, building on the work of scholars who studied Kleros, we analyze the major obstacles to widespread adoption of Kleros. Third, we explore whether social interactions of trust and claiming present unique characteristics under Kleros compared to models described in Law and Society literature. Throughout our analysis, we formulate questions for future research and investigation.

Keywords: Blockchain, arbitration, online dispute resolution

I. INTRODUCTION

This article uses Kleros as a socio-legal case study of a token-based business providing cutting-edge decentralized blockchain arbitration services.¹ According to its founders, Kleros “relies on game theoretic incentives to have jurors rule cases correctly...The result is a dispute resolution system that renders ultimate judgments in a fast, inexpensive, reliable and decentralized way.”² Numerous scholars have normatively analyzed Kleros’ promise of a new-and-improved dispute settlement mechanism, highlighting the positive aspects, as well as potential weaknesses of the forum.³ Building on that work, this article takes a deep dive into Kleros.

To paint the “big picture” of how Kleros works and analyze its efficacy as a solution to the problems entrenched in traditional, centralized dispute resolution systems, we provide insight regarding Kleros’ impact on the litigious behavior of its users and their business relationships. To do so, we focus on Kleros’ reliance on self-executing smart contracts as a key variable affecting claiming as compared to societies that lack automated enforcing mechanisms. Beyond this inquiry, our case study sheds light on three important questions: (i) what problems does Kleros solve, (ii) how does it solve them, and (iii) what is withholding Kleros’ widespread adoption? We begin answering these questions using mixed methods of empirical research, including an exploratory interview with key Kleros members, an exploratory, observational user survey, and a series of interface trials conducted by the authors.

The findings of this case study make the following contributions to the Law and Society literature as well as to the blockchain dispute resolution scholarship on systems such as Kleros. First, we introduce the concept of the “decentralized sheriff,” which we use to refer to the crowd-based compliance mechanism implemented by Kleros to certify crypto tokens. We argue that this phenomenon contributes to the public good by filling a regulatory gap with respect to the crypto market. Second, building on the work of scholars who studied Kleros, we analyze the major obstacles to widespread adoption of Kleros and find that certain structural barriers (the so-called Ethereum “gas” fees and a limited use of cryptocurrencies among the general population) significantly hinder Kleros’ prospects. Third, we explore whether social

¹ For general information about Kleros, see KLEROS, <https://kleros.io> (last visited Mar. 19, 2021).

² See Clément Lesaege, Federico Ast & William George, *Kleros Short Paper v1.0.7*, 1 (Sept. 2019), <https://kleros.io/assets/whitepaper.pdf> [hereinafter *Kleros Whitepaper*].

³ See James Metzger, *Decentralized Justice in the Era of Blockchain*, 5 INT’L J. ONLINE DISP. RESOL. 69 (2018) [hereinafter Metzger, *Decentralized*].

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interactions of trust and claiming present unique characteristics under Kleros compared to models described in Law and Society literature. Finally, we identify several empirical questions for future research and investigation.

The structure of this article is as follows. Part I introduces some key concepts and explains how Kleros works. Part II provides a brief overview of the literature on claiming and the more recent literature discussing Kleros and Online Dispute Resolution (ODR). Part III presents our research methodology, and Part IV reports our analysis and observations. Finally, we conclude.

II. THE KLEROS UNIVERSE: KEY CONCEPTS AND INNER WORKINGS

To place this study within its context, we (A) distill some concepts that are key to understanding Kleros; and (B) describe the two pathways to participation in Kleros.

A. Key Concepts

The concept of blockchain technology is still elusive to most people. Thus, to place this study within its context, we distill some short and easy-to-grasp definitions of the terms “blockchain” and “smart contract.”

At the dawn of electronic commerce, it quickly became apparent that the dependence on traditional trusted third parties—banks—to process electronic payments increased overall transaction costs and hindered the possibility of a higher volume of casual or low-value transactions.⁴ By relying on cryptographic proof in lieu of a centralized trusted authority, blockchain technology eliminates the middleman, thereby offering a cheaper avenue to execute transactions without compromising security.⁵

A blockchain is a decentralized database or ledger that is operated by a peer-to-peer computer network.⁶ Each computer in the blockchain network can replicate and store a copy of the original data and any of its legitimate subsequent alterations.⁷ The main advantage of blockchain is that if the computer with the original blockchain or any of the network nodes fail, any surviving node—just one would suffice—can retrieve the original blockchain and reconstitute it without the intervention of centralized middlemen.⁸ In the

⁴ See Satoshi Nakamoto, *Bitcoin: A Peer-to-Peer Electronic Cash System* (2008), <https://bitcoin.org/en/bitcoin-paper>.

⁵ *Id.*

⁶ See PRIMAVERA DE FILIPPI & AARON WRIGHT, BLOCKCHAIN AND THE LAW: THE RULE OF CODE 13 (2018); see also Primavera De Filippi & Samer Hassan, *Blockchain Technology as a Regulatory Technology: From Code is Law to Law is Code*, FIRST MONDAY 21 (2016), <https://firstmonday.org/ojs/index.php/fm/article/view/7113/5657>.

⁷ See DE FILIPPI & WRIGHT, *supra* note 6, at 35.

⁸ *Id.* at 36.

same vein, the fact that decentralized nodes constantly update the blockchain renders it increasingly transparent, extremely difficult (although not impossible) to alter, non-repudiable and, thus, more reliable.⁹

Blockchain technology plays an essential role in smart contracts. Smart contracts arise at the intersection of traditional contract law and technology.¹⁰ In its most primitive form, a smart contract is one that can be formed via mechanical means or computer code and without face-to-face interaction (the classic example is a purchase from a vending machine).¹¹ What distinguishes blockchain-based smart contracts from traditional contracts is self-enforcement by automated code.¹² As a consequence, in cases of contractual breach, the parties are left with significantly less wiggle room to negotiate or settle any disputes a posteriori compared to traditional contract settings.¹³

As with any contract, a blockchain-based smart contract may include a traditional dispute resolution clause (i.e., an arbitration clause). Typically, this clause would define a method for the parties to resolve their disputes and include the parties' consent that the outcome of the dispute resolution process would be automatically enforced on the blockchain.

In recent years, a number of technology startups devote their commercial activity to administering blockchain dispute resolution processes tailored to smart contracts.¹⁴ Several of these startups offer platforms that allow parties to enter into smart contracts and submit related disputes to arbitration by a crowdsourced, decentralized, and anonymous decisionmaker (jury) that is economically incentivized (using game theory principles and cryptocurrency rewards) to reach consensus and issue a decision.¹⁵

As we explain in further detail in the methodology section below, we selected Kleros as a socio-legal case study on decentralized justice and blockchain-based arbitration because it is the most developed platform of its kind to have emerged to date.

B. How Kleros Works: Two Pathways to Participation

⁹ *Id.* at 36–38.

¹⁰ See Jeff Lingwall & Ramya Mogallapu, *Should Code Be Law? Smart Contracts, Blockchain, and Boilerplate*, 88 UCLA L. REV. 285, 298 (2019).

¹¹ *Id.*

¹² DE FILIPPI & WRIGHT, *supra* note 6, at 74.

¹³ *Id.* at 74–75.

¹⁴ See Lingwall & Mogallapu, *supra* note 10, at 305–06.

¹⁵ *Id.* at 285, 305–06.

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In addition to being a facilitator of dispute resolution services, Kleros is also a token-based business with its own token¹⁶—the Pinakion (PNK)—at the core of its business model.¹⁷ Kleros first introduced PNK in an Initial Coin Offering (ICO) between May and July 2018, where 160 million PNK—representing 16% of the 1 billion total amount of PNK—were sold to 218 contributors.¹⁸ The idea behind the PNK is that it serves to protect the dispute platform from Sybil attacks.¹⁹

The requirement that potential jurors use the in-house PNK token—instead of more widely available ETH—to stake in Kleros courts acts as a safeguard that protects the integrity of the dispute resolution platform.²⁰ The risk associated with an attacker acquiring 51% or more of the PNK tokens is that they would be in a position to “game” the system by staking enough PNK to be selected as juror multiple times for the same dispute, thereby giving them great influence over the outcome.²¹ The PNK requirement significantly reduces the risk that such Sybil attacks²² may occur by making them more expensive and more difficult to execute.²³ Therefore, PNK serves as a barrier preventing attackers from disrupting Kleros’ justice system for their personal profit.

Just as the starting point to any crypto-transaction is owning cryptocurrency, the same applies to participating in Kleros’ dispute resolution process. This is illustrated in **Figure 1** below. Participation in Kleros requires

¹⁶ A token is not the same as a crypto coin. The former is a derivative asset that depends on, and benefits from the latter’s standalone independent blockchain. *See What is the Difference Between Coins and Tokens?*, LEDGER, <https://www.ledger.com/academy/crypto/what-is-the-difference-between-coins-and-tokens> (last visited Mar. 19, 2021). The purpose of both crypto coins and tokens is to serve as money; however, tokens also fulfill an important purpose by giving its holder the right to participate in certain blockchain-based projects or ecosystems. *See What is the Difference Between Coins and Tokens?*, MEDIUM, <https://medium.com/@bonpay/what-is-the-difference-between-coins-and-tokens-6cedff311c31> (last visited Mar. 19, 2021).

¹⁷ By its own terms, “Kleros is a decentralized application built on top of the Ethereum network that works as a decentralized third party to arbitrate disputes in every kind of contract, from very simple to highly complex ones.” *Kleros Whitepaper*, *supra* note 2, at 1.

¹⁸ *See* Federico Ast, *Kleros’ Token Sale is Over: the Next Chapter Begins*, MEDIUM (July 16, 2018), <https://medium.com/kleros/kleros-token-sale-is-over-the-next-chapter-begins-82ddac3e5b40>.

¹⁹ *See* William George, *Why Kleros Needs a Native Token?*, MEDIUM (June 7, 2018), <https://medium.com/kleros/why-kleros-needs-a-native-token-5c6c6e39cdfc>.

²⁰ *Id.*; *see also* *Kleros Whitepaper*, *supra* note 2, at 4–5.

²¹ George, *supra* note 19.

²² *Id.*

²³ *Id.*

having cryptocurrency. Since the Kleros PNK token is built on top of the Ethereum blockchain network, participants will need Ethereum (ETH or ether) to pay gas fees.²⁴ Potential Kleros users first acquire ETH and other cryptocurrency at an exchange using fiat currency (such as USD). The cryptocurrency can then be used either to purchase PNK (necessary for entering the Kleros juror pool), to place in escrow if using Kleros to set up a smart contract, or to pay the gas fees. Simply put, holding some ETH is a necessary condition for individuals to enter the pool of potential Kleros jurors and eventually vote, and for disputants to access Kleros' dispute services.²⁵

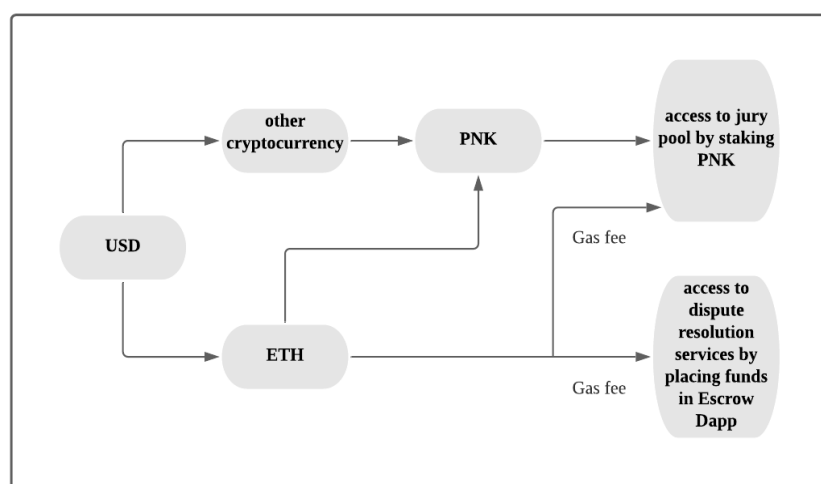


Figure 1: Pathways to Participation in Kleros

One may participate in Kleros' dispute resolution process in one of two ways: either as a juror or as a disputant. How the cryptocurrency is dispersed, and the total amount of costs incurred, depends on the nature of participation. Below, we describe the pathways to access Kleros (1) as a potential disputant and (2) as a potential juror.

1. *ACCESSING KLEROS AS A POTENTIAL DISPUTANT*

²⁴ See Figure (1). As explained in (1) below, the "gas fee" is the fee charged for recording the transaction on the Ethereum network.

²⁵ The Kleros Escrow Dapp accepts cryptocurrencies other than ETH, as long as they comply with the Ethereum ERC20 standard.

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Technically anyone with an Ethereum wallet can be a party to a Kleros dispute.²⁶ By registering their transaction on Kleros' Escrow Dapp,²⁷ contracting parties opt-in to Kleros as the chosen dispute resolution forum in their smart-contract.²⁸ The opt-in process requires placing the contract funds into an escrow account that Kleros controls.²⁹

In addition to needing cryptocurrency to conduct a crypto-transaction, the parties also pay a transaction fee to record the transaction on the Ethereum network.³⁰ This transaction fee is called "gas" and is paid in multiples of "gwei"—a nano fraction of ETH.³¹ Gas is separate from the funds in ETH used to pay the contract price. Gas is paid to ETH miners in consideration for verifying the transaction on the blockchain and represents the computational cost of the transaction. As shown in **Figure 2** below, contract parties who opt-in to Kleros pay the appropriate gas fee to register each of their crypto transactions on the Kleros Escrow Dapp.

Registering the transaction on Kleros' Escrow Dapp involves registering the parties' ETH address, the type of transaction (i.e., sale, freelancing, payroll, etc.), the contract amount in ETH (or applicable cryptocurrency), as well as the "Timeout Date" (i.e., the time and date by which the parties must have executed their contractual obligations, when the funds become due). The Escrow Dapp contains a feature that asks each party

²⁶ See *Ethereum Wallets*, ETHEREUM, <https://ethereum.org/en/wallets/> (last visited Mar. 17, 2021).

²⁷ The Escrow Dapp refers to Kleros' decentralized application which is built on top of the Ethereum network. For more information, see Stuart James, *Kleros Escrow Explainer - Secure Your Blockchain Transactions Today*, KLEROS (Apr. 30, 2019), <https://blog.kleros.io/kleros-escrow-secure-your-blockchain-transactions-today> [hereinafter James, *Kleros Escrow Explainer*]; see also Stuart James, *Out Now - Kleros ERC20 Token Escrow*, KLEROS (Aug. 9, 2019), <https://blog.kleros.io/make-erc20-escrow-payments-with-kleros/> [hereinafter James, *Out Now*].

²⁸ Kleros recently confirmed that it can provide dispute resolution services to parties to non-smart contracts that do not own any cryptocurrency. In other words, parties to non-smart contracts may opt-in to Kleros dispute resolution in their contract. The parties would not benefit from the automatic enforcement facilitated by the Escrow Dapp. Instead, they would have recourse to enforcement proceedings in regular court, such as under the New York Convention. For more information, see Federico Ast, *Secure Your Contract With Kleros Dispute Resolution*, KLEROS (Sept. 23, 2020), <https://blog.kleros.io/secure-your-contract-with-kleros/>.

²⁹ See James, *Kleros Escrow Explainer*, *supra* note 27.

³⁰ *Id.*

³¹ *Gas and Fees*, ETHEREUM (Sept. 7, 2021), <https://ethereum.org/en/developers/docs/gas/>.

whether the other fully complied with the contract.³² If the parties answer in the affirmative, then Kleros releases the funds held in escrow to the receiving party.³³

If, however, a party answers in the negative, then in order to trigger the arbitration mechanism and have the dispute referred to a Kleros jury, the parties need to pay the arbitration fee and the corresponding gas fee. The arbitration fee is the payment Kleros jurors receive for rendering a coherent (majority) decision in the dispute; it is reserved only to coherent jurors, and incoherent jurors receive no portion of it. Both parties must pay the arbitration fee by a certain deadline, otherwise the non-paying party automatically loses the dispute.³⁴ While the arbitration fee is initially paid by both parties to trigger the arbitration process, the winning party is reimbursed their portion of the arbitration fee. Therefore, the arbitration fee is ultimately paid only by the losing party to the coherent jurors.

In addition to the arbitration fee, the parties must also pay a gas fee to trigger the arbitration option. Therefore, disputing parties pay gas fees twice: first when they register their crypto transaction (as discussed above), and again when they trigger the arbitration process. The volatility of gas prices makes it difficult to predict how onerous the gas fee may be at each instance it is required. Consequently, while parties should expect to pay gas fees twice, it is difficult to plan a precise budget in advance.

At the end of the dispute resolution process, Kleros distributes the funds in escrow to the appropriate disputant in accordance with the jury's decision, disburses the losing disputant's portion of the arbitration fee to the coherent jurors, and reimburses the winning disputant's portion of the arbitration fee.³⁵

As described above, the breakdown of costs for disputing parties who resort to arbitration on Kleros depends on the outcome of the dispute. The two-time gas fee represents a fixed cost for both parties. Other than paying the appropriate gas fee twice, the winning party need only front the arbitration fee, which it will receive back in full at the end of the dispute. The losing party bears a greater financial burden since it pays the arbitration fee in addition to the gas fees.

2. ACCESSING KLEROS AS A POTENTIAL JUROR

³² Complying with the contract means either performing the non-money obligation or paying the contract sum.

³³ This is illustrated by the dotted line in **Figure 2** below, where dotted lines represent sums that are transferred but later reimbursed, while solid lines represent sums that remain permanently with the receiving party.

³⁴ See James, *Kleros Escrow Explainer*, *supra* note 27.

³⁵ *Id.*

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To be eligible for “jury duty,” Kleros jurors (virtually anyone in the world) must purchase PNK from an online exchange, and pledge (stake) them to one of Kleros’ courts, as a sort of “entry fee.”³⁶ As described above in (1) and illustrated in **Figure 1**, an aspiring Kleros juror must hold some cryptocurrency (either ETH or other) to purchase PNK, and some ETH to pay the necessary gas fees. Thus, the pathway to participation as a potential juror is usually as follows. First, fiat currency (such as USD) is used to purchase cryptocurrency. The cryptocurrency is in turn used to purchase the Kleros crypto token, the PNK.³⁷ Finally, PNK are staked to one or more Kleros courts in order to enter the pool of potential jurors, and a gas fee corresponding to the staking is paid in ETH.

Each Kleros court has its own threshold for the minimum amount of PNK that must be staked to enter the pool.³⁸ The amount staked above the required minimum determines the odds of each individual juror being selected from within the specific Kleros court juror pool.³⁹ Thus, the more PNK is staked, the greater the chances of being selected to serve as a juror.⁴⁰ Once drawn to serve in a case, jurors consider the evidence, and either cast a binary vote on the arbitrable issue and pay the corresponding gas fee, or receive a penalty for failure to submit a vote which is equal to that charged from an incoherent juror.⁴¹

Under Kleros’ incentive system model (based on game theory), honest jurors are expected to form a majority and reach the same outcome, and they will receive the arbitration fee deposited by the disputant for their “coherent” vote that is paid in cryptocurrency (Ethereum).⁴² The system admittedly contemplates that, in some cases, honest jurors will nevertheless fail to constitute a majority and, therefore, will lose money.⁴³ Thus, Kleros’ incentive system model is one that expects honest jurors to become the systems’ repeat-

³⁶ See James Metzger, *The Current Landscape of Blockchain-Based, Crowdsourced Arbitration*, 19 MACQUARIE L. J. 81, 99 (2019) [hereinafter Metzger, *The Current*]; *Kleros Whitepaper*, *supra* note 2, at 4.

³⁷ It is possible to purchase PNK with cryptocurrencies other than ETH, depending on each decentralized exchange that lists PNK.

³⁸ See *The Kleros Juror Starter Kit*, KLEROS, <https://blog.kleros.io/the-kleros-juror-starter-kit/> (last visited Mar. 4, 2021).

³⁹ See Metzger, *The Current*, *supra* note 36, at 100; *Kleros Whitepaper*, *supra* note 2, at 4.

⁴⁰ See *The Kleros Juror Starter Kit*, *supra* note 38.

⁴¹ See *Kleros Whitepaper*, *supra* note 2, at 6–8 (noting that when the majority of jurors refuse to arbitrate, no penalty is charged to any jurors).

⁴² *Kleros Whitepaper*, *supra* note 2, at 6.

⁴³ *Id.* at 8.

players, to form a majority more often than not, and, ultimately, to make more money than they lose in deciding the outcome of disputes.

When jurors are drawn to serve on a Kleros court, a portion of their staked PNK is “locked,” while the remainder is refunded. Staked PNK is refunded entirely to potential jurors who were not drawn. After the jurors complete their vote, coherent jurors are refunded the entire amount of their locked PNK, while incoherent jurors lose their locked PNK. This is illustrated in **Figure 2** below, where the dotted lines represent sums that are transferred but later reimbursed, while solid lines represent sums that remain permanently with the receiving party. The penalty for incoherent jurors is significantly less than the minimum required PNK stake for that court—in other words, incoherent jurors do not lose all the PNK they had staked. The PNK penalty collected from non-coherent jurors, if any, is divided among the coherent jurors.

As with Kleros disputants, Kleros jurors are also subject to paying gas fees twice: once, when they stake PNK in a Kleros court, and a second time, when they cast their vote to determine the outcome of a dispute. The double gas fee represents a fixed cost of participation for all Kleros jurors. Incoherent jurors are subject to an extra expense: they lose a portion of their staked PNK in the form of a penalty. In contrast, coherent jurors receive financial gains in the form of the losing party’s portion of the arbitration fee, and an equal portion of the penalty paid by incoherent jurors. Again, in order for the endeavor to be financially worthwhile for the jurors, the aggregate gains must be enough to offset the fixed costs of participation (i.e., the double gas fee), as well as the penalties associated with any incoherent votes.

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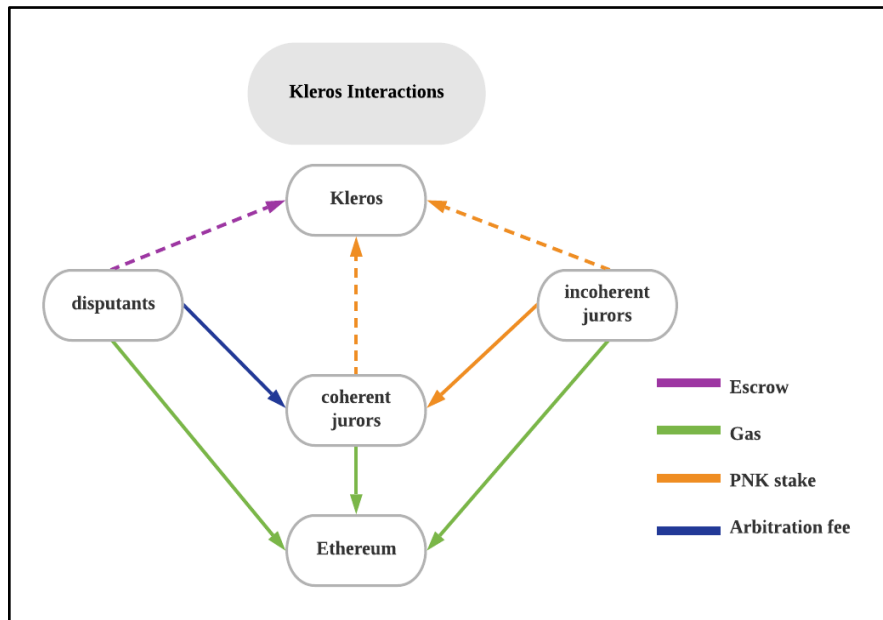


Figure 2: Financial Interactions Under Kleros' Dispute Resolution Process

III. FROM NON-CONTRACTUAL RELATIONS IN BUSINESS TO A WORLD OF (SMART) CONTRACTS

A. *We Are Usually of the Non-Litigious Type*

The literature on claiming behavior supports a potentially unintuitive proposition: The members of our societies are not as litigious as we may think. Some four decades ago, Law and Society scholars articulated the idea that disputes are social constructs that each person fills with different content.⁴⁴ They further explain that disputes materialize through a three-step transformation process known as “naming” (perceiving experiences as injurious), “blaming” (attributing the responsibility to another), and “claiming” (demanding a remedy).⁴⁵ A dispute materializes when the demand for a remedy, at the claiming stage, is rejected by the agent of the damage.⁴⁶

More recently, Lawrence Friedman emphasized “getting out the message” as a necessary requisite for legal impact.⁴⁷ In fact, a lot can happen

⁴⁴ William L. Felstiner et al., *The Emergence and Transformation of Disputes: Naming, Blaming, Claiming*, 15 L. & SOC'Y REV. 631, 631–32 (1980-1981).

⁴⁵ *Id.* at 635–36.

⁴⁶ *Id.* at 636.

⁴⁷ See LAWRENCE M. FRIEDMAN, *IMPACT: HOW LAW AFFECTS BEHAVIOR* 7–43 (2016).

between the “blaming” and “claiming” transformation steps that Felstiner et al. outlined before. When the law confers individuals a right, the individuals who “get the message” contained in the law are more likely to enforce their rights.⁴⁸ Logically, messages contained in simpler rules are easier to communicate and, therefore, more likely to have a legal impact. More complex legal messages tend to get lost in the process, and rights go unenforced as a consequence.⁴⁹

The result is that individuals who have “gotten the message” and go through the naming and blaming steps, never reach the claiming stage. Oftentimes factors intrinsic to the dispute process cause the potential claimants to withdraw from it despite having already invested significant resources into enforcing their legal rights. In socio-legal parlance, this is called “lumping.”⁵⁰ David Engel further explains that the reasons for this lumping can be economic, cultural, or even religious.⁵¹

Law and Society literature also includes studies on the specific nature of litigious behavior in close-knit business-to-business relationships. Stewart Macaulay’s now-classic 1963 study on non-contractual relations in business shows that businessmen will not sue their counterparts for contractual breach, but rather will “get the other man on the telephone and deal with the problem.”⁵² In any event “[y]ou don’t read legalistic contract clauses at each other” and “[one doesn’t] run to lawyers if [one wants] to stay in business because one must behave decently.”⁵³ In discussing Macaulay’s study, Lawrence Friedman reveals that this behavior is not purely altruistic; making claims and bringing lawsuits is disruptive and costly.⁵⁴ Seeking to enforce contractual rights could have a devastating effect for the business

⁴⁸ *Id.* at 18.

⁴⁹ *Id.* at 28–29.

⁵⁰ See DAVID M. ENGEL, THE MYTH OF THE LITIGIOUS SOCIETY: WHY WE DON’T SUE 20 (2016) (noting the dictionary definition of “lumping” which defines the term as “‘to put up with;’ ‘resign oneself;’ ‘accept and endure[.]’”).

⁵¹ *Id.* at 21 (referencing the empirical findings—that 9 out of 10 tort victims in the U.S. never become plaintiffs—reported in DEBORAH R. HENSLER ET AL., COMPENSATION FOR ACCIDENTAL INJURIES IN THE UNITED STATES 121, RAND Corporation (1991), <https://www.rand.org/pubs/reports/R3999.html>).

⁵² See Stewart Macaulay, *Non-Contractual Relations in Business: A Preliminary Study*, 28 AM. SOC. REV. 55, 61 (1963) (reporting the findings of a qualitative study conducted in Wisconsin that involved a wide range of semi-structured interviews—from a 30-minute “brush-off” to a six-hour sit-down—with “68 businessmen and lawyers representing 43 companies and six law firms”).

⁵³ *Id.*

⁵⁴ See FRIEDMAN, *supra* note 47.

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relationship.⁵⁵ Finally, Friedman highlights a proposition for which Macaulay's study is seldom cited: just like broken marriages resort to divorce law as a framework for determining the terms of their future relationship, the non-breaching parties in broken business relationships invariably seek to enforce the contract.⁵⁶

By enforcing contracts automatically, Kleros offers a solution that potentially avoids the negative impact on relationships that is inherent to the dispute materialization process of traditional contract enforcement. Since many steps of the dispute materialization process are bypassed under Kleros, the result is that the dispute at hand is settled with minimal confrontation between the parties, and their relationship therefore remains relatively intact.

B. Literature Discussing ODR and Kleros

It is a truism that face-to-face interactions in business are no longer a necessary and common part of business transactions.⁵⁷ Along with that, the traditional businesspeople handshake—an important ingredient for building

⁵⁵ *Id.*

⁵⁶ *Id.*

⁵⁷ Over the last couple of decades, consumers have taken their business for low-value retail goods away from traditional (and local) “mom-and-pops” to e-commerce platforms like eBay or Amazon. This trend to conduct economic transactions online continues to expand and now covers high-value investments such as the purchase of real estate. *See generally* Patrick Sisson, *Millennials, Priced Out of Homes Locally, Shop for Investment Properties Online*, CURBED, <https://archive.curbed.com/2019/9/10/20852849/millennial-buy-a-home-homeownership-remote> (last visited Mar. 17, 2021). For automobiles, see Neal E. Boudette, *Pandemic Forces Car Dealers to Do the Unthinkable: Sell Online*, N.Y. TIMES, <https://www.nytimes.com/2020/05/29/business/car-dealers-sell-online-coronavirus.html> (last visited Mar. 17, 2021).

trust—is also becoming increasingly rare.⁵⁸ With the advent of the internet, modern day businesspeople and online consumers are mostly concerned with their counterparts' ability to guarantee the quality of their products (and services) on the one hand, and provide fast and efficient remedies on the other hand.⁵⁹ Schmitz and Rule have characterized ODR as “the new handshake” that is necessary to generate trust among the participants in electronic commerce.⁶⁰ Kleros takes ODR a step further by adapting it to the era of blockchain and smart contracts. This adaptation, as Nappert and Agarwal note, is grounded on relational trust theory and hinges on a juror appointment method that causes parties, who would not otherwise trust each other, to develop a sort of “trustless trust” necessary to carry on with their business.⁶¹

Much of what is written about Kleros is limited to descriptions of its mechanisms, sometimes with explanations of blockchain and smart contracts. Numerous other papers provide a purely descriptive comparison of several

⁵⁸ See AMY J. SCHMITZ & COLIN RULE, *THE NEW HANDSHAKE: ONLINE DISPUTE RESOLUTION AND THE FUTURE OF CONSUMER PROTECTION* (2017). For a discussion of blockchain in the context of international arbitration, see Ibrahim Shehata, *Three Potential Imminent Benefits of Blockchain for International Arbitration: Cybersecurity, Confidentiality & Efficiency*, *YOUNG ARB. REV.* 32–37 (2018).

⁵⁹ *Id.* (Colin Rule is a pioneer in this field, and his experience developing an Online Dispute Resolution (ODR) system for handling the enormous volume of disputes that eBay began generating at the turn of the century is an example of our time's greatest attempts to meet these new needs). See generally, Louis F. Del Duca, Colin Rule & Kathryn Rimpfel, *eBay's De Facto Low Value High Volume Resolution Process: Lessons and Best Practices for ODR Systems Designers*, 6 *Y.B. ARB. & MEDIATION* 204 (2014).

⁶⁰ See SCHMITZ & RULE, *supra* note 58.

⁶¹ See Sophie Nappert & Avani Agarwal, *Twenty-First Century Arbitration: Who Do You Trust?*, *KLUWER ARB. BLOG* (Mar. 2, 2020), <http://arbitrationblog.kluwerarbitration.com/2020/03/02/twenty-first-century-arbitration-who-do-you-trust/>.

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blockchain dispute resolution systems, including Kleros.⁶² In these studies, Kleros stands out from the pack. For example, in their comparative analysis of nine blockchain-based dispute resolution systems, Metzger describes Kleros as “the most developed, and perhaps the most ambitious, of the dispute resolution providers to emerge to date.”⁶³

Previously, however, in *Decentralized Justice in the Era of Blockchain*, the same author—Metzger—provides a normative analysis of Kleros and assesses its ability to deliver on its promise to provide “quick, cheap and most of all fair” dispute resolution for “parties with real (smart) contracts and real disputes.”⁶⁴ In this study, Metzger also provides one of the most in-depth takes on Kleros so far reported, and one which is largely informed by its author’s experience as a participant in Kleros’ first Interactive Initial Coin Offering (IICO).⁶⁵

Metzger’s Kleros critiques were directed towards the absence of verification of jury qualifications, barriers to participation (obtaining Ether is complicated), the volatility and unpredictability of cryptocurrency, inflexibility of the sub-court designation in the event that a dispute arises

⁶² See Francisco Uribarri Soares, *New Technologies and Arbitration*, 7 INDIAN J. ARB. L. 84 (2018); Orna Rabinovich-Einy & Ethan Katsch, *Blockchain and the Inevitability of Disputes: The Role for Online Dispute Resolution*, 2019 J. DISP. RESOL. 47 (2019); Amy J. Schmitz & Colin Rule, *Online Dispute Resolution for Smart Contracts*, 2019 J. DISP. RESOL. 103 (2019); Darcy W. E. Allen, Aaron M. Lane & Marta Poblet, *The Governance of Blockchain Dispute Resolution*, 25 HARV. NEGOT. L. REV. 75 (2019); Bronwyn E. Howell & Petrus H. Potgieter, *Governance of Smart Contracts in Blockchain Institutions*, (Jun. 11, 2019), <https://ssrn.com/abstract=3423190>; Janet K. Martinez, *Designing Online Dispute Resolution*, 2020 J. DISP. RESOL. 135 (2020); Amy J. Schmitz, *Resolving a New Kind of Trade War Through ODR*, 2019 UNIV. OF MO. SCH. OF L. LEGAL STUD. RES. PAPER NO. 103 (Jan. 26, 2020), available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3525767; John Lande, *Theories of Change for the Dispute Resolution Movement: Actionable Ideas to Revitalize Our Movement*, UNIV. MO. SCH. L. LEGAL STUD. RES. PAPER NO. 2020-03 (Feb. 6, 2020), available at: <https://ssrn.com/abstract=3533324>. For another description of the advantages and shortcomings of ODR platforms, see Aleksei Gudkov, *Crowd Arbitration: Blockchain Dispute Resolution*, 3 LEGAL ISSUES IN THE DIG. AGE 59–77 (2020) (using examples from Kleros, Baidu and Alibaba-Taobao and reporting the results of a survey of Kleros’ jurors and stakeholders, without describing the study methodology).

⁶³ See Metzger, *The Current*, *supra* note 36, at 99.

⁶⁴ See Metzger, *Decentralized*, *supra* note 3. For a critique of the broader social imaginaries of Kleros, see Matthew Dylag & Harrison Smith, *From Cryptocurrencies to Cryptocourts: Blockchain and the Financialization of Dispute Resolution Platforms*, INFO., COMM’N & SOC’Y at 8, 11–13 (2021) (taking the position that “[t]hese platforms instead pose important questions concerning their potential impact on civil dispute resolution practices by embedding it within an economy of cryptocurrency speculation”).

⁶⁵ Metzger, *Decentralized*, *supra* note 3.

outside of the court's area of expertise, impact on the fairness of outcomes since having more tokens increases the probability of being selected as a juror, as well as impossibility to "determine whether a juror understands the expectations of the parties or the actual or perceived law that is to be applied."⁶⁶ In the following section we describe the triangular research approach we use to shed light on the world of Kleros.

IV. METHODOLOGY

A. *Why Kleros?*

Kleros is not alone. There are many blockchain solutions available that cater specifically to the smart contract and blockchain-based dispute resolution needs of its users.⁶⁷ In fact, Metzger's comparative study reveals that at least nine such platforms have come into existence from 2017 onwards.⁶⁸ Kleros' predecessor—*CrowdJury*—launched in 2015, paving the way for Kleros to emerge in 2017.⁶⁹ We share Metzger's belief that Kleros is the most sophisticated platform of its kind, which is probably due to the fact that Kleros has been around for relatively longer than its competitors, and has received distinctions and financial support from private and governmental institutions. Therefore, Kleros is the ideal platform to study the emerging field of token-based online dispute resolution.⁷⁰

⁶⁶ *Id.* at 9; see also Tonya M. Evans, *Role of International Rules in Blockchain-Based Cross-Border Commercial Disputes*, 65 WAYNE L. REV. 1 (2019).

⁶⁷ See Nevena Jevremović, *2018 In Review: Blockchain Technology and Arbitration*, KLUWER ARB. BLOG (Jan. 27, 2019), <http://arbitrationblog.kluwerarbitration.com/2019/01/27/2018-in-review-blockchain-technology-and-arbitration/> (last visited Mar. 19, 2021) (referencing several examples of blockchain-based platforms, including *Kleros* and *Jury.online*).

⁶⁸ See Metzger, *The Current*, *supra* note 36.

⁶⁹ Kleros' current CEO began shaping the idea of a decentralized blockchain-based dispute resolution platform (then marketed as *CrowdJury*) as early as 2015. For more information about *CrowdJury*, see Federico Ast & Alejandro Sewrjugin, *The CrowdJury, a Crowdsourced Judicial System for the Collaboration Era*, MEDIUM, <https://medium.com/the-crowdjury/the-crowdjury-a-crowdsourced-court-system-for-the-collaboration-era-66da002750d8> (last visited Mar. 17, 2021).

⁷⁰ As it is often the case in qualitative and socio-legal research, we purposely and opportunistically selected Kleros as the subject of this case study. See generally JOHN W. CRESWELL, *RESEARCH DESIGN: QUALITATIVE, QUANTITATIVE, AND MIXED METHODS APPROACHES* (SAGE 2014). The subject specific knowledge and network that our co-author, Luis Bergolla, developed when he participated in Kleros' inaugural Fellowship of Justice Program in 2018 overall facilitated the data collection phase of this study.

B. Kleros' Caseload

As part of this case study, we inspected Kleros' public database of disputes.⁷¹ At the time of conducting our observations, 372 cases had been filed with Kleros,⁷² out of which 362 had been finally decided, and with 10 cases pending.⁷³ For purposes of this case study, we reviewed the first 362 "resolved" cases focusing on the nature of the dispute and the Kleros court in which they were decided. Based on our observations, we identify trends in those Kleros cases and describe the basic characteristics of the most common type of Kleros disputes.

C. Exploratory Interview with Kleros' Key Players

In preparation for the exploratory semi-structured interview, we sent Kleros two preliminary questionnaires by e-mail. Then, following standard qualitative methodology used in the field of social sciences, we conducted a 2.5-hour semi-structured interview via Zoom conference.⁷⁴ This interview enabled us to probe Kleros' narrative and to better understand some of the technical aspects of blockchain, smart contracts, and cryptocurrencies generally. Our goal in this interview was to clarify our own understanding of Kleros in order to fill out the numerous gaps that we and other prior studies have flagged.

D. Observational Survey of Kleros Community Members

The aim of our case study is to analyze Kleros as a dispute resolution institute and a social process. To further our understanding of Kleros, we conducted a survey of Kleros community members. Kleros maintains an active

⁷¹ Anyone can inspect Kleros' cases through Kleros' own portal. *See, e.g.*, <https://court.kleros.io/cases/1>. To browse the cases, one has to manually write the case number in the URL. For example, the URL transcribed in this footnote would take the user to Kleros case No. 1, <https://court.kleros.io/cases/1>, <https://court.kleros.io/cases/2> would take the user to Kleros case No. 2 and so on.

⁷² A third-party web-based application called Kleroscan allows users to inspect Kleros' entire caseload history in real time. This application has now been replaced by Klerosboard. *See* KLEROSBOARD, <http://klerosboard.com/> (last visited Dec. 10, 2021).

⁷³ As of July 22, 2020, when we started reviewing cases, the total number of disputes registered with Kleros was 302. We limited ourselves to the first 300 cases. However, it is important to note that the number of disputes is increasing and as of the last quarter of 2021, there are already over 1000 cases registered with Kleros.

⁷⁴ *See* IRVING SEIDMAN, *INTERVIEWING AS QUALITATIVE RESEARCH: A GUIDE FOR RESEARCHERS IN EDUCATION & THE SOCIAL SCIENCES* (4th ed. 2013).

community through the use of a messaging application called Telegram.⁷⁵ As described below in more detail, Kleros benefits from an engaged community of users, followers, and admirers who communicate daily, oftentimes hourly, using Telegram.⁷⁶ Following the standard survey methodology that is used in social science research, we designed a 14-question online interactive survey using Qualtrics[®].⁷⁷ In September of 2020, we availed ourselves of Kleros' English and Spanish channels on Telegram to distribute the survey using an anonymous link generated by Qualtrics[®].⁷⁸

Our survey received 51 full responses and 40 partial responses.⁷⁹ Since our study is exploratory and observational, we refrain from making any causal claims or generalizations based on the survey responses. In particular, since the survey was designed to gain knowledge about Kleros as an institution and social process, the survey responses cannot be used to draw generalizations about the Kleros community or participants of ODR. The survey responses allow us to formulate interesting questions that given their empirical nature warrant further research. Where relevant, we also discuss our own experience using the Kleros escrow application, as well as serving as jurors in three Kleros arbitration cases.

The following section focuses on our case study of Kleros.

V. CASE STUDY OF KLEROS

The Kleros platform is designed to entertain disputes on a variety of issues arising from traditional contractual breach cases, like one involving someone buying a vehicle from a used car dealership,⁸⁰ to Covid-19-related

⁷⁵ See TELEGRAM, <https://t.me/kleros> (last visited Mar. 17, 2021).

⁷⁶ At the time of writing, Kleros Telegram chat in English has over 4000 members, the chat in Spanish has over 500 members, and Kleros trading channel—also on Telegram—has 700 members. Presumably, multiple individuals subscribe to multiple chats.

⁷⁷ See generally PAMELA L. ALRECK & ROBERT B. SETTLE, *THE SURVEY RESEARCH HANDBOOK: GUIDELINES AND STRATEGIES FOR CONDUCTING A SURVEY* (Nina McGuffin & Heather McCammond-Watts eds., 2d ed., 1995); FLOYD J. FOWLER, JR., *SURVEY RESEARCH METHODS* (5th ed. 2013); NORMAN M. BRADBURN, SEYMOUR SUDMAN, & BRIAN WANSINK, *ASKING QUESTIONS: THE DEFINITIVE GUIDE TO QUESTIONNAIRE DESIGN—FOR MARKET RESEARCH, POLITICAL POLLS, AND SOCIAL AND HEALTH QUESTIONNAIRES* (2d rev. ed. 1982).

⁷⁸ While the link to the survey was transferable, we turned on Qualtrics' feature to prevent "ballot stuffing" (i.e., to keep the respondents from taking the survey twice on the same device or from the same IP address).

⁷⁹ Survey design plan and responses on file with the authors.

⁸⁰ See *Case #196*, KLEROS, <https://court.kleros.io/cases/196> (last visited Mar. 17, 2021).

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disputes arising from a principal-contractor relationship.⁸¹ Since its inception, the paradigmatic case that Kleros has used to market its platform and to explain its dispute settlement mechanism has been the hypothetical dispute between “Alice” and “Bob,”⁸² the “exemplar parties to a smart contract” as defined by the *Smart Contracts Glossary*.⁸³ In this example, Alice and Bob want to close a small business deal despite being located in different countries. The geographical distance between them, however, makes it difficult to assess each other’s trustworthiness. As rational businesspeople, Alice and Bob are expected to eventually abandon the idea of doing business with each other in face of the high risk of contract breach, a risk made even higher by the absence of any traditional form of security to guarantee the contract. Online interactions are insufficient to develop the trust that businesspeople need to comfortably deal with each other. Through its Escrow process, Kleros offers a solution for bridging the trust gap that separates Alice from Bob so that the two can finally and securely do business together.

As it is used currently, however, Kleros provides a dispute resolution solution for a type of disputant that is very different from the “Alice and Bob” model. In this section, we report the results of an exploratory, observational user survey and analyze Kleros’ capacity to improve on traditional dispute resolution. First, we introduce the concept of the (A) “decentralized sheriff,” a term that we use to refer to the crowd-based compliance mechanism implemented by Kleros to certify crypto tokens. Second, building on the work of scholars who studied Kleros before us, we analyze (B) the major obstacles to widespread adoption of Kleros. Third, we explore (C) social interactions of trust and claiming present unique characteristics under Kleros compared to models described in Law and Society literature. Finally, we highlight key insights regarding our (D) survey respondents’⁸⁴ thoughts on Kleros.

A. An Emerging Niche Area for Dispute Resolution: The Kleros “Decentralized Sheriff”

Although primarily designed for smart contract disputes, a significant portion of Kleros cases have a niche subject matter: the so-called “curated lists” (i.e., a compliance mechanism for the listing of crypto tokens for sale on a number of cryptocurrency exchanges and as currency in the Kleros Escrow

⁸¹ See Case #195, KLEROS, <https://court.kleros.io/cases/195> (last visited Mar. 17, 2021).

⁸² See Kleros, *Kleros – The Justice Protocol Explainer*, YOUTUBE (Mar. 28, 2018), https://www.youtube.com/watch?v=NuSps_2wMQ4&t=8s.

⁸³ Nick Szabo, *Smart Contracts Glossary*, NAKAMOTO INSTITUTE (1995), <https://nakamotoinstitute.org/smart-contracts-glossary/>.

⁸⁴ We use the term “respondent” to refer to those who replied to our survey.

Dapp). It is apparent from the caseload inspected that these curated lists constitute the subject matter of the majority of cases resolved by Kleros juries during the observed period. Kleros' CEO confirms that the "compliance mechanism for token listings is big!"⁸⁵ The survey data obtained in this case study also confirms that the overwhelming majority of respondents who declare having participated in Kleros either as a party or juror, have done so in curated list cases, as opposed to other categories like e-commerce, escrow, insurance, gaming, etc.⁸⁶

While the "Alice and Bob" prototypical dispute presupposes that the parties are in contractual privity, this is not the case of curated list disputes. Curated list disputes are a novel example of "arbitration without privity."⁸⁷ Kleros' CEO explains the curated list dispute process as follows: "[y]ou list your token saying it's compliant, then someone can challenge the listing, and the case is submitted before anonymous Kleros jurors who then decide if the token is indeed compliant with the rules."⁸⁸ But why would one want to stake money that can potentially be lost in arbitration by challenging a token? After all, it is one thing to pay an arbitration fee in the context of a consensual multi-party transaction, and entirely another to independently scrutinize a listed token and stake money (ETH) on one's assessment that the token is non-compliant and should therefore be struck from the listing. The answer is rather simple: like jurors, good faith token challengers are expected to become the system's repeat-players and to make money from challenging tokens in the aggregate. Cryptocurrency holders who benefit from a healthy market, inasmuch as they foster asset appreciation, find an economic incentive⁸⁹ in Kleros to stay alert and try to bust (challenge) the "bad guys"⁹⁰ who try to list "bad" tokens.⁹¹ As a system safeguard, the challenger must demonstrate that

⁸⁵ See Interview with Federico Ast, CEO, and William George, Crypto Economics Researcher, Kleros (Aug. 12, 2020) [hereinafter Kleros Interview No. 1] (transcript on file with the authors).

⁸⁶ The percentage of curated list cases is estimated at least at 48% of the total cases decided by Kleros during the observed period, and significantly more than 50% of the real cases considering that 15% of the cases are onboarding dummy cases filed for juror training purposes.

⁸⁷ See JAN PAULSSON, *THE IDEA OF ARBITRATION* 92 (1st ed. 2013).

⁸⁸ Kleros Interview No. 1, *supra* note 85.

⁸⁹ Successful token challenges earn a fee that is paid to the challenger's Ethereum wallet. See *Kleros Tokens Tutorial*, KLEROS, <https://kleros.gitbook.io/docs/products/tokens/kleros-t2cr-tutorial> (last visited Dec. 30, 2021).

⁹⁰ See Kleros Interview No. 1, *supra* note 85.

⁹¹ See Kleros Interview No. 1, *supra* note 85.

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they have “skin in the game” before they can receive the direct economic incentive in place for the curated lists.

Kleros’ curated lists dispute resolution mechanism is further justified for the following reasons. Exchanges like Binance,⁹² or the token exchange platform Uniswap,⁹³ as well as Kleros, have an interest in featuring only tokens that are “good”—tokens that comply with the house rules for listing and which will tend to contribute to maintaining a healthy market for the exchange of cryptocurrencies. Kleros has an interest in ensuring that it only supports legitimate tokens in the Escrow Dapp since that is the currency in which the contract funds will be paid. If the token were not compliant, then Kleros would be facilitating payment in an invalid currency, which would in turn mean that the owed party would go unpaid, thereby defeating the purpose of smart contracts (i.e., automatic enforcement). Kleros’ Research Lead further explains the incentive mechanism as follows:

[I]f you submit a token, you have to put down a deposit that will cover the [potential] arbitration fees and the challenger also has to put down an additional fee. If your token is successfully challenged, the challenger gets a portion of your deposit . . . Both parties have to put in a large deposit to pay the jurors. Say it costs \$50 to pay the three jurors . . . then the submitter might have to pay a \$100 deposit, and the challenger might have to pay a \$50 deposit. . . . if you’re the challenger, and you’re wrong, [then] you lose your \$50 deposit. But if you win, you get your deposit back plus the difference between what the submitter deposited to cover the arbitration minus the jurors’ fees.”⁹⁴

This set of incentives is true for any Kleros arbitration, since the disputing parties place a deposit to cover the arbitration fees. However, the intent behind fronting the arbitration fee is vastly different in the context of curated lists. Rather than fronting the arbitration fee in order to safeguard a contractual right, the token challenger deposits the arbitration fee with the intent that they will receive a financial gain from taking initiative and raising

⁹² See BINANCE, <https://www.binance.com/en> (last visited Mar. 17, 2021).

⁹³ See UNISWAP, <https://uniswap.org/> (last visited Mar. 29, 2021).

⁹⁴ See Kleros Interview No. 1, *supra* note 85.

the alarm against the suspicious token.⁹⁵ This gives rise to what we refer to as a *decentralized sheriff* phenomenon whereby the “sheriff” collects a bounty if they are able to bust the undeserving token. This also means that the *sheriffs* will have “skin in the game” such that if they bring a frivolous challenge, they will lose the arbitration fee in the event that a Kleros jury ultimately rejects the challenge.

Kleros founders explain that this kind of compliance system is unique compared to other cryptocurrency exchanges; according to them, other exchanges apply arbitrary standards to decide whether to list a token. We learned that, in contrast, Kleros’ compliance system is one in which any potential noncompliance with the rules is flagged by an economically incentivized challenger and resolved by a panel of economically incentivized jurors who rule on the token challenge. Kleros’ CEO believes “this [mechanism] gives you the same kind of warranties that you get in [a system governed by] the rule of law.”⁹⁶

B. Issues Preventing Adoption by a Broader User Base

Although designed to serve as a dispute forum for parties to smart contracts, instead, Kleros is predominantly used to flag potentially non-compliant blockchain tokens. This raises the question: why are all the Alices and Bobs of the world missing out on all the Kleros action?

In this section, we report the results of our survey questions regarding interest in Kleros as an investment and as a dispute resolution solution. We also report the results related to familiarity of cryptocurrencies and gas prices and analyze these as obstacles to a wider adoption of Kleros.

1. KLEROS: AN INVESTMENT IN A DISPUTE RESOLUTION PLATFORM

In a multiple-choice question, we asked our survey respondents (drawn from a biased sample of individuals who already are members in Kleros’ various Telegram chats) to describe the nature of their interest in Kleros. As shown in **Figure 3**, 71% of respondents answered that their interest

⁹⁵ The pathway to participation in a Kleros curated list dispute is different from that described in 1(B) above. Instead of contract funds, the token lister submits the arbitration fee (plus corresponding gas fee) in addition to a deposit that would be paid to a successful challenger. The token challenger deposits the arbitration fee and pays the corresponding gas fee. If the challenge is successful, the token challenger receives the deposit submitted by the token lister. See Stuart James, *Kleros TCR – A Deep Dive Explainer*, KLEROS (Mar. 7, 2019), <https://blog.kleros.io/kleros-ethfinex-tcr-an-explainer/> [hereinafter James, *Kleros TCR*].

⁹⁶ See Kleros Interview No. 1, *supra* note 85.

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in Kleros stems from wanting to invest in PNK, while 48% answered that they are interested in earning fees serving as jurors.⁹⁷ Furthermore, 32 respondents indicate having both an interest in investing in PNK as well as in acting as jurors.

These observations give rise to some interesting empirical questions for future research. In traditional fora, judges and arbitrators are paid for the work they do deciding disputes, irrespective of the outcome they reach. In contrast, the financial gains of Kleros jurors are dependent on whether or not they reach a specific outcome. As discussed in (II)(B) above, previous commentators have highlighted the risks that this poses to the integrity of the Kleros dispute process. The results of our survey suggest that there may be some basis to these fears, given the respondents' strong interest in using Kleros for financial gains. Could this financial incentive influence the jurors' neutrality? It warrants asking whether a mass of dual investors-jurors with a financial 'stake' in the outcome of the disputes will be able to decide objectively and impartially, without benefitting a particular type of litigant (i.e., claimant over defendants or repeat-player over one-time participant).⁹⁸ Future research may investigate these issues by implementing a controlled study to investigate whether Kleros repeat players are likely to prevail more than non-repeat players, or whether users who also have experience acting as Kleros jurors tend to prevail more than those who do not.

⁹⁷ Since data regarding actual (versus potential) Kleros jurors was outside the scope of our study, we do not know whether in fact those driven by investing in PNK are also acting as jurors in Kleros cases.

⁹⁸ Whether this double-hatting has any impact on the dispute outcomes, and whether Kleros' built-in incentive to mitigate such biases is effective, remain interesting empirical questions that are outside the scope of this case study.

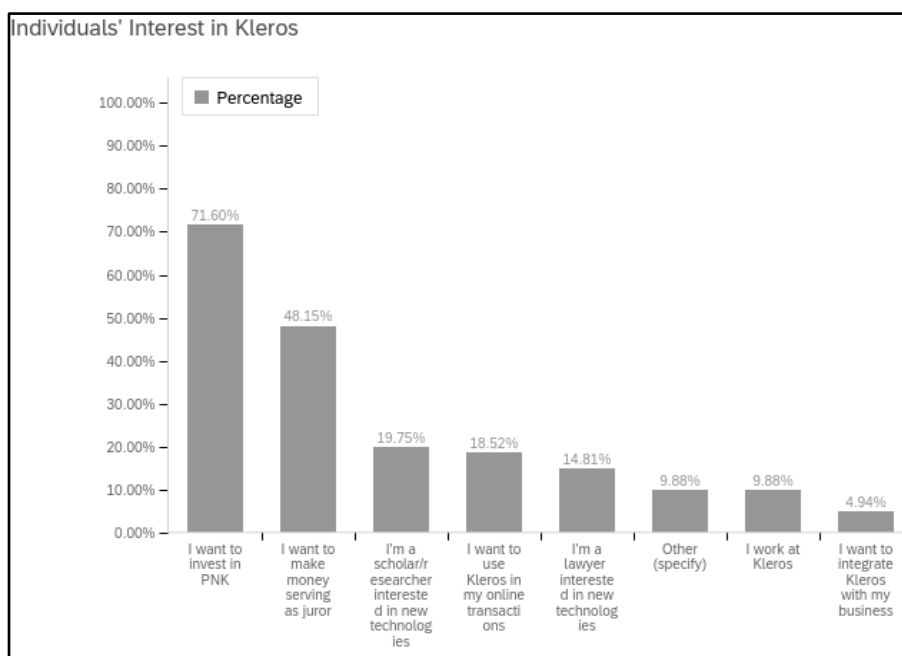


Figure 3: Interest in Kleros ($n = 81$)

As discussed above, the financial incentive offered to Kleros jurors may pose a risk to the integrity of the dispute resolution process. The predominance of the financial incentive for survey respondents is apparent from the amount of PNK held. **Figure 4** below shows that most respondents are holding significant amounts of PNK. The amounts held are enough to meet the higher minimum stake that some of the specialized courts—that offer a higher payout—require for juror participation. This situation is problematic for at least two reasons. For starters, unless one is prepared to accept that speculation is what drives most jurors to participate, then Kleros’ incentives for jurors to stake more and more PNK (in order to improve the odds of being drawn) could defeat the very purpose of random juror selection.⁹⁹ Second, given the high degree of ongoing, fast-paced communication that occurs—and, in fact, is encouraged by Kleros¹⁰⁰—among individuals on the Kleros

⁹⁹ See *Kleros Whitepaper*, *supra* note 2, at 5 (“The probability of being drawn as a juror is proportional to the amount of staked tokens.”).

¹⁰⁰ See *The Kleros Juror Starter Kit*, *supra* note 38 (“If you have questions regarding the courts, or would just like to reach out to fellow jurors, feel free to drop a message on our Telegram, our vibrant community will be at your disposal.”).

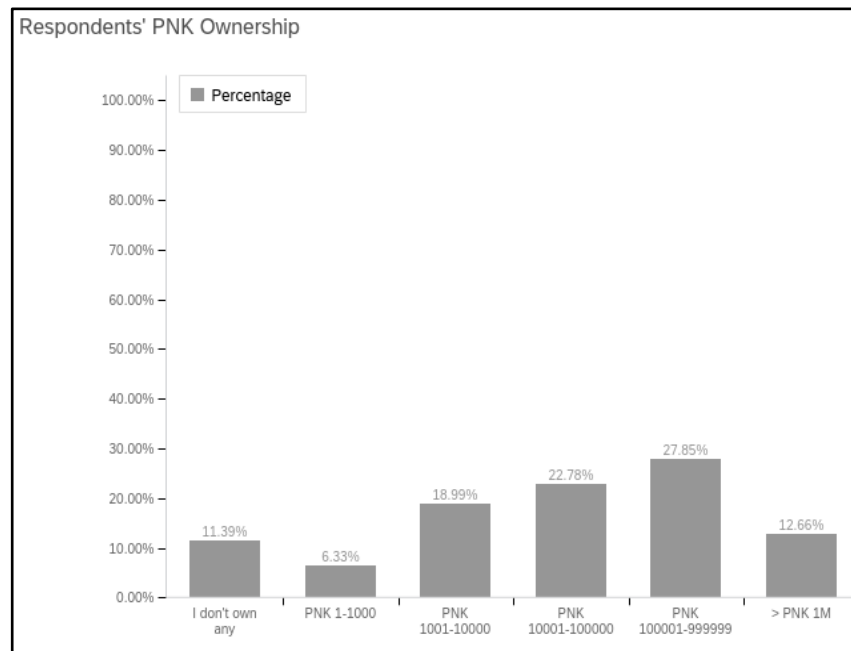
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juror Telegram channels,¹⁰¹ one cannot discard the theoretical possibility of juror collusion. Jurors colluding on outcomes to ensure financial gain would run afoul the game-theory tenets upon which Kleros is based.

Figure 4: PNK Ownership ($n = 79$)

2. SPECIALIZED KNOWLEDGE OF CRYPTOCURRENCIES AND BLOCKCHAIN MECHANISMS

Kleros founders generally agree with scholars as to the potential barriers that prevent its adoption by a larger user base. The “Big Barrier” or



the main “friction point” as Kleros’ CEO refers to it, is that “you have to put crypto into an escrow and there are only a few people [in the world] who are using cryptocurrencies.”¹⁰² We set out to understand and to explore whether lacking knowledge about cryptocurrencies may be an obstacle to more widespread adoption of Kleros.

¹⁰¹ At the time of writing, we found two Kleros public chats active on Telegram, one in English (<https://t.me/klerosjuror>) and one in Spanish (<https://t.me/juradosKleros>). It is not unusual in these channels to find jurors discussing case selection, facts, possible outcomes, voting inclinations, and the content of actual votes casted.

¹⁰² See Kleros Interview No. 1, *supra* note 85.

Using a five-point Likert scale (from “no knowledge at all” to “highly knowledgeable”), we asked survey respondents to identify their level of cryptocurrency knowledge. Based on the answers received, the average respondent possesses a mean knowledge of cryptocurrencies of 3.17. **Figure 5** shows how only 6 out of 79 respondents (7.6%) lack absolute knowledge of cryptocurrencies. The results indicate some association between (perceived) knowledge of cryptocurrency and integrating the Kleros community. This is further confirmed by the remarkably low number of respondents with no knowledge of cryptocurrencies. This suggests that there may be some basis to the knowledge barrier described above.

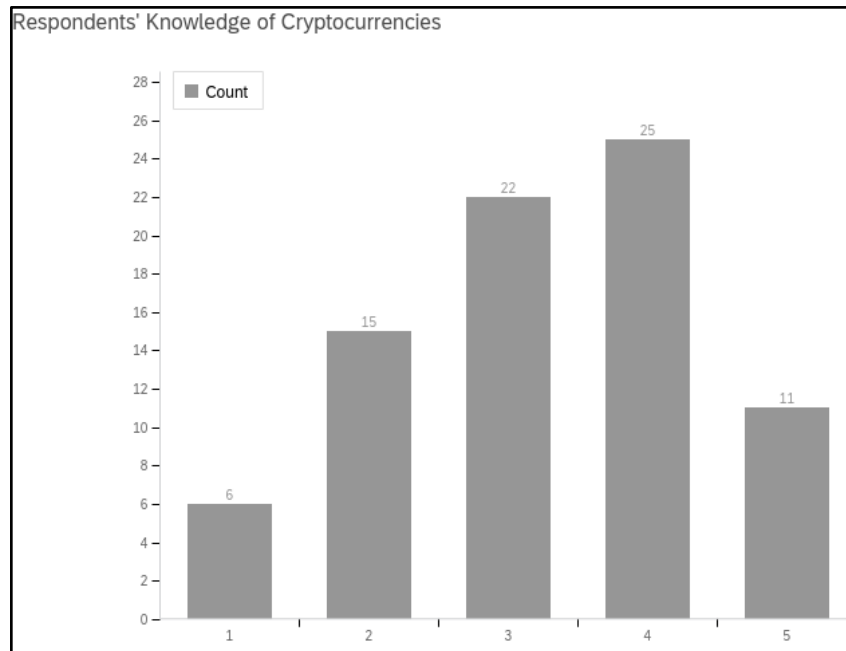


Figure 5: Cryptocurrency Knowledge ($n = 79$)

3. *THE TRIPLE THREAT OF FLUCTUATING GAS PRICES*

Many have applauded the introduction of blockchain dispute resolution based on the assumption that a reduction of transaction costs would

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follow.¹⁰³ However, the value of PNK and Ethereum (ETH), as well as gas,¹⁰⁴ is subject to dramatic fluctuation and cannot be fixed.¹⁰⁵ The “gas problem” is so salient that it has made the headlines of specialized news outlets who deem

¹⁰³ See Sophie Nappert & Federico Ast, *Decentralised Justice: Reinventing Arbitration the Digital Age?*, GLOBAL ARB. REVIEW (May 1, 2020), <https://globalarbitrationreview.com/decentralised-justice-reinventing-arbitration-the-digital-age> (“Because of the way in which they are structured, decentralised justice systems are *radically cheaper* and faster than alternative dispute resolution systems, which makes them especially suited to the resolution of cross-border claims in e-commerce, freelancing, crowdfunding and many other cases from the digital economy with comparatively low financial stakes and a requirement for speedy, and often technical, decision-making.”) (emphasis added); Yingyu Wang, *Blockchain Dispute Resolution: A Better Alternative for the Decentralised World?*, TAYLOR VINTERS (Apr. 3, 2019), <https://www.taylorvinters.com/article/blockchain-dispute-resolution-a-better-alternative-for-the-decentralised-world> (“It is often not worthwhile for parties in an online transaction to seek recourse because the legal costs [...] are likely to outweigh the disputed amount. If such transactions are conducted through smart contracts on a public blockchain, blockchain dispute resolution can provide a cost-effective and efficient method for parties to resolve their disputes.”); Josh Lee, *Smart Contracts and Blockchain-Based Crowdsourced Arbitration: A Primer*, LAWTECH ASIA (Nov. 3, 2020), <https://lawtech.asia/smart-contracts-and-blockchain-based-crowdsourced-arbitration-a-primer/> (“Arbitration conducted by arbitral institutions is generally faster, but more expensive than national judicial systems. They are also not exempt from the time and monetary costs required to enforce awards. Blockchain-based crowdsourced arbitration presents a more affordable form of arbitration that the masses (including freelancers) are more likely to be able to access.”).

¹⁰⁴ Certain computational effort is required to pass a transaction on the Ethereum network. Miners provide such computational effort in exchange for gas payments payable in Ethereum. Gas fees fluctuate according to transaction complexity and also market activity. To learn more about gas fees generally, see *Gas and Fees*, USE ETHEREUM (Sept. 29, 2021), <https://ethereum.org/en/developers/docs/gas/>; William M. Peaster, *Ethereum Gas Explained*, DEFIPRIME (Sept. 22, 2020), <https://defiprime.com/gas>.

¹⁰⁵ It should be noted that PNK—Kleros’ own token—is equally subject to significant fluctuation, having increased from \$0.006 to \$0.09 at the time of writing (and reaching an all-time high price of \$0.4849 in November of 2020). To consult Kleros’ PNK historical values see *Kleros Price*, COINBASE, <https://www.coinbase.com/price/kleros>.

the problem a threat to the viability of smart contracts.¹⁰⁶ By extension, this problem would also apply for Kleros.

To explore the impact of fluctuating gas prices on the volume of interactions in the Kleros platform, we asked survey respondents whether they had ever refrained from using Kleros due to high gas prices. As shown in **Figure 6**, 71% of respondents (i.e., 37 out of 52) confirmed that they had refrained from using Kleros due to high gas prices. As described in (I)(B) above, gas fees arise in Kleros interactions in numerous configurations, and participants in the Kleros dispute resolution platform typically pay gas twice. Of the 37 responses that reported having refrained using Kleros due to gas prices, 22 provided further elaboration. From these elaborations, 5 explicitly mentioned refraining from Kleros as a disputant, while 6 referred to refraining as potential jurors.

In reality, volatile gas prices pose a triple threat to the Kleros system. First, high gas prices make it more expensive to have recourse to Kleros as a disputant (since it becomes more expensive to register a smart contract on the Escrow Dapp) or as a juror (since it becomes more expensive to stake PNK to access the jury pool).

Second, higher gas prices may slow down Kleros' dispute resolution process because economically incentivized jurors may either withhold their votes until gas prices go down in order to maximize their profit or decline to

¹⁰⁶ For a few recent news reports documenting this phenomenon see Terence Zimwara, *Defi Boom Fueling ETH Gas Fees, Threatens Viability of Smart Contracts*, BITCOIN.COM (Sept. 5, 2020), <https://news.bitcoin.com/defi-boom-fueling-eth-gas-fees-threatens-viability-of-smart-contracts/>; Stuart Popejoy, *Peril or Promise for Defi?*, KADENA (Sept. 2, 2020), <https://medium.com/kadena-io/high-gas-prices-peril-or-promise-for-defi-d0297f905f69>; Michael Garbade, *High Gas Fees Prevent Ethereum From Being Ethereum*, COINDESK (Aug. 24, 2021, 7:04 PM), <https://www.coindesk.com/high-gas-fees-prevent-ethereum-from-being-ethereum/>; Jacob Rozen, *The Ridiculously High Cost of Gas on Ethereum*, COINGEEK (Jan. 19, 2021), <https://coingeek.com/the-ridiculously-high-cost-of-gas-on-ethereum/>; Greg Thomson, *Ethereum-Based Social Media Project Shuts Down as ETH Fees Approach New Highs*, COINTELEGRAPH (Feb. 11, 2021), <https://cointelegraph.com/news/ethereum-based-social-media-project-shuts-down-as-eth-fees-approach-new-highs>.

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arbitrate the dispute altogether.¹⁰⁷ This is because high gas prices make it more expensive for potential jurors to stake (or to unstake) PNK to a Kleros court and to vote in a particular dispute. Additionally, since gas fees are paid to purchase PNK in the first place, those interested in acquiring PNK with the purpose of accessing the juror pool might either be discouraged from doing so (thereby curbing the expansion of the total juror pool) or delay doing so (this would be particularly problematic if the caseload became so high that there was a real need for more jurors to serve on courts).

Third, high gas prices potentially pose a serious barrier to the effectiveness of the crowd-sourced compliance mechanism if high gas prices make it less financially attractive to challenge bad tokens. Each of these threats will be discussed in turn below.

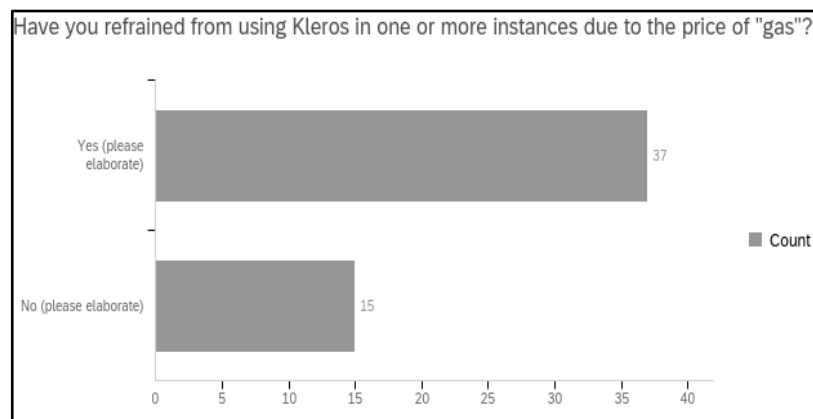


Figure 6: Gas Prices ($n = 52$)

a. Potential Threat on Participation by Jurors and Disputants

¹⁰⁷ The first steps require opening an electronic wallet with a third party (<https://metamask.io/>), purchasing some PNK—Kleros' token—and staking them to one of Kleros' courts for a chance of being selected as juror. Staking one's PNK in a Kleros' court is a transaction that must pass on the Ethereum blockchain; thus, to occur, the issuing juror must pay a gas fee. As with the staking, for a juror's vote on Kleros to be recorded on the blockchain, the issuing juror must pay an additional gas fee. To date, one of our co-authors has served as a juror in three Kleros cases and to record their votes, they had had to pay gas fees of approximately \$2-6. It is perfectly possible, as it is discussed in further detail below in this paper, that gas prices could render the voting state prohibitively expensive relative to the reward to be obtained. See *The Kleros Juror Starter Kit*, *supra* note 38.

The results in **Figure 6** suggest that gas prices pose a barrier to broad adoption of Kleros. Our survey results provide additional insight into the gas problem that goes beyond the mere cost-benefit analysis. That gas prices may sometimes constitute a barrier to juror participation in Kleros was described by one respondent, who eloquently notes that:

It is too high to stake in the amounts that I am moving today, and it is not profitable for me. I want to be a juror and have many cases, but for that I would need a lot of PNK to stake. I think this is the main barrier to Kleros today. The need to invest a lot in order to have many cases so that it becomes profitable. Today, the profitability is more due to the increase in value of the PNK than to the economic benefit of voting coherently.¹⁰⁸

In this same vein, gas price problems also pose a potential barrier to registering smart contracts on the Kleros Dapp and to participation in Kleros as disputants. When two of our co-authors tried to play “Alice & Bob” and register a smart contract for the value of \$100 on the Kleros Dapp, they could not initially close their deal. As **Figure 7** shows, their first attempt to close this deal in August of 2020 proved economically prohibitive for the lender when the gas fee was approximately \$350 (i.e., more than twice the contract value). Luckily, the transaction was possible a few weeks later in September of 2020, when the gas fee for the same transaction dropped to the equivalent of roughly \$11.

¹⁰⁸ See Survey Results (on file with the authors).

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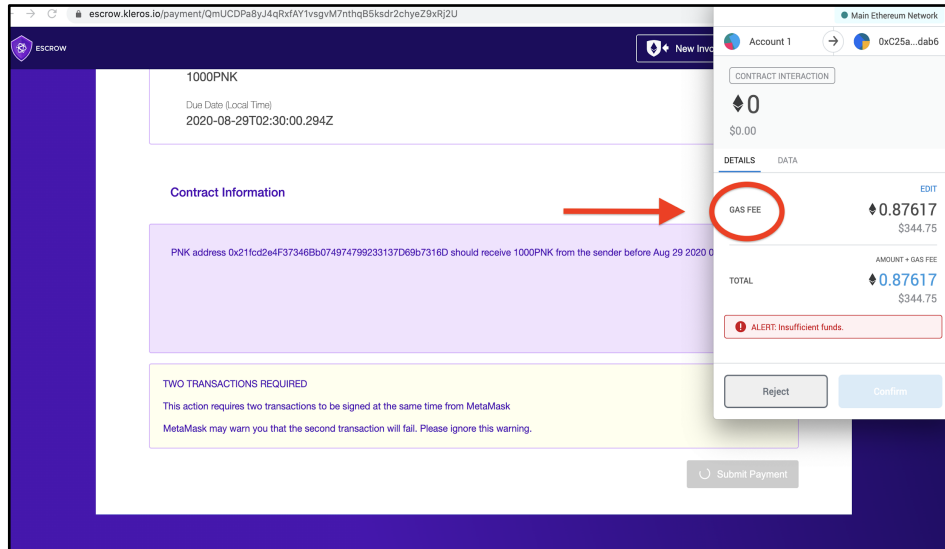


Figure 7: Gas Fee/1000PNK Transaction in August 2020

b. Potential Threat to Speed of Kleros Resolution

The price of gas might also impact the speed with which Kleros disputes are resolved. As we know from our own experience, such fluctuations in gas prices may influence how Kleros jurors perform their role. One survey responder puts it bluntly: “[c]urrently, I am not staking PNK in other courts than the General Court due to high gas costs. That makes an extra effort in voting because: 1. You must wait for gas to go down in order to get a profit that justifies the time spent.”

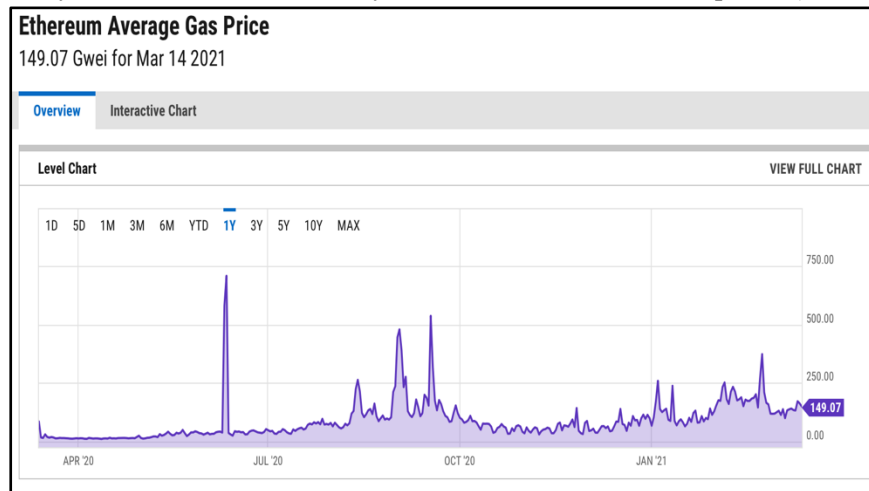
Further research is needed to confirm whether high gas prices lead the general population of Kleros jurors to slow down or hold off their final vote. If yes, this would represent a serious flaw in the Kleros juror incentive mechanism and in the Kleros dispute process as a whole.

c. Potential Threat to Efficacy of the Decentralized Sheriff

One of our survey respondents reported refraining from challenging tokens because “[t]he cost is too high to justify a slim chance of getting a minor payout.” If future research were to establish this (i.e., decrease in challenge of tokens when gas prices are high) as a generalized phenomenon to the pool of Kleros token-challengers, it would uncover a major threat to the efficacy of the *decentralized sheriff* compliance system. This is because if potentially “bad” tokens are not challenged when gas prices are prohibitive, then the effectiveness of crowd-sourced policing is significantly reduced, and tokens

that otherwise should not be listed find their way into the market with the false veneer of having passed the test of public scrutiny.

The extent of the impact of the above requires paying careful attention to the historic fluctuation of gas prices. **Figure 8** shows the average gas price fluctuation over the course of the last year (from March of 2020 to March of 2021), including very high peaks in June, August, and September of 2020 that occurred precisely at the time when two of our co-authors experimented with the system. The calm eventually came, but the more recent peaks (albeit not



as high as those registered in 2020) do little to appease the concerns that we describe in this section in connection with the volatility of gas.

Figure 8: One-Year ETH Average Gas Price (March 2020-March 2021)¹⁰⁹

C. Social Interactions Under Kleros: Trust and Claiming

Trust plays an important role in contract formation and dispute resolution. We explore whether the social interactions of trust and claiming might present unique characteristics under Kleros compared to the models described in Law and Society literature.

1. TRUST UNDER KLEROS

¹⁰⁹ *Ethereum Average Gas Price*, YCHARTS, https://ycharts.com/indicators/ethereum_average_gas_price (last visited Mar. 13, 2021).

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Based on the well-known hypothetical scenario that Kleros uses to market their escrow application, we asked survey respondents to rank the level of trust they would have in their counterpart in a hypothetical remote business transaction under two scenarios: with and without Kleros.¹¹⁰ More specifically, respondents were first asked to suppose they are Alice—an entrepreneur—who wants to hire Bob—a web designer—to craft their boutique’s new website. Respondents were asked to indicate on a 5-point Likert scale—where 1 = “A lot less,” 3 = “About the same,” and 5 = “A lot more”—how much more or less trust they would have as Alice (the party with the payment obligation) in dealing remotely with Bob (their counterpart with the service obligation and potential future disputant) without Kleros and with Kleros.

Figure 9 below represents the 57 responses. The breakdown is as follows: 12 out of 57 (i.e., 21%) answered that they would have a lot less trust in Bob without Kleros, while 31 out of 57 (54%) responded that they would have somewhat less trust in Bob without Kleros. As for the level of trust under Kleros, 22 out of 57 (38%) would have a lot more trust in Bob, while 21 out of 57 (36%) answered that they would have somewhat more trust under Kleros. Some respondents were neutral: 11 out of 57 (19%) answered that their level of trust would be the same without Kleros, and 7 out of 57 (12%) answered that their level of trust would be the same under Kleros.

¹¹⁰ See Kleros — *The Justice Protocol Explainer*, *supra* note 82.

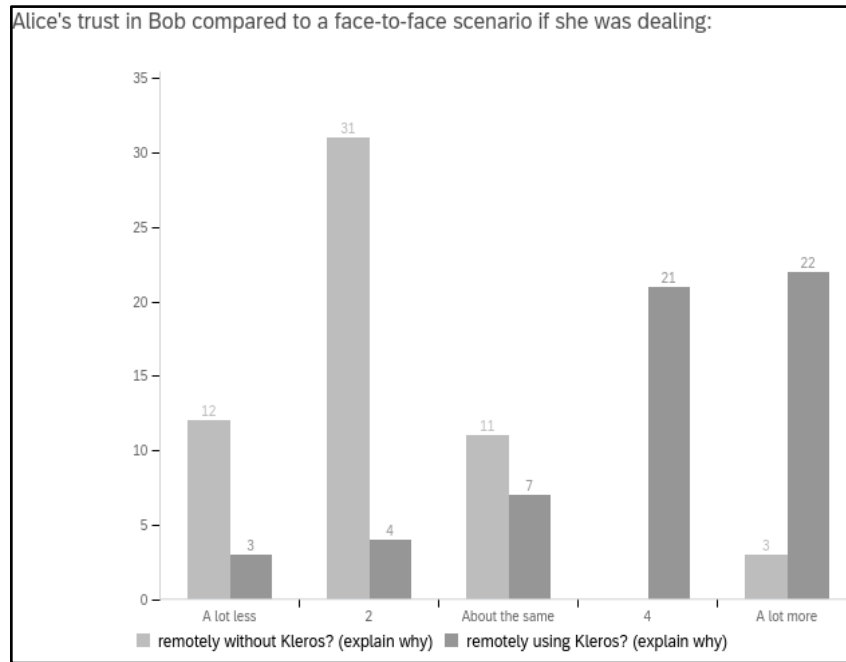


Figure 9: Alice's Trust in Bob ($n = 57$)

Using the same 5-point Likert scale, we also asked respondents to rank their level of trust in Alice. The 54 responses received are represented in **Figure 10** below. The breakdown is as follows: 9 out of 54 (16%) answered that they would have a lot less trust in Alice without Kleros, and 23 out of 54 (42%) indicated that they would have somewhat less trust. In comparison, 22 out of 54 (40%) answered that they would have a lot more trust in Alice under Kleros, and 19 out of 54 (35%) answered that they would have somewhat more trust. A number of respondents indicated that they would have the same amount of trust in their counterpart without Kleros (19 out of 54, or 35%), and with Kleros (10 out of 54, or 18%).

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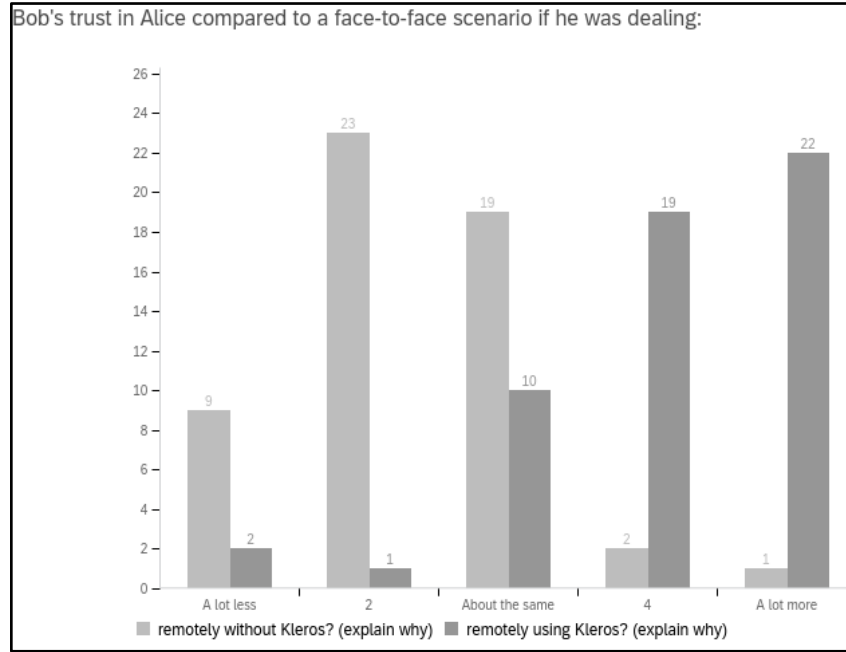


Figure 10: Bob's Trust in Alice ($n = 54$)

Overall, the results suggest that the value of Kleros lies in bolstering the trust of both the party that has the payment obligation (i.e., Alice) and the party that has the performance obligation (i.e., Bob). In that sense, Kleros offers a solution for bridging the trust gap in long-distance business transactions that may be too risky to pursue without it.

In addition to asking respondents about the level of trust they place in their counterparties—who are potential future disputants—with and without Kleros, we also asked them to report their level of trust in Kleros following negative experiences as actual disputants (i.e., where they are the losing party in a Kleros dispute). These questions allow us to further probe respondents' trust under Kleros and of the fairness of the Kleros dispute resolution process. If Kleros indeed adds value through bolstering trust, then it would follow that the added trust would be maintained even when a party loses a dispute. In a similar vein, we asked respondents about participation as Kleros jurors after losing money, which may provide some additional insight into their views regarding the fairness of the jury incentive mechanism. Repeat players are a testament that Kleros serves the purpose of participants, whether that is facilitating business or making money as a juror.

To this end, we asked the respondents to rate their likelihood of using Kleros again after being defeated in a Kleros court either as claimant (Alice)

or defendant (Bob), or after being penalized as juror for casting an incoherent vote.¹¹¹ In each of the three scenarios, respondents were asked to select an answer from a 5-point Likert scale where 1 = “Not at all likely to use Kleros again,” and 5 = “Extremely likely to use Kleros again.” The answers are represented in **Figure 11** below.

For both Alice (claimant) and Bob (defendant), the answers show a similar pattern. In both instances, 6 out of 54 respondents (11%) answered that they were not likely at all to use Kleros again if they lost their first case, and 11 out of 54 (20%) answered that they were somewhat less likely to use Kleros again. A number of respondents provided neutral answers: 18 out of 54 (33%) as Alice, and 21 out of 54 (38%) as Bob.

On the other end of the spectrum, 7 out of 54 (13%) answered that they are extremely likely to use Kleros again if they lost their first case as Alice, compared to 12 out of 54 (22%) answered that they were somewhat more likely, while in the case of Bob, 5 out of 54 (9%) answered that they would be extremely likely, compared with 11 out of 54 (20%) who answered somewhat more likely.

As for how likely respondents would be to use Kleros again if they were a juror penalized for an incoherent vote, the answers present the following distribution: 14 out of 54 (26%) answered that they would be neutral, 12 out of 54 (22%) answered that they would be somewhat likely and somewhat not likely, while on the end of the spectrum, 9 out of 54 (16%) answered extremely likely, and 7 out of 54 (13%) answered not likely at all.

Figure 11 shows there is no clear trend in terms of user attrition. The mean response of all users was quite similar for each type of user (disputant or juror), with respondents appearing neither particularly more nor less likely to use Kleros again following a defeat: 3.06 (if lost case as Alice), 2.96 (if lost case as Bob), and 3.07 (if penalized as juror).¹¹² **Figure 11** also shows that among the respondents (drawn from a biased sample), a high number of respondents would be willing to do business again with a party with whom they had a prior “bad” business experience (i.e., where a dispute arose).

¹¹¹ Incoherent vote means that the vote of the juror is not the same as the majority vote of jurors in that case.

¹¹² This represents a mean response since the scale is out of 5.

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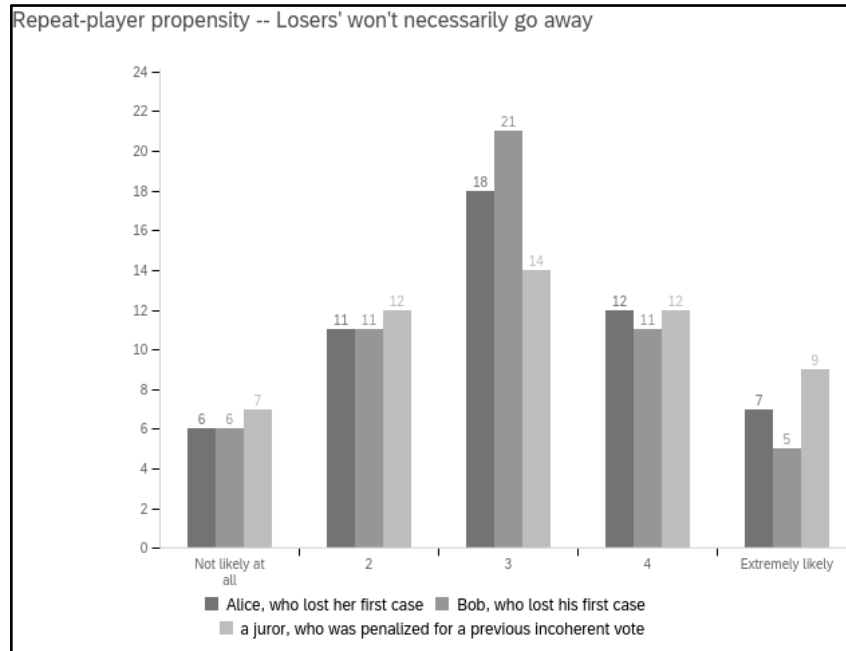


Figure 11: Trust in Kleros as Losing Disputant or Penalized Juror ($n = 54$)

To get a better understanding of the responses in **Figure 11**, we asked the questions above in different terms, without referring to Alice and Bob. This time, respondents were asked to rate their likelihood of using Kleros again with a party against whom they had lost a previous dispute and against whom they won a previous dispute. Once again, answers were presented on a 5-point Likert scale, where 1 = “Not likely at all” and 5 = “Extremely likely.” The 53 responses are represented in **Figure 12** below.

From the scenario of the losing party, the answers follow a (somewhat) normal distribution—similar to the one seen in **Figure 11** for Alice and Bob. The breakdown is as follows: 4 out of 53 (7%) answered “Not likely at all,” 12 out of 53 (22%) answered somewhat not likely, 21 out of 53 (39%) were neutral, 8 out of 53 (15%) were somewhat more likely, and 8 out of 53 (15%) were “Extremely likely.”

However, when asked the question from the perspective of the prevailing party, a different pattern emerged where the answers were skewed to the right. 2 out of 53 (3%) respondents answered, “not likely at all,” 6 out of 53 (11%) answered somewhat not likely, 8 out of 53 (15%) were neutral and somewhat more likely, and finally, 29 out of 53 (54%) were “extremely likely.”

Based on their responses, survey respondents were more likely to use Kleros again where they had been the *prevailing* counterparty (mean response: 4.06), but neutral about using Kleros again where they had previously been the *defeated* counterparty (mean response: 3.08).

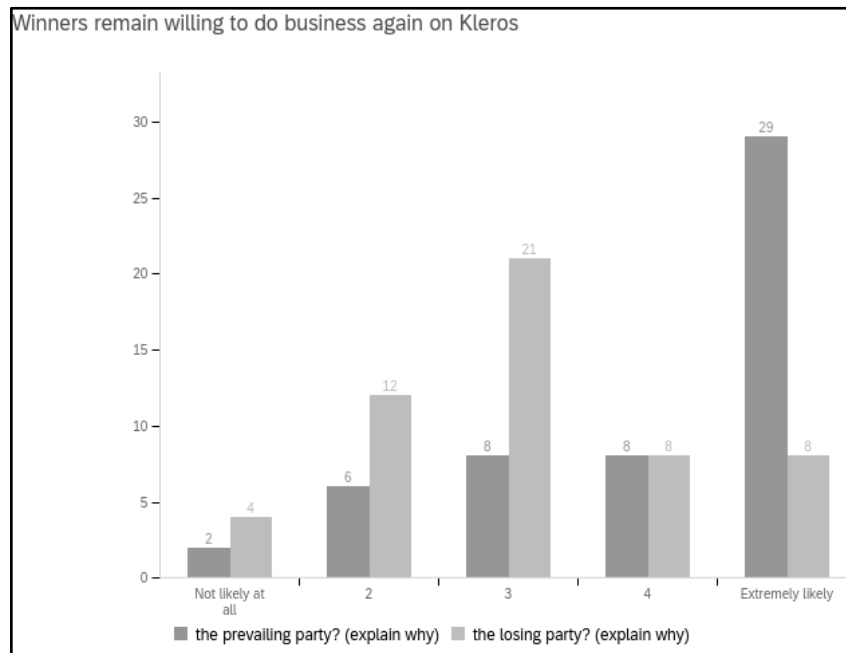


Figure 12: Trust in Kleros as Actual Disputant ($n = 53$)

2. CONTRACT CLAIMS UNDER KLEROS

As part of this case study, we also wanted to explore whether the presence of a Kleros smart contract might have any bearing on the parties' use of litigation to settle contractual claims in case of breach. As we noted, almost 60 years ago, Macaulay found that members of a close-knit community of businesspeople in the automobile industry frequently refrained from initiating litigation against each other. This was due to the strong economic dependence that supply chain parties had on the large automobile manufacturers and the formers' need to preserve the underlying business relationships.

The circumstances surrounding ODR and blockchain-based arbitration are very different. The parties to Kleros disputes typically have no prior business ties (at least initially) and do not know each other personally (since their identity is anonymous, although identifiable in terms of their anonymous online identity). Thus, unsurprisingly, our observations here,

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based on the sample of respondents, run in the opposite direction of Macaulay's findings from their now-classic study.

We asked respondents how likely they would be to bring a Kleros claim against Bob (as Alice) if they were not satisfied with the contract performance. Respondents were asked to select an answer from a 5-point Likert scale, where 1 = "Not likely at all," and 5 = "Extremely likely."

As shown in **Figure 13** below, the answers were heavily skewed to the right, with 22 out of 57 (38%) answering somewhat likely, and 21 out of 57 (37%) answering "Extremely likely."

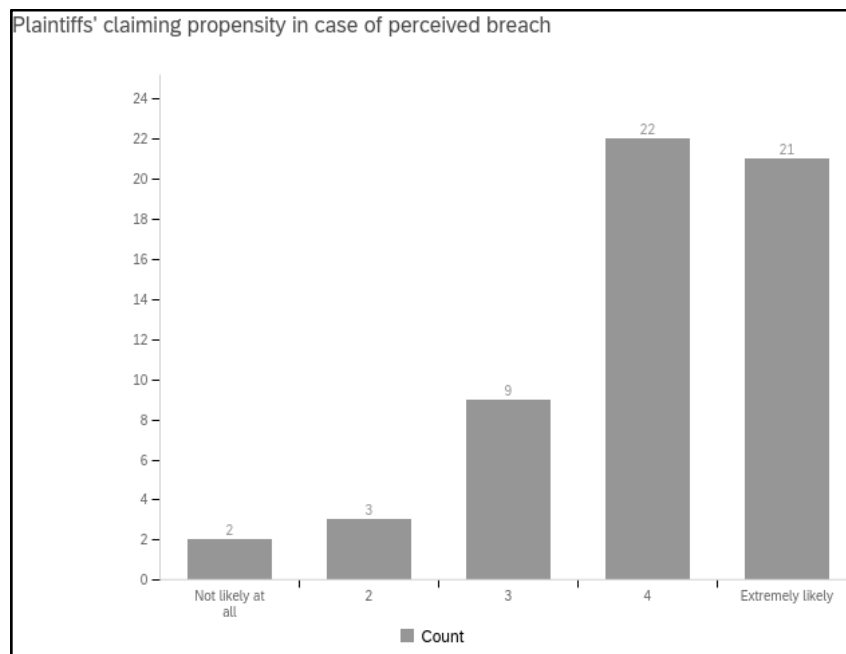


Figure 13: Claiming Under Kleros ($n = 57$)

We also asked respondents what action they would take if they decided to not bring a Kleros claim. The answers are represented in **Figure 14** below. The majority responded that they would do nothing (39 out of 57, or 68%), with the remainder answering that they would take the claim to regular court (11 out of 57, or 19%) or an alternative dispute resolution forum (7 out of 57, or 12%). This suggests that Kleros offers a solution for resolving disputes that would otherwise go unresolved.

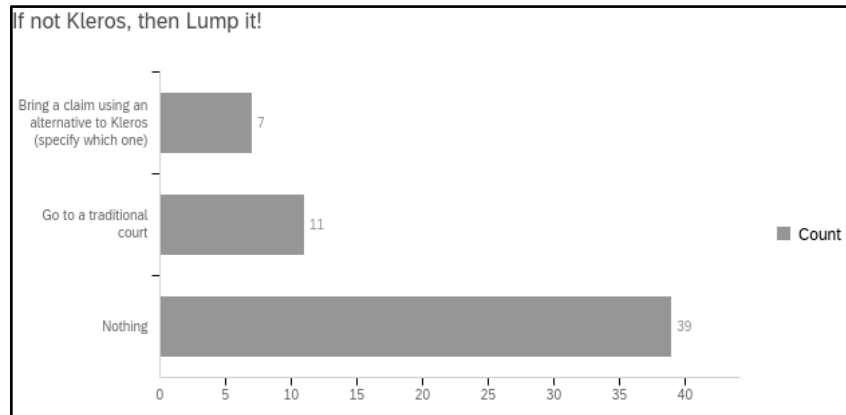


Figure 14: Claiming Without Kleros ($n = 57$)

D. What Kleros Users Think

In an open-ended question, we asked respondents to share their experience with Kleros, in any capacity. We received 18 responses, out of which 11 provide particularly valuable insight. These responses can broadly be divided into two categories: praisers and skeptics. On the one hand, 5 respondents highlighted their excitement about the project, with two respondents specifically emphasizing the importance of decentralized justice. On the other hand, 2 respondents reported the negative impact of gas prices on their participation, while 1 respondent reported “staking [PNK] sometimes sounds like rocket science to those who are on [sic] a completely different area of expertise and would’ve probably never entered Kleros without intense assistance from myself.” Other responses noted their concerns that, although Kleros “addresses real need” there are nonetheless “significant challenges to scaling up to more mainstream disputes” and that “[users] [g]otta give this time and find a spot where this fits. I’m really worried that this will be a technology without a market fit;” while a third shared while there is ample room for improvement “[Kleros] is definitely here to stay.”

VI. CONCLUSION

To the extent that the past few years have seen the proliferation of decentralized systems, Kleros is at the forefront of products unique to this era. Taking a simultaneously in-depth view and broad outlook, this case study dissects the key characteristics of the Kleros system and articulates avenues that are ripe for future research.

Kleros’ use of blockchain technology to memorialize smart contracts and to support an arbitration mechanism that relies on anonymous and

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economically incentivized juries constitutes a novel platform for the resolution of traditional and modern disputes. But Kleros is more than a simple ADR/ORD provider. In fact, the Kleros cooperative is about the tokenization of its crowd-sourced decisionmaking platform, which it has successfully accomplished by pegging its business activity to its own token—the PNK.

This business model—one that is based on its own crypto token—has allowed Kleros to grow significantly in the last few years without having to charge its users fees for using its dispute resolution platform. However, in order to increase and maintain the value of the PNK, Kleros has to offer an attractive and competitive dispute resolution platform that is capable of generating a significant caseload at any given time. This pays off when disputes are registered on Kleros because the more jurors (i.e., PNK holders) are able to participate in the process, the higher the demand and subsequent appreciation of the PNK. In sum, Kleros indirectly makes money from its dispute platform when it sells PNK that are needed to access the platform and when the PNK appreciates.

This article investigated the unique characteristics of the Kleros platform. Our results suggest that there may be some empirical basis to risks identified by previous commentators (the highly volatile price of “gas” and cryptocurrency awareness). We highlighted the normative and gap-filling value of Kleros through the *decentralized sheriff*, but also noted potential shortcomings that potentially undermine the guarantee provided by the mechanism.

Our observations map out the complete picture of Kleros, highlighting its potential to contribute to maintaining public order in decentralized spaces on the one hand and the obstacles to reaching that potential on the other hand. Kleros’ reliance on the sale and subsequent appreciation of the PNK token in conjunction with Kleros’ model of reliance on crowd wisdom renders Kleros useful not only to resolve traditional contract disputes, but also creates a space where participants can use the juries and their insight to validate the value of crypto tokens. We expect this practice will have broader policy implications in the future as regulators evaluate the impact of individuals using decentralized applications to police certain activities like the listing of crypto-assets in public exchanges. In this particular example, Kleros has acquired powers that have been traditionally bestowed upon centralized compliance bodies such as stocks of exchange or government agencies like the U.S. Securities and Exchange Commission. While barriers might perhaps currently impede broader adoption of Kleros, these may disappear in the future through a restructuring of economic incentives as more people become familiar with cryptocurrencies and trends in gas prices.

On claiming behavior, the design of our study does not allow us to make any generalizations; however, our results suggest that survey respondents view the added value of Kleros as increasing trust in otherwise risky transactions. To this end, additional research is required in order to ascertain whether novel forms of dispute resolution platforms like Kleros have a noticeable impact on claiming behavior that departs from the classic Law and Society studies cited in this article. Whether claiming behavior does or does not present unique characteristics under Kleros is a question worth analyzing through future research and for which the empirics of this paper provide a good starting point. Other interesting questions also arise—for example—related to the trust between the disputants and the jurors or about how personal characteristics of Kleros disputants and jurors might influence their claiming behavior.

Similar to the space that it occupies, Kleros is under constant metamorphosis. Our in-depth snapshot is representative of Kleros as it was in the time period during which it was studied—it is continuously evolving and adapting, and more change is imminent. As decentralized spaces continue to grow and generate more widespread interest, more questions will arise about their viability as alternatives to centralized systems. Time, together with more research and adaptation, will test their durability.