KLEROS

DAO BANKRUPTCY: CHARTING THE COURSE FOR BANKRUPTCY COURTS ON THE BLOCKCHAIN

Aakriti Anurag Tewari
Kleros Fellowship of Justice, 2023

TABLE OF CONTENTS

Abstract

Kleros has risen to widespread acclaim in recent years owing to its significant success in the arbitration of on-chain, blockchain-based disputes. This paper applies its specialization in this particular field to tackle a pressing and fast-approaching predicament within the blockchain ecosystem: Decentralized Autonomous Organization (DAO) bankruptcy.

Through the Kleros Protocol is largely centered around commercial disputes and arbitration, this paper will attempt to assert that DAOs cannot find a space within traditional insolvency and bankruptcy jurisprudence or procedure. Therefore, a need arises for a specialized, and tailored solution for such situations, wherein an on-chain mechanism, or Bankruptcy Court, may be proposed. The primary recommendation this paper will make, therefore, is through the recommendation of a Kleros Bankruptcy Court, using many of the traditionally successful methods deployed by Kleros in a typical proceeding, and tailoring the same to DAO bankruptcy procedures. It will also center mediation as a key aspect of the bankruptcy process, allowing the parties to come to a mutually beneficial, mediated settlement in how to redistribute or liquidate the DAO's assets. This aspect borrows significantly from mediation's rich role in bankruptcy disputes across multiple jurisdictions.

This study will delve into multiple theoretical questions that enable the feasibility of such a model, including the underpinnings of corporate law doctrines and the place of DAOs within the understanding of the modern corporation. This paper will make these points in three parts, as follows:

Part I situates the DAO within the notion of the modern corporation. Principles of company law and distinct features of DAOs will be studied to understand whether a DAO ought to be considered a company at all, and if not, why this leads to the necessity for a specialized forum in the event that the DAO becomes insolvent.
Part II builds on this argument, delving into the transplantation of bankruptcy law frameworks into the DAO model, attempting to carve out the hallmarks of a traditional bankruptcy process and where a DAO may be able to fit in within these contours.

Part III proposes the model that is the ultimate recommendation made by this paper. The final aspect of this paper will not only establish the need for a specialized Bankruptcy Court, but also how this proposed Court will use pre-existing features within the Kleros protocol to ensure that it provides a speedy, cost-effective, and tailored bankruptcy process for DAOs.

Introduction

Decentralized Autonomous Organizations (DAOs) have established themselves as a dynamic and revolutionary component of the blockchain ecosystem. Often compared to a decentralized corporate structure, DAOs have brought to the fore multiple questions of law as to how to regulate their existence and resolve disputes surrounding DAOs. These are numerous, ranging from whether the DAO constitutes a corporate structure, to what jurisdiction a DAO would be subject to, and whether the token-holders within a DAO could be understood broadly as shareholders in order to discern their rights and obligations. However, in recent years, with the looming threat of a recession and the apparent decline of the cryptocurrency market, a clear need has arisen to tackle the question of the potential insolvency, and eventual bankruptcy of DAOs.

While insolvency and bankruptcy jurisprudence has been developed meticulously for companies over time, leading to national and international rules of bankruptcy that are applicable to companies globally, there is a great need to clarify whether the same can be transplanted to DAOs. Furthermore, clarifications are pertinent as to whether a DAO requires special, new frameworks that may be applied in the event that its debts cannot be repaid to creditors, and the extent to which such a model will be impacted by modern notions of insolvency and bankruptcy law and procedure, if at all.

Given this incredibly nascent development at the intersection of law, technology, and modern corporate and insolvency laws, this paper aims to focally address the question of how decentralized justice for insolvent DAOs attempting to enter into bankruptcy proceedings should be undertaken. This will be explored by clarifying not only the theoretical underpinnings of such a consideration, but simultaneously providing a devised solution as to how, and why, a specialized mechanism of justice must be sought for both debtors and creditors within the DAO model.

Beginning with arguing that DAOs ought to be considered distinct from companies when dealing with their bankruptcy, this paper will then delve into the inadequacies of the hallmarks of traditional insolvency and bankruptcy processes, including the inability of judges and insolvency professionals to undertake a DAO bankruptcy adequately. Hence, it will be established that while aspects of the traditional bankruptcy process can certainly be optimized for the resolution of a DAO bankruptcy, there must be significant deliberation into how, and to what extent, such transplantation should occur. Therefore, the significant contribution in this paper will lie in its situating of blockchain-based dispute resolution platforms, such as Kleros, as the ideal mechanisms for blockchain-based insolvency resolution. In doing so, the author will provide insight into how such a process ought to be undertaken, in the context of specialized blockchain-based resolution platforms and the goal of decentralized justice and governance.

PART I: DAOs and the Modern Corporation

In order to fulfil the mandate of this research, the fundamental underpinnings of the DAO structure must first be engaged with to help develop the rationale and model proposed in the latter half of this paper.

As mentioned above, a DAO is fundamentally understood as a decentralized mechanism to generally allocate capital for the pursuit of a range of activities, endeavours, and goals. The goals of such an organization do not, however, always have to be driven by profit generation, nor does capital always have to be involved in the functions of a DAO.[1] Since DAOs typically do manage or utilize capital in some way or form, the infusion of capital into a DAO can be suitably inferred in most, but not all, circumstances. There is a pre-arranged agreement between the members of the DAO to ensure efforts towards any common goal or objective, crystallized in the form of blockchain-based smart contracts. Essentially, the actions and scope of the organization is built into code within smart contracts, incentivizing those part of the DAO to act in the best interests of the organization by voting publicly on the blockchain itself if the organization must undertake any activities.[2] These votes are visible to all token holders of the DAO, ensuring that all token holders can see and identify the voting pattern of any single holder. Individuals part of the DAO are referred to as token holders and are generally given control proportionate to the number of tokens held. In this way, control of a DAO is entirely decentralized and in the hands of its token holders. The intention is to bypass any central authority, such as a Government or regulator, from maintaining stringent control and supervision over the DAO, instead keeping it in the hands of its token holders with vested interests in the organization.[3]

In order to discern how to govern and regulate DAOs, if at all, we must understand whether a DAO can be construed as a company. For the purposes of this paper, understanding whether a specialized model for DAO bankruptcy may be proposed, mandates the question of whether DAOs ought to be understood as companies under law and further, whether they are subject to bankruptcy jurisprudence specially developed for companies and other such similar entities. It is only upon the answering of these theoretical questions can a model be adequately justified and proposed for the resolution of DAO bankruptcies and any disputes arising therein.

---

[1] Vu Tuan Truong, Long Le, Dusit Niyato, "Blockchain Meets Metaverse and Digital Asset Management: A Comprehensive Survey", IEEE Access, vol.11, pp.26258-26288, 2023.
[2] Aaron Wright, "The Rise of Decentralized Autonomous Organizations: Opportunities and Challenges" Stanford Journal of Blockchain Law and Policy (2021).
[3] Ibid.

As has been observed by scholars and regulators when attempting to transplant laws of a particular jurisdiction into another one, such a measure can often be ill- advised and futile, owing to differences in culture, context, and the mechanism through which such laws are applied.[4] In the case of DAOs and notions of company and bankruptcy law, a similar predicament arises, wherein the DAO has been structurally adapted in order to circumvent many of the issues rife within the regulation and governance of a company. Therefore, while similar, merely adopting notions of company law or bankruptcy law and applying it to a DAO would entirely defeat the purpose of a DAO having its own structural uniqueness that makes it entirely different from a company.

As found in company law jurisprudence, the understanding of a company is fairly fluid, and has not been accorded any strict meaning under the black letter of law. That being said, company law jurisprudence has evolved extensively to allow for in-depth, multi-jurisdictional understanding of companies, their management, shareholders, and how they ought to be governed and regulated.

In the British case of *In Re Tenant v. Stanley*[5], the Chancery Division found that the meaning of a company is largely premised upon two notions: (a) That the entity is comprised of associated persons that are significant enough in number to not be described as a firm, and (b) That the consent of all members is not a prerequisite to transfer any one of the shareholders' interests in the company. The case further deliberated upon the idea of a company being one incorporated as such, in any applicable jurisdiction, in consonance with the laws and regulatory conditions prescribed in that particular territory. Such discourse has undergone significant evolution to establish a few settled features of a company, such as limited liability, legal personality, transferability of shares, investor ownership, as well as, perhaps most prudently for this paper's purposes, a clear management structure with an identifiable Board of Directors. As per definition, however, there is a consistently vague approach across jurisdictions as to what a company is. Black's Law Dictionary, for instance, defines a company as: *"A society or association of persons, in considerable number, interested in a common object, and uniting themselves for the prosecution usually of some commercial or industrial undertaking, or other legitimate business."*[6] While such definitions leave a considerable amount of scope for what may be construed as a company under law, they also do not exclude many structures, including DAOs, from their purview. However, the jurisprudence developed by legal practitioners, scholars, and Courts, allows for more streamlined definitions and features of companies, such as the ones aforementioned.

Central to this discussion are the most fundamental building blocks of companies: shares. Shares, representing a certain amount of capital infused into units that make up

[4] Umakanth Varottil, A Cautionary Tale of the Transplant Effect on Indian Corporate Governance, 21 National Law School of India Review. 1, 8-9 (2009)
[5] Tennant v. Stanley [In re Stanley] (1906) 1 Ch. 131
[6] Garner BA and Black HC, Black's Law Dictionary (Thomson Reuters 2021)

companies, along with their shareholders, form the basis of the corporate structure of a limited liability corporation. Similar to token holders in DAOs, the number of shares held by an individual or group amounts to a proportionate degree of voting power in the decisions and actions made by the company. Typically, the larger one's shareholding in a company, the greater their voting rights. The shareholders are therefore referred to as "owners" of the company, as their percentage of shareholding amounts to the percentage they own of the company, in addition to proportionate voting rights.[7] Hence, the consolidation of shares may be understood to be the exercise of consolidating both ownership and control over the corporate entity. Central regulators, such as the Securities and Exchange Commission (SEC) in the United States, assume authority over companies owing to their use of securities such as shares and debentures, or debt securities.[8] Hence, the SEC and other analogous organizations in other jurisdictions probe situations where a company is found to be acting illegally or in contravention of the law, helping ensure that the corporate landscape is well regulated in the interest of the general public and economy. The process of incorporation of a company, therefore, is a purposeful means to accord legal recognition to such a corporate structure, providing it with rights and obligations in exchange, such as the ability to have legal personhood.

A DAO, by contrast, is clearly not able to be incorporated in a majority of jurisdictions, barring few and remote exceptions, such as in the Cayman Islands or the state of Wyoming in the United States.[9] While this may be attributed to the novelty of the concept of DAOs in themselves, it is imperative to note that DAOs are not protected by features such as limited liability, or legal personality, except in certain specific jurisdictions. While a DAO is technically an entity, most of the defining features of a company have been developed in order to maintain good corporate governance through shareholder protection measures, and the regulation of the relationship between owners and managers. This is by observing the presence of relationships of agency between managers and shareholders, where the managers are the agents of the owners, or shareholders. In the case of a DAO, in theory, such features are not required to exist. This establishes a structural difference between the company and the DAO. That being said, in practicality, a DAO may at times be conceived and incorporated as a company in certain jurisdictions, such as the Marshall Islands. It may also, as is more often the case, borrow multiple features from a company and not be entirely and fully decentralized. Therefore, while a DAO, being a blockchain-based entity that uses smart contracts as a mechanism of enforcing its existence, is certainly a very different entity than a traditional company, there are several notable similarities between the two, especially in practice. This also often means that much of the issues, agency problems, and predicaments faced by companies are likely to fall upon DAOs as well.

---

[7] Supra (n 4)
[8] Ibid.
[9] Laila Metjahic, "Deconstructing the DAO: The Need for Legal Recognition and the Application of Securities Laws to Decentralized Organizations," Cardozo Law Review (2018).

As ownership and control are separate in a company, the Directors are meant to act in the broader interests of the shareholders and the company at large. Being agents of the company, Directors are at liberty to take actions in its name, including the entering into of contracts and decision-making. Shareholders, by contrast, have a vested financial interest in the company, having acquired its shares. Though they are allowed to vote, the decision-making, day-to-day functions, and control of the company, is entirely in the hands of the Board of Directors.[10] This prompts the forming of information gaps between both groups, the bridging of which has given rise to the rules and regulations that make up corporate law, which attempts to fill these information gaps and fix the agency problem between shareholders and Directors.

The corporate law of any jurisdiction is largely developed with the sole aim of ensuring information asymmetry between multiple parties does not occur, disadvantaging any stakeholders. From a purely theoretical standpoint, DAOs ought to not face these issues at all as in their case, in complete contrast to companies, ownership and control are not vested with separate groups of individuals. Token holders, akin to shareholders, are the "owners" of the DAO, with a vested interest in the organization. Additionally, though voting is the mechanism of decision making in a company, which is also undertaken in a DAO, the management is equally decentralized in a DAO and not vested in any external agents. Token holders are entitled to both manage, and own, the DAO, due to the absence of any elected Board or centralized authority of any form that undertakes the responsibility of running the organization.[11] While this reasoning does hold some ground due to this being the aim of a fully decentralized DAO, this plays out differently in reality. For one, though a DAO is meant to be an entirely decentralized entity, a majority of DAOs are only partially decentralized, functioning similar to companies in many respects, including through the presence of a committee similar to a Board of Directors. However, that being said, as the popularity of the DAO model increases, there are multiple options to structure a DAO, which are being seen even in the present. Though most DAOs have some form of a leadership structure, such as the Mission Board in the Proof of Humanity DAO, it is also possible that an entirely decentralized DAO may come about in the future. Leadership in a DAO, though currently common, may at some point manage to be totally and completely diffused in nature, in consonance with its theoretical aims and functions. Therefore, a leadership structure in a DAO, common as it may be, is inherently optional in nature.

For example, if a company such as Uber was a DAO, the taxi drivers working within Uber would be token-holders, and not merely employees. All other employees that help manage operations would also be token-holders, while the management of the Company in the form of a Board of Directors may or may not exist. It is equally feasible that Uber could delegate a sub-committee to take on the role of the Board of Directors,

[10] Ibid.
[11] Henrik Axelson, Johannes Rude Jensen, and Omri Ross, "When is a DAO Decentralized?" Complex Systems Informatics and Modelling Quarterly, CSIMQ (2022).

entrusted with decision-making within the DAO. In such a case, similar agency problems as in a company would probably arise between the DAO's management structure and other token-holders to whom functions are delegated, such as the Uber drivers, and other individuals working in the DAO. On the other hand, it also conceivable that no such sub-committee or management committee would exist, and the token-holders, such as Uber drivers and other individuals working within the framework of the DAO, vote on and manage the day-to-day affairs of the DAO. While there are arguments for and against both structures, a DAO has the flexibility to operate in such a manner, which is vastly different to a company.

This lies central to the argument that a DAO should not be construed to be a company in the eyes of the law. The presence of a Board of Directors, though not explicitly provided for in the definition of a company, is an imperative component of the basic features of a company. It has been successfully argued by numerous scholars, and shown through the corporate law regimes of multiple jurisdictions, that the Board of Directors is indispensable and necessary for an entity to be described and understood as a valid company. The absence of a Board of Directors is not only infeasible, but also invalidates the existence of a corporate entity entirely. Scholars of corporate law such as Armour, Kraakman, and Hansmann[12] have explored this notion in depth, both from the angle of agency problems and the key role of Directors in giving rise to these problems, as well as through the essential elements of corporate law, with the Board of Directors being one such intrinsic element. Similar arguments have been made by Frank Easterbrook in notable works such as *"The End of Corporate Law."*[13] Together, this body of work has solidified the role and importance of the Board of Directors within Western corporate law and governance. In the East, scholars such as Umakanth Varottil[14] have made equally seminal contributions that argue fervently for the importance and necessity of the Board of Directors, and their indispensable role in the running and governance of a company. It is worth mentioning that no nation in the world allows for the incorporation or running of a company without an identifiable Board of Directors. Incorporation procedures are typically impossible without providing clear evidence of details of Directors, including their addresses, details, and other information, along with identifying them. To impose the requirement of having a Board of Directors, or any identification of individuals who have control over a DAO, by contrast, would be to discredit entirely its potentially decentralized nature, that ensures ownership can be completely dispersed with no central management. While, as we have explored above, DAOs may be flexible in adhering to this characteristic and may more often than not actually have a management committee, this is not a necessity to establish the very existence of the entity.

---

[12] Armour J, Hansmann H and Kraakman R, 'Foundations of Corporate Law' [2017] The Anatomy of Corporate Law, Armour J, Hansmann H and Kraakman R, 'Agency Problems, Legal Strategies and Enforcement' [2017] The Anatomy of Corporate Law

[13] Easterbrook F, The Economic Structure of Corporate Law (Harvard University Press)

[14] Umakanth Varottil, A Cautionary Tale of the Transplant Effect on Indian Corporate Governance, 21 National Law School of India Review. 1, 8-9 (2009)

Additionally, the enforcement of such procedures would largely be conflicting with recent developments in decentralized ID mechanisms and the presence of Soulbound Tokens (SBTs). Identities on the blockchain are not as linear or clear as in everyday commerce. The rise of digital IDs mandates that a certain degree of anonymity may be preserved, which is not the case in the case of companies, where employees, Directors, and other personnel must be directly and lucidly identifiable at all times, often through Government-verified IDs. Creating a system where a DAO and its token-holders are afforded similar treatment as to the managers of a company, ensures that the law is unable to view a DAO as a separate entity in its own right. Requesting for clear identity proof through Government-approved IDs and other such paperwork, as is required under company law jurisprudence, would essentially do a disservice to the very notion of what a DAO inherently is, or any blockchain-based entity for that matter. Hence, the definition of company as understood in modern jurisprudence and legal identification, cannot be extended to DAOs without entirely depleting its structure and negating its defining features.

Having established this clear distinction, it follows that DAOs require novel, specialized mechanisms of regulation and forums for recourse relating to disputes. This stems from the idea that a DAO ought not to be subject to restrictions and rules accorded to companies that have been put in place owing to extremely different issues of agency and resulting conflicts between Directors and shareholders. That being said, however, with the SEC in 2017 clearly establishing DAO tokens to fall under the definition of "securities," pursuant to an investigation by the Commission under US law, it is clear that some overlapping considerations may be borrowed and suitably utilized from corporate law into DAOs.[15] Being organizations that do involve the use of securities, in the form of tokens, certain hallmarks of company and bankruptcy law may be relevant in the case of DAOs, albeit upon modification to suit their specific and unique structural needs. Additionally, where a DAO is quite similar to a company in nature and function, certain provisions of law and governance may be transplanted to the DAO. However, this must be done with utmost care and consideration on a case-by-case basis by Courts or any adjudicating mechanism. Unfortunately, given the overburdening of Courts, especially bankruptcy forums, and the lack of technological expertise to make such a judgement, it is unlikely that a traditional system would be able to deliver the justice and resolution necessary to a DAO filing for bankruptcy.

This is especially relevant as the use of securities immediately brings to the fore concerns regarding the inability of a DAO to pay back any debt that it accrues. Given the ambiguous legal placement of DAOs, creditors may find it increasingly difficult to recover debts from DAOs, with the virtual nature of the organization making the honouring of such debts all the more onerous. Furthermore, the use of securities in any way opens up

[15] Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The DAO, Release No. 81207 / July 25, 2017, Securities and Exchange Commission

the obligation of the DAO and its token holders to repay these debts, under applicable law. The lack of a clear structure for insolvent DAOs to make the transition into bankruptcy leaves most at the mercy of being either embroiled in complex matters of not having a jurisdiction (owing to being blockchain-based), or entangled in the question of how to collect, and pay back the debt.[16] The fact that it is not a company, as explored above, makes it necessary to formulate a mechanism to ascertain how, and to what extent, bankruptcy jurisprudence can be transplanted to be utilized by DAOs.

While certain academics have attempted to liken a DAO to partnerships, joint ventures, and other such corporate structures, this paper argues that doing so, in view of the above arguments, would be a disservice to the DAO's novel and unique contributions to corporate and securities regulation. Bringing it within the purview of partnerships, or other business arrangements, would insinuate that a DAO may then be categorized neatly into classifications, that would dictate how it would be required to disclose information, resolve disputes, as well as distribute proceeds in the case of liquidation and insolvency. Furthermore, the notion of personal liability in mechanisms such as partnerships ensure that DAOs may become far more complex to track and ensure compliance,[17] in the event of default, as the identity of each token-holder, and the extent of the same, may become extremely difficult to ascertain. The possibility of token holders being from different jurisdictions that may make determining their personal assets far more onerous is an additional reason to not consider DAOs as partnerships, inherently. An independent notion that draws inspiration of certain aspects of limited liability companies, where applicable, is therefore far more feasible.

Additionally, the DAO's use of smart contracts, lack of central management authority, and entirely distinct features from any existing corporate form would mandate any regulation, dispute resolution, or insolvency mechanism to be considered meticulously, with its specific needs kept firmly in mind. Merely relegating DAOs to being a partnership, joint venture, or limited liability company would impede and restrict the formulation of a tailored process that DAOs can undergo, while overshadowing their uniqueness and novelty by simply bringing them within the ambit of modern legal structures.

[16] Supra (n 11)
[17] Supra (n 9)

PART II: The Transplantation of Bankruptcy Law to DAOs

Having established that DAOs are independent and novel entities, separate from a company, the case of bankruptcy of a DAO in particular must further be ascertained. The separation of the definition of a DAO from that of a company allows for significant leeway for creativity in terms of how best to meet any unique needs arising out of the DAO structure.

Historically, debt has been most primitively understood as the inability to pay a certain borrowed or agreed upon sum of money/capital. The evolution of this notion has undergone significant development, culminating into the well-developed body of jurisprudence that is insolvency and bankruptcy law. Insolvency and bankruptcy concerns instances wherein corporate entities, such as companies, are unable to repay debts to their creditors, prompting a state of liquidation. While any company unable to pay debts is known as insolvent, the liquidation and/or winding up of the company owing to the accruing of debts and losses is known as bankruptcy. Bankruptcy is largely a process that is formal in nature, and is filed for by insolvent companies. In such cases, the proceeds of the company are generally liquidated and distributed amongst the creditors and shareholders.

The differences between a DAO and company establish that even the very notion of insolvency and bankruptcy for a DAO ought to be clarified. The author argues that in such a case, a DAO falling into a state where they are unable to pay debts owed may be understood to be insolvent, adopting the standard understanding under company law. Furthermore, the use of tokens as securities makes a compelling case for some influence of insolvency law as undertaken in companies, however, the defining features of a DAO separate from a company as explored previously mandate a specialized, differentiated mechanism for insolvency resolution where all stakeholders' interests are taken into account.[18]

In most jurisdictions, laws and statutes prescribe specific processes to resolve the inability of a company to repay debt. Nuances of private international law, as well as national insolvency regimes, have evolved to accommodate for both domestic and cross-border insolvencies. However, as compellingly argued by numerous scholars specifically in the realm of blockchain arbitration, the advent of the *lex cryptopgraphica* mandates that smart contract-based agreements must have independent resolution forums on the blockchain.[19] This paper takes this argument a step further by bringing

[18] Galia Kondova and Renato Barba, "Governance of Decentralized Autonomous Organizations" Journal of Modern Accounting and Auditing (2019).
[19] Maxime Chevalier, From Smart Contract Litigation to Blockchain Arbitration, a New Decentralized Approach

bankruptcy within the ambit of the lex cryptographica, as a DAO bankruptcy, being one separate from the bankruptcy of a company, must be treated as such and have the option of resolving this bankruptcy on the blockchain.

By likening a state of insolvency, and eventually bankruptcy, to a layered dispute between debtors and creditors, the use of smart contracts, as has been argued in the event of blockchain arbitration, mandates the existence and application of a lex cryptographica. This is owing to, especially in the case of DAOs, parties (or token holders) from varying jurisdictions of origin, with the DAO existing without a jurisdiction except that of being on the blockchain.[20] As Professor Maxime Chevalier argues,[21] national laws and traditional courts are ill-equipped to undertake any adjudication of smart contract and blockchain-based disputes, owing to the complex questions of law that would inadvertently arise. While determining jurisdiction is an important step, in the event of a bankruptcy proceeding, courts would find it difficult to not only determine the identities of the token holders within a DAO, but also in avoiding being tangled in questions of applicable law, and procedural nuances for such an entity. This is especially problematic owing to the special need for bankruptcy proceedings to contain an element of speed – by referring DAO insolvency disputes to traditional courts, the aim of insolvency processes to be undertaken efficiently and quickly would be defeated.

Procedure lies central to the notion of bankruptcy, in order to ensure quick resolution and an equitable redistribution of liquidated assets. What is especially difficult in the event of a DAO bankruptcy, is that bankruptcy procedure is typically one of that is highly domestic in nature, and can largely differ between jurisdictions. For example, Chapter 11 bankruptcy in the United States follows a debtor-in-possession model,[22] wherein possession of assets is retained with debtors. The purpose of such a model is premised around providing creditors with a claim to the assets of the debtors. The debtors, upon filing for bankruptcy, still hold a claim to their assets, along with the creditors. Conversely, India follows a creditor-in-control mode, via the Insolvency and Bankruptcy Code, 2016.[23] In a creditor-in-control model, a Committee of Creditors is formed with the main objective of regaining the amount in question from debtors[24].

The individuals primarily involved in decision making and activity with respect to the resolution plan for the bankruptcy, in the US model, are the debtors, whereas in India, it is the creditors. These are only two of varied examples around the world that have unique and specific mechanisms in adjudicating and resolving bankruptcies.

Leading Towards the Blockchain Arbitral Order, Journal of International Dispute Settlement, Volume 12, Issue 4, December 2021, Pages 558–584

[20] Ibid.

[21] Supra (n 19)

[22] Orderly and Effective Insolvency Procedures: Key Issues (International Monetary Fund 1999)

[23] Gupta A, "Insolvency and Bankruptcy Code, 2016: A Paradigm Shift within Insolvency Laws in India" (2019) 36 The Copenhagen Journal of Asian Studies 75

[24] Ibid.

A focal contribution of this paper is to conceptualize a bankruptcy proceeding as a layered dispute between debtors and creditors. While such proceedings are by default extremely mechanical, they are, at essence, largely a dispute as to how the assets of the entity in question are to be distributed in a fair manner that ensures debts are repaid to the creditors. The application of ADR mechanisms to bankruptcy disputes has gained significant traction, especially through cases such as the use of mediation in high-profile bankruptcies such as that of the Lehman Brothers.[25] The incident brought to the fore the possibility of alternate dispute resolution as reaching a level of equitable distribution that procedural law could not. Though the Lehman Brothers bankruptcy was a complex and multi-party dispute across multiple jurisdictions, a traditional adjudication-based system became quickly overburdened solely owing to the number of parties and the variation in jurisdictions and procedural laws. In subsequent sections, this paper will strongly argue for a similar solution to the bankruptcy of DAOs, centering a mediation-based process as an integral part of the Kleros Bankruptcy Court model, given its extremely rich history in the resolution of a multitude of complex and niche commercial bankruptcies.[26] As explored earlier, the DAO cannot be equated to a company, and therefore treating it as such over the course of a bankruptcy proceeding would be doing it a great disservice. However, treating the bankruptcy as a dispute and recommending it to be resolved through a specialized forum outside of a traditional bankruptcy court would ensure a solution that would be tailored to the unique requirements of a DAO, while prioritizing the needs of various stakeholders.

In order to propose a robust solution to adequately outline how to create a bankruptcy system for DAOs, it is imperative to analyze the most central and basic tenets/objectives of any bankruptcy system, and how to apply such considerations to come up with innovative proposals and solutions. The International Monetary Fund (IMF) in its book, Orderly and Effective Insolvency Processes, outlines the central objectives and features of any insolvency law and model that can be extrapolated to use as a yardstick for the construction of a DAO bankruptcy resolution framework, irrespective of jurisdiction.

Objectives of a Bankruptcy Process

The IMF establishes that the first objective of an insolvency/bankruptcy process is the allocation of risk among stakeholders in a market economy in a manner that is "predictable, equitable, and transparent:"[27]

Predictable: An insolvency system that is predictable is one that allows for risk allocation mechanisms to be clearly outlined and provided within the rules and framing of the laws

[25] Lucarelli P and Forestieri I, "The Three Targets of Insolvency Mediation: Dispute Resolution, Agreement Facilitation, Corporate Distress Management" SSRN Journals
[26] Ibid.
[27] Supra (n 22)

and policies of insolvency within that particular jurisdiction. They must also be consistent in their application. A clarity in the framing of insolvency law in a manner that is predictable, and allows for participants to allocate and manage risk with adequate foresight as to the ramifications enshrined in law, ensures the success of the underlying insolvency system.

Equitable: An equitable insolvency system recognizes the need to equitably recognize creditors and the specific nature of the debts that they have provided to the insolvent entity. This often also denotes that rather than ensuring creditors are treated in exactly the same way, the individual circumstances of debts are taken into account – this includes understanding the quantum of debt, the nature of the commercial bargain and the underlying deal struck with the debtor, and the implications for repayment of the debt in the specific scenario in question. Conversely, an efficient insolvency law ought to fundamentally ensure the lack of any discrimination against creditors. While the differences in the specific circumstances of the debt must be considered, it is equally important that no creditor is provided with unfavourable treatment in comparison to other creditors, and receives an equivalent and proportionate say in the final distribution of liquidated assets.

Transparent: Transparency refers to an insolvency process that is known to the parties involved and provides adequate information in order for the affected parties to exercise their various rights conferred under any insolvency system. This includes ensuring that any decisions arrived at by the adjudicating authority and appointed liquidator be made known to the parties, and the rationale behind any such decision also be available to the parties for their perusal, and, where necessary and appropriate, a possible appeal.

The second objective of any insolvency system is the maximization of value for all concerned stakeholders, as well as the broader economy. This is a much more all-encompassing goal that deals solely with ensuring that both creditors and debtors are equally prioritized, without any one party being provided with beneficial treatment during the pendency of the insolvency process.

While these objectives, when applied to DAO insolvency, appear to be fairly efficient and fitting, certain nuances and perspectives are clearly very different when dealing with companies vis-à-vis DAOs. For one, a company's bankruptcy process is made infinitely more complex owing to the shareholders and variations of rights accorded to them through the insolvency process. This can often be owing to special rights accorded to certain specific shareholders, such as investors, preference shareholders, and shareholders provided with liquidation preferences. Furthermore, the role of management and shareholders, and the separation (in most jurisdictions) between the two adds a further layer of complexity to the bankruptcy process that demands a very different perspective when ensuring value maximization for all stakeholders.[28]

[28] Supra (n 12)

Conversely, in the case of DAOs, shareholders are replaced in a sense by token holders.[29] Though this is usually not always the case, there may be circumstances where token holders both own and manage the company. If this is true for the DAO, then token holders are therefore not aggrieved principals whose agents have run their organization into insolvency but are both the owners and managers simultaneously. This ensures that the perspective through which token holders are viewed, as well as their interests as debtors, is starkly different from that of shareholders in a company. Their interest transcends a mere financial interest and enters the domain of management, technical expertise, and typically, the desire to ensure that the DAO survives as a going concern. This is in contrast to shareholders that enjoy a separation from management – with solely vested financial interests, a shareholder would generally have their interests aligned with purely financial motives and want to exit their investment at a profit.[30] While DAO token holders no doubt share this sentiment, managers often aim to continue to keep an enterprise alive and have interests that go far beyond mere financial investment. Furthermore, with tokens being instruments that are securities, however function quite differently to shares in that the inherent system of a DAO is quite different from a company, the adjudication of any insolvency dispute would require technical expertise far beyond simply that of law.[31] A presiding authority would have to familiarize themselves with the notion of a DAO, its operations, the concept of the blockchain and its application, and other ancillary technological concepts that go beyond the purview of just bankruptcy law.

Even in cases where there does exist a management committee within a DAO, it lacks the varying set of disclosures and responsibilities that are placed upon company management. As such committees, unlike Boards of Directors, do not have to have their financials audited, nor have any clear fiduciary responsibility under law, it is necessary for creditors to have a clear system through which they are able to painlessly recover unpaid debts. The complex web of disclosures, monitoring from government agencies, shareholder protection measures and corporate governance standards are entirely lacking with respect to a DAO.[32] This further impacts notions of bankruptcy law, as it is these standards that protect creditors and ensure the recovery of their debts. As explored in company law jurisprudence, a creditor-debtor relationship between a company and its creditors is that of principal and agent, creating robust obligations upon the company to make good on its debts. The grey area that this space occupies within law and policy pertaining to DAOs makes it more necessary than ever to have a dispute resolution mechanism that ensures that the needs of all stakeholders are adequately addressed.

[29] Supra (n 18)
[30] Ibid.
[31] Quinn DuPont, "Experiments in Algorithmic Governance: A History and Ethnography of "The DAO," A Failed Decentralized Autonomous Organization" Bitcoin and Beyond: Cryptocurrencies, Blockchain and Global Governance (2017).
[32] Ibid.

In order to devise a system that incorporates elements to satisfy both objectives outlined above, it is imperative that unpreparedness of modern courts and domestic insolvency procedures be taken into account as a significant hindrance to DAO bankruptcy in the near future. The understanding of the needs of stakeholders as well as their inherent interests is a core aspect of any successful bankruptcy mechanism.[33] However, in this case, any presiding authority would either declare a DAO as entirely analogous to a company, which would be untrue, or not be able to consider the very specific perspectives of debtors and creditors within a DAO. Given the time-bound nature of bankruptcy proceedings, which often need speedy resolution, presiding authorities would be forced to resort to quick and inefficient mechanisms to conduct DAO bankruptcies, without properly being able to acknowledge and recognize the need for specialized knowledge and expertise related to the domain of technology, blockchain, and DAOs. This directly contravenes the idea of an equitable insolvency process,[34] as well as one that maximizes value for all stakeholders, and would serve as a detriment for token holders, as well as their creditors.

With an efficient bankruptcy system, both debtors and creditors are able to predictably allocate risk as they are aware of the repercussions, as well as the procedure regarding any default in the repayment of debt. This keeps both parties in a secure position, however, where the system responsible for the allocation of resources in order to ensure fairness and equality to all stakeholders is unable to do so efficiently, DAOs will largely remain unfavourable and unsecure investments. On the other hand, if a DAO bankruptcy system is able to not only meet the two objectives above, but also have a mechanism and presiding authority that is technologically abreast of developments regarding the blockchain, emerging technologies, and DAOs, it would be much more suited to the undertaking of DAO insolvencies, encouraging parties to not only invest into DAOs and blockchain technology, but also to promote the safety and regulation of such investments on a far greater scale.

Features of a Bankruptcy System

In addition to the above objectives of a bankruptcy framework above, there are certain specific features of a bankruptcy system that are often ubiquitous, and are required to be present in order to ensure efficiency. The most important aspects, in the case of DAO bankruptcies in particular, will be explored in the subsequent section, that provides an exploration of a potential solution to establish an independent mechanism to adjudicate and help facilitate DAO bankruptcy. However, as a baseline necessity, a bankruptcy mechanism typically requires two focal features:[35]

[33] Anderson H, 'Function and Objectives of Insolvency Law' [2017] The Framework of Corporate Insolvency Law
[34] Ibid.
[35] Supra (n 22)

(i) A legal framework that provides the base for both substantive and procedural law, outlining the rights and obligations of debtors and creditors participating in the insolvency process.

(ii) An institutional framework to ensure the implementation of the above legal rights and obligations provided to debtors and creditors.

Hence, these four objectives and features are the building blocks of any bankruptcy mechanism. As explained above, however, the DAO being a unique and nascent type of entity comprising of self-executing smart contracts, a primitive model with an ill-equipped institutional framework would cause significantly more harm than help to any circumstance of non-repayment of debt. Therefore, the next section will be dedicated to outlining a proposed solution to facilitate the resolution of DAO bankruptcies, in a manner that is in consonance with the explored features and objectives of a successful bankruptcy mechanism.

PART III: Bankruptcy Courts on the Blockchain – Introduction to the Kleros Bankruptcy Court

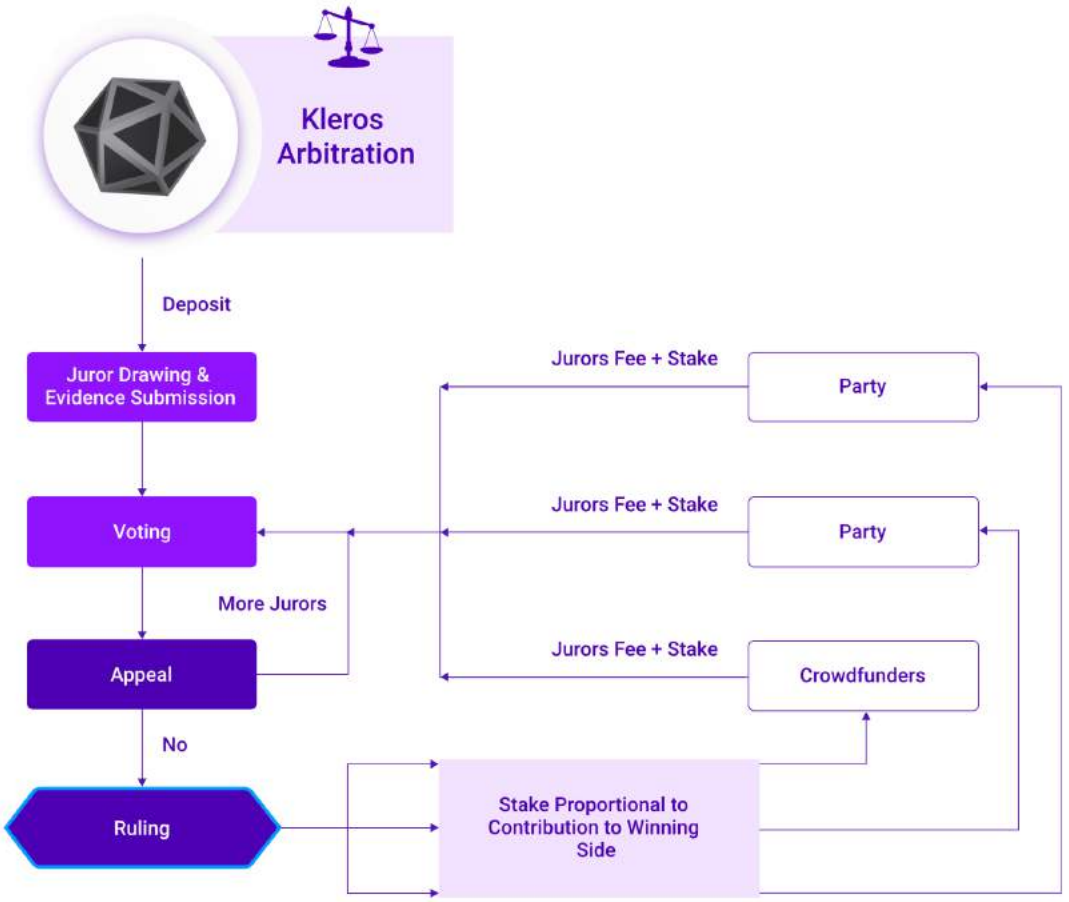
The following section will attempt to discuss the potential of a specialized forum dedicated to the resolution of DAO bankruptcy. It situates Kleros, the blockchain-based dispute resolution platform, as a basis for its features and mechanism, essentially creating a bankruptcy court on the blockchain specifically custom-built for DAOs. It will be argued, through the exploration of this idea, that such a solution is a viable and efficient resolution to the predicament of a lack of expertise, guidance, or specialized process for DAOs undergoing bankruptcy proceedings.

Kleros' use of a jury system, game theory, cryptography, and blockchain to resolve technology and other commercial disputes has made it an undisputed leader in the field of blockchain arbitration.[36] Many of its pre-existing features, when suitably modified and moulded to a situation of bankruptcy, would help ensure that parties are able to resolve their disputes in the most efficient manner possible, while using an enforcement mechanism that is well-versed with the intricacies of DAOs, as well as their unique needs and interests. Hence, this paper has utilized the Kleros model as a recommendation upon which the foundations of the "blockchain-based bankruptcy court" is built. Another salient reason for the utilization of the Kleros protocol is its work surrounding the integration of mediation within its ambit of dispute resolution services. Though the use of mediation on the Kleros Protocol has not been put into practical use as yet, its current work on the theoretical and planned underpinnings of the same are a path-breaking foray into mediation as a key part of the future of blockchain-based dispute resolution. As will be explored in greater depth over the course of this section, mediation makes up an integral part of this model, to ensure the best possible interest-based outcome for both debtors and creditors.

Kleros relies upon an opt-in decentralized system of dispute resolution.[37] In a typical arbitration dispute, the parties must contract in advance, through the form of a dispute resolution clause, that the dispute will be submitted to Kleros for adjudication. Parties also have the option of selected sub courts for adjudication – in such a scenario, if Kleros were to devise a Bankruptcy Court, the parties would refer their dispute to the Kleros Bankruptcy Court.

The image below outlines how Kleros works for a typical arbitration process.

[36] Clement Lesaege, Fedrico Ast and William George, 'Kleros' (Short Paper v1.0.7, Whitepaper 2019)
[37] Bergolla L, Seif K and Eken C, 'Kleros: A Socio-Legal Case Study of Decentralized Justice & Blockchain Arbitration' (2021) 37 Ohio State Journal on Dispute Resolution



Source: https://docs.kleros.io/products/court

As seen above, the Kleros Court relies upon a unique and unprecedented mechanism of resolving on-chain disputes. While the current Kleros Court is tailored towards on-chain arbitration, this paper argues that a somewhat similar approach, once suitably altered, may be extrapolated towards bankruptcy disputes. However, its focal contribution will revolve around drawing from Kleros' nascent work on a mediation process undertaken on the Kleros Protocol,[38] to develop a Bankruptcy Court that employs mediation as a central tool to allow the parties to come to an agreeable plan for the bankruptcy of the DAO. Therefore, it will depart from the Kleros arbitration process in multiple ways – both owing to innovation in the blockchain space such as the use of SBTs, as well as due to the very unique needs of a bankruptcy process that require a very different process from that of arbitration. What this model is ultimately seeking to do is to re-envision the mechanism of on-chain dispute resolution with respect to bankruptcy as a mediation process rather

[38] Dean, R. (2023, June 20). Kleros Mediation Bridge: A Cohesive Approach Blending Traditional Mediation and Kleros Blockchain Arbitration. Kleros.< https://blog.kleros.io/innovating-dispute-resolution-a-cohesive-approach-blending-traditional-mediation-and-kleros-blockchain-arbitration/ >

than an arbitration process, while also containing some defining features of a typical bankruptcy process.

A bankruptcy being conceived as a dispute, rather than a rigidly procedural and adversarial process, allows for more flexible and tailored solutions to a state of bankruptcy and the distribution of assets. Of course, while procedural nuances will not entirely be ignored, an on-chain dispute resolution mechanism allows for a clear and specific solution for a more nuanced and complex type of bankruptcy on the blockchain. For a DAO, this is especially beneficial. Taking into account the DAO's use of smart contracts, a dispute resolution clause, as in the case of a traditional arbitration or mediation, could be deployed outlining that Kleros will be the forum of choice to undertake the bankruptcy proceeding. As DAOs do not have a formalized jurisdiction, this becomes a far more convenient and quick referral to ensure speedy justice for both debtors and creditors.

In the context of arbitration, a Mexican Court[39] has previously allowed for Kleros to be a valid arbitrator for a commercial dispute, choosing to lay no objections to the parties choosing Kleros as the forum for dispute resolution. As there is strong precedence at the intersection of ADR and bankruptcy proceedings, it follows that such a procedure could in fact be referred to a dispute resolution mechanism such as Kleros, through the means of a dispute resolution clause within the DAO's smart contract that will automatically make Kleros the appropriate forum.

The benefits of such a proposal go far beyond the structure and unique needs of a DAO. For one, insolvency and bankruptcy courts are often the most overburdened globally. Despite the clear need for speedy resolution, Courts far overshoot their approximate time estimates to complete a proceeding, making the entire procedure extremely onerous for the parties. To compound this predicament, in the case of DAOs, the Courts would not only be stuck on identifying the parties themselves, but also find it challenging to settle the question of a lack of jurisdiction. Deliberating on this issue, which is bypassed entirely through the Kleros Protocol, would be one that would only further elongate the process. The unfamiliarity of typical judicial infrastructure with blockchain-based disputes, smart contracts, and the enforceability of such contracts would prove highly detrimental to any DAO attempting to undergo a bankruptcy proceeding.

Conversely, Kleros' specialization in the arbitration and resolution of on-chain disputes makes it an undoubtedly reliable model to resolve a bankruptcy procedure. The nuances of on-chain disputes, smart contracts, and the underpinnings of the DAO structure would be well within the mandate of Kleros, ensuring a far more efficient, speedy, and cost-effective solution to the parties involved.

In the case of a DAO Bankruptcy Court model, an efficient approach would be to ensure

[39] Mexican Company X v. Mexican Company Y (Jus Mundi) 2020

that the process is party-driven, with stakeholder perspectives taken into account at every step of the process. Therefore, a document, known as a Resolution Plan, which lays down the structural process of the bankruptcy that is to be followed, ought to be negotiated and settled on between the parties. This would ensure that, given the very nascent and nuanced considerations necessary to be taken into account for DAOs, the solution arrived at is agreeable to both debtors and creditors and is feasible, just, and tailored to the needs of the specific situation.

A majority of jurisdictions utilize the mechanism of a Resolution Plan as a means to outline the plan of action for the company in question. This can be either through a mediated settlement, as seen in numerous Western nations, or through an adversarial court process, wherein a corporate insolvency resolution plan process is undertaken. This is given several names across the world and exists in a number of variations across jurisdictions. From the Corporate Insolvency Resolution Process (CIRP) in India to Chapter 11 Bankruptcy in the United States, countries have developed homogenous and domestic models in the event a company is insolvent, centred around developing a Resolution Plan to decide how a bankrupt company is meant to either be restructured or liquidated. For the Kleros Bankruptcy Court model, therefore, it would be illogical to not include a final plan, or mediated settlement referred to as a Resolution Plan, to illustrate the decision of the Court and the mechanism through which the DAO will be restructured/liquidated. The use of a Resolution Plan is one that is used in practically every jurisdiction which has its own bankruptcy proceeding process. These documents are enforceable, reliable, structured, and useful in outlining a blueprint for the bankrupt entity and its future steps forward – hence, it has been adopted for use in the Bankruptcy Court as well.

However, it may be observed that many nations, especially post the advent of the COVID-19 pandemic, have seen a nascent interest in the role of mediation within bankruptcy processes. This is largely owing to the role of mediation in reaching beneficial, balanced solutions that are entirely driven by the inherent interests of the parties. As a result, there has been a surge of scholarly and policy interest globally into the merits of mediation as a tool in arriving at an amenable Resolution Plan that is agreeable to both creditors and debtors over the course of bankruptcy proceedings.[40]

Hence, within the proposed DAO bankruptcy model, the suggested course of action is a facilitated mediation between creditors and debtors, in order to negotiate the terms of the Resolution Plan, and to ensure that there is a meeting of minds between the parties. In the case of DAOs, being a fairly niche aspect of decentralized finance, it is far more likely that the parties are competent enough to come to an agreement by themselves as to the necessary course of action for either liquidation or the rehabilitation of the DAO. The involvement of too many external bodies, especially those without adequate

[40] Lucarelli P and Forestieri I, "The Three Targets of Insolvency Mediation: Dispute Resolution, Agreement Facilitation, Corporate Distress Management" SSRN Journals

knowledge of the DAO model, would only serve to result in an inadequate solution that does not necessarily fulfil the needs of a DAO, upon its bankruptcy.

Kleros is a unique and particularly imperative choice at this juncture, largely owing to their work on the *"Kleros Mediation Bridge,"*[41] a first of its kind solution at the intersection of blockchain-based dispute resolution and traditional mediation that has not been replicated elsewhere across the world. Though still in early stages, the Mediation Bridge represents a pioneering foray into the convergence of mediation with decentralized justice. As with most issues arising out of blockchain regulation and law, the need for subject and technological expertise is one that is pressing, especially with the rapid adoption of blockchain technology and development on a massive scale. Hence, a mediation system that is inbuilt within such a forum, to specifically mediate the drafting of a Resolution Plan, and the outcomes therein, would allow the parties to be guided by experts well-versed in the inner workings of blockchain technology and DAOs to reach a balanced solution that ensures satisfaction of both parties.

With rapid advancements in technological progress, significant developments in blockchain technology, law and policy have made it necessary for dispute resolution on the blockchain to also become more layered and complex. Therefore, for issues such as the subject of this paper, there is a pressing need for a certain revamp in how these issues are considered and decided, if on-chain resolution is to come into being. This is why, for the purposes of this paper, while the Kleros Protocol has been used as a basis for the model, many features recommended as part of the Bankruptcy Court are nascent interventions in the blockchain ecosystem that have been fitted into the Kleros Protocol to work better. Bankruptcy specifically is a complex process, with numerous considerations at hand. This means that certain features used in a typical on-chain arbitration model, for instance, need to be modified or reimagined to suit the context of bankruptcy.

Let us take the example of a simple contractual dispute for specific performance of the contract. While the matter can certainly be arbitrated and decided in a certain way, in a bankruptcy dispute, there are layered considerations required and the need for parties to communicate with each other openly. It is, in one way, a much more collaborative, complex, and interest-based process than a contractual dispute. This means that features that have been integral to the Kleros Arbitration Court, such as confidentiality, anonymity, and random selections, though still used in the proposed model, will have to be modified to be able to suit and fit a bankruptcy dispute. In some ways, Kleros will have to be re-imagined to an extent if it seeks to take on disputes that are so very different to those that are explored in the realm of a traditional arbitration. The Mediation Bridge that is currently being worked on by Kleros is a poignant example of the same.

Observing European jurisdictions and their common usage of mediation in bankruptcy

[41] Ast F, 'Kleros Project Update - May 2023' (Kleros, 6 May 2023) accessed 18 May 2023

disputes, the multiple merits of mediation are highlighted. Nations such as Germany, France and Italy have systems wherein parties are able to undergo facilitated negotiation/mediation, while Italy has the most heavily mediation-dependent bankruptcy system in comparison to other European nations, with multiple tools for mediation at the disposal of the parties.[42]

The United States also has seen a rich history of mediation within bankruptcy disputes, including for some of the most high-profile bankruptcy cases in history. Both the bankruptcies of Macy & Co, and most notably, the Lehman Brothers, were resolved through mediation.[43] In the case of the Lehman Brothers debacle, 75 claims were resolved across 40 jurisdictions,[44] all through the use of multi-party mediation. The US case of *Thompson v. Greyhound Lines*[45] saw thousands of creditors being satisfied after 60 days of mediation with the debtors, post which settlements were arrived at in almost every case. Therefore, there is clear precedent of complex, multi-party disputes being undertaken through the use of mediation, often with multiple creditors. This is not unlike the complexity of a DAO bankruptcy – the further need for technical expertise and very specialized knowledge only adds to the merits of mediation in such a case. The modern courts are highly unprepared for such circumstances, making a safe, equitable process of distribution post DAO bankruptcy a distant dream, in the event a specialized solution is not carved out. While transplantation is certainly helpful, blindly transplanting the systems and forum on which such a bankruptcy takes place would only result in confused, often misguided notions of blockchain technology and DAOs. This would only increase mistrust in the system and not allow the parties to come together to generate conducive settlements that reflect their own interests and needs.

The procedure that Kleros would undertake, influenced to an extent by the typical process in an arbitration, consists of a few key steps. This paper proposes a similar, albeit mediation-centric approach to bankruptcy, with certain modifications to make sure that the model is suitable for this particular circumstance.

Step 1: Dispute Resolution Clause

As aforementioned, the parties would first initiate the proceedings by ensuring that they have agreed upon Kleros as the mediator in the event of bankruptcy. Both parties would have to, using the opt-in mechanism of Kleros, select it as the forum through which the bankruptcy mediation can take place. In the case of a DAO, this can be easily programmed into the smart contract governing the DAO, ensuring that the dispute is automatically referred in the event the parties decide to file for bankruptcy.

[42] Supra (n 32)
[43] Mani R, "Mediation in Insolvency Matters" Insolvency and Bankruptcy Board of India Handbook
[44] Ibid.
[45] 2013 U.S. Dist. LEXIS 196209

Upon commencement of the dispute, Kleros ought to select one mediator well versed in insolvency and bankruptcy to help communicate with and assist the parties through the process. This will be instrumental in streamlining terms and coming with a realistic, coherent, and fair Resolution Plan. This mediator must also be qualified to mediate the dispute, and ensure that the parties are able to negotiate the Resolution Plan as the process is undertaken.

The selection of mediators utilizing the Kleros protocol, in order to ensure that it aligns with the goals and objectives of Kleros' resolution process, must be on the basis of random selection. However, at this juncture, there is a pressing need for a mediator with very specific skills, especially with respect to insolvency and bankruptcy law and policy. This, at first glance, appears to contravene the stated functionality of Kleros, however, for this particular sub-court, the use of SBTs could preserve both the need for random selection as well as factoring in the skills and qualifications of the professional mediator.

First introduced by Vitalik Buterin, Puja Ohlhaver, and E. Glen Weyl in *"Decentralized Society: Finding Web3's Soul,"*[46] SBTs are intended to be tokens representing the individual's credentials, past history, and affiliations. They are a step forward from a mere digital identity and can be used almost as a digital "CV," when used for professional purposes. They are an integral part of the development of a decentralized future, and would be especially useful to ensure that the individual one is engaging in business with in any form is competent, and has the professional skills, experience, and attributes necessary for whatever business is being undertaken.

In a similar vein, a mediator being chosen randomly from a pool of mediator SBTs would ensure that there is a filtering mechanism underway, on the basis of their credentials and past history. For example, only mediators with some professional experience in the field of corporate bankruptcy will be able to be part of this pool, therefore ensuring that the mechanism to facilitate the DAO bankruptcy is undertaken by competent professionals. Despite this, however, these mediators will be entirely randomly selected, and the parties will not have to use their own biases and notions to select the same.

Of course, this must be put into place with certain contingencies – for example, dishonest conduct by a mediator selected via SBTs would automatically ensure that the mediator loses their SBT, if found guilty of such misconduct by Kleros. This decision will be final and not subject to appeal, and will apply in cases of bribery, improper conduct, or grave ethical violations over the course of the mediation process. This aspect in particular is one that is influenced by some recent changes in Kleros Version 2, such as Juror Fraud Protection. Given the sensitivity of bankruptcy disputes and the sensitive information handled by the mediator, it appears to be equally prudent to ensure that any frauds, or dishonest conduct is penalized accordingly, even in the case of a mediator.

[46] Weyl EG, Ohlhaver P and Buterin V, 'Decentralized Society: Finding Web3's Soul' [2022] SSRN Electronic Journal

Furthermore, the decision of mediator selection, once made, is final and cannot be appealed – this will be through application to the Kleros Bankruptcy Court, post which selection will simply be on the basis of whether the mediator meets the criteria necessary to mediate a bankruptcy dispute. The mediator will then be added to the pool, from which they will be randomly selected.

Step 2: Submission of Resolution Plan

Similar to the submission and gathering of evidence during an arbitration proceeding, this stage would involve the DAO submitting a Resolution Plan, and any other required evidences of the debt accrued. This deviates from a traditional dispute as well as the standard Kleros Arbitration Court significantly as the process is less with respect to liability, and more with respect to agreeing on a Resolution Plan that is reasonable and ensures the equitable and fair liquidation/redistribution of assets.

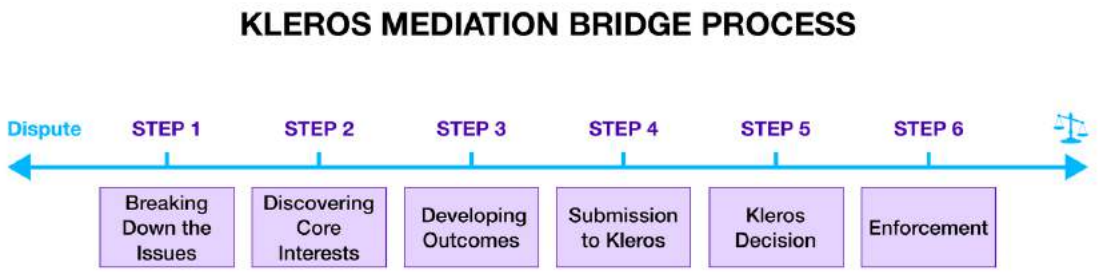
In this stage, the terms desired by debtor and creditors may differ, which would be uncovered on the basis of the submissions made by both parties. While the debtor (the DAO) may submit a Resolution Plan, the creditor would be able to provide a list of terms and a representation of whether or not they approve the Plan made by the debtor. This is quite different from this stage in a typical arbitration in the Kleros Court, as evidences are gathered with confidentiality. However, in such a case, it is necessary that the parties, on some level, come to an agreement. If the Resolution Plan is amenable to the Creditors, then there is no requirement for the dispute to be escalated.

In a similar vein, this step as a whole represents some deviation from the traditional model. As argued earlier in this paper, a bankruptcy calls for a far more specific, tailored, and complex mechanism to resolve disputes, that necessitates a sharp rethinking of how certain aspects of the Kleros Arbitration model may require modification before being utilized in a bankruptcy dispute. With the introduction of changes to Kleros such as Kleros Version 2, as well as the Mediation Bridge, both of which will soon become a reality, there is a pressing need for consistent evolution in dispute resolution and procedure. In the event of a bankruptcy dispute, especially on-chain DAO bankruptcy, this model is attempting to instead build on the intersection of the Kleros Mediation Bridge, along with a traditional bankruptcy process, tailored to suit the needs of a DAO. Hence, the use of a Resolution Plan is consistent with this model, and necessary to undertake a bankruptcy process.

With the Mediator presiding over the submission of the Resolution Plan, and the comments and opinions of the creditor, the Court may escalate the dispute to mediation if the creditors feel their terms are not being met, and if the debtor is not amenable to making such changes.

Step 3: Mediation

If the parties feel that the Resolution Plan needs further discussion and negotiation before coming to an agreement, the parties will undergo a mediation process, facilitated and mediated by the mediator. The objective here is to re-imagine the blockchain-based bankruptcy process as a mediation process, with both parties coming to a solution in their best interests. The Kleros Mediation Bridge encompasses a few focal stages of mediation, on the basis of its current theoretical model. These are as seen in the diagram below, and will influence the various stages of the Bankruptcy Court:



Source: https://blog.kleros.io/innovating-dispute-resolution-a-cohesive-approach-blending-traditional-mediation-and-kleros-blockchain-arbitration/

For the purposes of the Bankruptcy Court, a similar set of steps will be complied with, in order to facilitate a structured and efficient mediation process:

a) Breaking Down the Issues
At this stage, the Mediator must familiarize themselves with the Resolution Plan submitted by the debtors, as well as the list of terms from the creditors. They must also begin by ensuring that each of the issues are grouped into smaller issues that may be tackled by the parties in an organized fashion. The complexity level of bankruptcy proceedings is often extremely high – an issue compounded by the fact that the debtor in question is a DAO. Therefore, the Mediator ought to work with the parties individually and together to ensure clarity and efficiency, as is characteristic of the traditional mediation process.

b) Discovering Core Interests
The Mediator, having familiarized themselves with the dispute, core issues, and Resolution Plan submitted, must at this juncture aid the parties in coming to the root of

their core interests. These interests must be known and expressed by the parties over the course of a facilitated mediation between debtors and creditors, allowing the parties to negotiate on the terms of the Resolution Plan. This mechanism is borrowed from the use of mediation in bankruptcy proceedings in nations such as Italy and the United States, as explored earlier in this paper. The process will allow the parties, with the help and guidance of the Mediator, to identify the key points of contention, and how to bypass these issues to come to a more amendable Resolution Plan that encompasses the interests of both debtors and creditors.

c) Developing Binary Outcomes

The Kleros Mediation Bridge process suggests creating binary outcomes for each issue. This can also be extrapolated into the Bankruptcy Court, wherein the contentious aspects of the Resolution Plan may be sorted issue-wise, with each issue having two binary outcomes. For example, if both parties' core disagreement is premised on how a particular class of assets is to be distributed, then the Mediator will come up with two binary outcomes: one for the debtor's suggestion of how these assets ought to be distributed, with the second for the creditors' suggestion of how the same should be distributed. If certain aspects of the same have been agreed upon in the mediation, this may be factored into the two options, with only the remaining point of contention remaining. This can be done for a number of salient issues that inevitably may be under dispute throughout the process, with each issue generating two possible outcomes. The Mediator here will have to work extensively with the parties to come to these binary outcomes, ensuring that these outcomes best represent the parties' interests, and are commercially and legally viable and wise. This is the best possible solution as it borrows from one of the key processes of the proposed Mediation Bridge, which is the aspect on binary outcomes, while also merging this notion with a traditional bankruptcy process, thus ensuring that the unique interests of the parties are not disregarded at any point. Keeping the issues to two binary options makes sure that the jury are not inundated with options, and also allows the parties to better center their own perspectives and interests in a concise fashion. This entire process will be facilitated by the Mediator.

This process ought to be highly party-driven, and both binary options should be entirely reflective of party interests and perspectives. Each issue will be dealt with separately, with two binary outcomes stemming from each issue to be voted upon, to create the final terms of the Resolution Plan. These outcomes ought to be realistic and reflective of the inputs gained by the parties throughout their mediation and negotiation process. It would also be necessary for the Mediator to review the issues and the binary outcomes with the parties separately and together.

Step 4: Submission to Kleros

Once the mediation process is concluded and the binary outcomes for each issue

decided upon, the dispute will be submitted to Kleros. Pursuant to the dispute being submitted, a jury with subject matter expertise in bankruptcy and insolvency will be selected through a two-part process, inclusive of the use of SBTs. This is, in part, slightly similar to the selection of the Mediator in Step 1.

This is necessary as the jury plays an integral role in the final decision of the Kleros Protocol, and therefore, it is imperative that the jury be well versed in the highly technical nuances of bankruptcy procedure. SBTs therefore ensure that Kleros can control for the quality of the decision, and the competence of its jury, before determining the outcome of a niche and technical type of dispute that requires mastery of highly specific subject matter. While typically, the jury is selected via the staking of Pinakion (PNK) tokens, here, one extra step is added.

First, the jury pool (not the final jury members, but a potential jury member pool) is selected through the usage of SBTs. This is the quality control necessary to ensure the competence of the potential jury members, similar to the reasoning behind the use of SBTs for the mediator pool. However, since the staking of PNK is extremely relevant for Kleros to function as envisioned, and creates the incentives necessary for the model to work, the final members of the jury will be selected through an additional step. Essentially, the selected members of the jury pool will then partake in the staking of PNK tokens, which will determine the final cut of individuals who will be a part of the jury to decide the dispute. Therefore, this becomes a two-stage process, with an initial shortlisting with respect to competence and qualifications using SBTs, and the second being through the traditional method of PNK staking that is unique to Kleros to arrive at the final, smaller number of jurors. The use of PNK also ensures that the jury is incentivized to come to the most rational, and viable decision, and therefore, ought to remain a necessary component of the Kleros Bankruptcy Court.

Step 5: Kleros Decision

The jury members will be provided with information including the Resolution Plan, the nature of the debts, and the current circumstances of the DAO that have made it difficult to repay the debt. All necessary information required to adequately decide on the matters of contention ought to be provided to the jury. To this effect, it may be prudent to receive representations from both the debtor and creditors as to their desired restructuring/liquidation arrangement, the points of contention, and reasons for the same.

The jury members will then vote solely on the issues under contention, limited to the issues and their binary outcomes.[47] Essentially, if there are three issues under dispute

[47] Supra (n 38)

between creditors and debtors framed by the Mediator, the jury will be provided with binary outcomes to vote on for each issue. The binary outcomes are prepared to streamline the process and make it as easy as possible for the jury to cast a vote, ultimately resulting in the final decision being arrived at through a majority vote. As seen in Kleros Version 2, adequate safeguards against juror fraud ought to also be deployed, to ensure that any jurors engaging in unethical conduct are penalized.
The below diagram illustrates how such a jury-based voting process would work, drawing from the Mediation Bridge currently being proposed by Kleros:

	OUTCOME 1	OUTCOME 2	KLEROS DECISION
DELAY	2 M	0,5 M	2 M
HVAC	1 M	0,1 M	0,1 M
ROOFING	1,5 M	0,2 M	0,2 M
TOTAL			2,3 M

Source: https://blog.kleros.io/innovating-dispute-resolution-a-cohesive-approach-blending-traditional-mediation-and-kleros-blockchain-arbitration/

Step 6: Enforcement

The Mediator will then organize the decided upon terms by the Bankruptcy Court process into a final Resolution Plan, based on the votes by the jury and the previously decided upon terms via mediation between the parties. The final Resolution Plan will be akin to a Master Settlement Agreement, which will be enforceable under the Singapore

Convention on Mediation.[48] Examples such as that of the Lehman Brothers bankruptcy, resolved through mediation, further supplement the enforceability and success of mediated settlements in the case of bankruptcy proceedings, making the enforceability of such a process one that is robust in nature.

Step 7: Appeal

If the parties are unsatisfied by the outcome, they may appeal the same at a higher cost to them, in order to ensure a larger number of jurors rule on the issues. The issues under contention will not change here, nor will the parties engage in further mediation – the same selected issues and their binary outcomes will simply be appealed to a larger number of jurors to decide the dispute. As subject matter expertise for the jurors is important, the larger jury pool will be created by choosing additional jurors from the initial SBTs created to form the jury pool, as they were selected via SBT but were not chosen to be jurors after staking their tokens. The higher cost of the process will ensure that the parties do not have a significant incentive to choose to submit the dispute to appeal, and rather will accept the decision of the Bankruptcy Court once it has been made. However, the right to appeal is certainly available for both parties, as in the case of a regular arbitration conducted by Kleros.

Step 8: Token-Based Rewards for the Jury

This model will retain the redistribution of PNK for the members of the jury voting correctly, as in the traditional Kleros arbitration process. Jurors who vote correctly will receive PNK, while jurors who did not concur with the correct opinion, will be forced to part with their tokens.

The process above concludes the proposed function for the Kleros Bankruptcy Court, a streamlined and specialized mechanism for the resolution of bankruptcy disputes. It draws from global efforts to integrate ADR with insolvency and bankruptcy proceedings, allowing for a more party-centric approach that ensures the benefit of both debtor and creditors. It further centers mediation as a core and necessary part of the process, allowing for the parties to reach an interest-based, enforceable settlement that is in the interests of both creditor and debtor. Therefore, it borrows most saliently from the Kleros Mediation Bridge process, as well as how bankruptcy proceedings are conducted the world over for inspiration to build such a mechanism on the Kleros Protocol. An adversarial process, especially owing to the nascent and niche nature of DAOs, would do a disservice to both creditors and debtor in this scenario. With an economic slowdown worldwide, DAOs are forced to grapple with a potential descent into insolvency, forcing

[48] Ibid.

them into having to choose between traditional, inefficient bankruptcy procedures, or simply being stuck with an inability to resolve such disputes. Drawing inspiration from several prominent nations and companies in the world that utilize mediation as a key tool integrated within bankruptcy proceedings, this paper has attempted to illustrate a potentially helpful and tailored solution to this very specific issue plaguing the modern blockchain ecosystem. The Kleros Bankruptcy Court provides a simple solution that is premised upon a specialized mechanism of dispute resolution, making bankruptcy courts on the blockchain an accessible, quick, and cost-effective reality.

Conclusion

Through this paper, a case has been made for a specialized model of bankruptcy resolution in the case of DAO insolvency. Its most salient contribution is a model underscoring the enforcement of such a mechanism, situated upon the Kleros Protocol, one of the world's only such forums for blockchain-based dispute resolution. In order to develop the same, its theoretical underpinnings were first explored, for the purpose of being able to justify several features of the model. Delving into corporate and insolvency law, the need for an insolvency mechanism separate from those of companies was underscored, alongside the fundamental building blocks of a successful bankruptcy system. The aforementioned model, therefore, is a necessary intervention to help foster an environment that ensures DAOs are robust investments without any lack of clarity with respect to the rights of both creditors and debtors, so as to ensure harmony and the interests of all stakeholders in the event a DAO is unable to make good upon its debt.

Kleros, and its unique mechanism of resolving disputes in a manner that is tailored to blockchain-based entities, makes the model a viable and very specific solution to the issue at hand. This papers' endeavor has therefore been to situate Kleros within the ambit of DAO bankruptcy as a key factor in facilitating the same, by being the forum for any grievances relating to DAOs and instances wherein the token holders may fall insolvent and find themselves unable to repay their creditors through an organized, systematic, tailored mechanism for decentralized justice.