THE USE OF BLOCKCHAIN ARBITRATION IN RESOLVING VIRTUAL ECONOMY DISPUTES: A CRITICAL ANALYSIS

SAESHA GEHANI*

This paper aims to critically analyse the effectiveness of decentralised arbitration provided by blockchain platforms as a dispute resolution mechanism for the settlement of rising number of disputes in the realm of virtual economy. The paper's objectives are threefold: firstly, to examine the challenges faced by conventional arbitration while resolving disputes involving virtual economy assets. Secondly, to delve into the mechanism in which blockchain arbitration helps overcome these challenges and provide an effective dispute resolution platform for such disputes, and lastly, to examine the challenges regarding enforcement faced by blockchain and provide a way forward. In the evolving legal landscape, alternate dispute resolution methods are gaining prominence and there is a need for their instrumentalization in this digital era marked by significant technological advancements. By offering a nuanced look at the workings of both blockchain and arbitration's inner workings, it offers a fresh perspective on resolving complex legal disputes in the realm of virtual economy without the need for intervention by third parties. This research employs a doctrinal approach, analysing primary and secondary sources of data to gauge the potential advantages and perils of blockchain arbitration and its success rate in the current scenario.

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* *Student at National Law Institute University, Bhopal.*

I. INTRODUCTION

Considering the rather coincidental convergence of pertinent technologies ensuring the creation of entirely new ecosystems, the future is approaching sooner than we can anticipate. For instance, the virtual economies are rapidly expanding through the trade of digital currencies and goods. To elaborate, a virtual economy is an economy that exists in a virtual world where users can exchange digital or real assets, products, and services in the context of a game or platform environment.[1] An asset can be tangible, such as a house, a car, cash, or land, or intangible, like intellectual property such as patents, copyright, or branding.[2] Virtually anything of value can be tracked and traded on a blockchain network with minimal risk of document alteration or loss. In these virtual economies, users can participate for entertainment or for real economic benefits.[3] An example of such virtual asset is a Non-Fungible Token (**"NFT"**). NFT has been defined as a unique, non-interchangeable cryptographic unit of data that is stored on a blockchain.[4]

For context, a blockchain is a decentralized, distributed ledger that records transactions across multiple devices, called nodes, in a manner that they cannot be modified later,[5] making it ideal for verifying and documenting the ownership of digital assets.[6] The recorded transaction data is stored within immutable blocks, where each block comprises a hash value (a unique cryptographic

[1] Edward Castronova, 'On Virtual Economies' (*Research Gate* February 2002) https://www.researchgate.net/publication/4811957_On_Virtual_Economies accessed 16th April 2025.

[2] Tangible v Intangible Property' (*brmmlaw* August 5 2024) https://www.brmmlaw.com/blog/2024/august/tangible-vs-intangible-property/ accessed 7th August 2025.

[3] Dr Soha Maad, 'Virtual Economy: A Complete Overview (2023)' World Union of Arab Bankers https://wuab.org/magazine-articles/virtual-economy-a-complete-overview/#:~:text=Cryptocurrencies%20are%20built%20using%20of,utilized%20and%20traded%20by%20users. Accessed 18th April,2025.

[4] Janne Kaisto, Teemu Juutilainen, Joona Kauranen 'Non-fungible tokens, tokenization, and ownership' (2024) 54 Computer Law and Security Review https://doi.org/10.1016/j.clsr.2024.105996.

[5] McQuinn A & Castro D, 'A Policymaker's Guide to Blockchain' (2019) Information Technology and Innovation Foundation. See also, Stephanie Susnjar & Ian Smalley, 'What is Blockchain?' (*IBM*) https://www.ibm.com/think/topics/blockchain accessed 20th April 2025.

[6] Sparsh Sharma & Sara Ibrahim, 'Blockchain Technology: Benefits, Challenges, Applications, and Integration of Blockchain Technology with Cloud Computing' (*MDPI* 2022) https://www.mdpi.com/1999-5903/14/11/341.

identifier), a timestamped batch of transaction data, and the hash value of the preceding block.[7] This link helps in connecting the blocks in a chronological and continuous chain. Consequently, each block authenticates the transaction data of the preceding block, thereby ensuring the integrity and security of the entire digitalised ledger.[8] Once a new block is added, it becomes permanently linked in the chain, preventing any insertion of new blocks between existing ones thereby safeguarding the system from tampering, fraud, and corruption.[9]

Cryptocurrencies are also created and managed using blockchain which can be exchanged automatically through the execution of a smart contract with conditions specific to their transaction.[10] For background, a smart contract is an agreement with automated execution based on the fulfillment of certain condition laid down in the contract by the parties to the contract themselves.[11]

Blockchain, driven by core features such as decentralization, is now increasingly being promoted as a fast, transparent, and cost-effective alternative to traditional dispute resolution. It helps in cutting costs involved in traditional arbitration by eliminating the intermediaries, as it enables self-executing smart contracts and automated dispute mechanisms, thereby streamlining the process.[12] Consequently, this upsurge also leads to the emergence of disputes involving virtual economies.[13] These disputes include virtual property ownership disputes, data privacy, and cybersecurity concerns.[14] Further, legal disputes arising out of smart contracts such as controversies regarding

[7] Hari, Adiseshu, and T. V. Lakshman. 'The internet blockchain: A distributed, tamper-resistant transaction framework for the internet.' In Proceedings of the 15th ACM workshop on hot topics in networks 204-210. 2016.
[8] Bralić, Vladimir, Hrvoje Stančić, and Mats Stengård. 'A blockchain approach to digital archiving: digital signature certification chain preservation.' 3 (2020) Records Management Journal 345-362.
[9] Sey, Collins, Hang Lei, Weizhong Qian, Xiaoyu Li, Linda Delali Fiasam, Seth Larweh Kodjiku, Isaac Adjei-Mensah, and Isaac Osei Agyemang. "VBlock: A blockchain-based tamper-proofing data protection model for internet of vehicle networks.' 22 Sensors (2022) 8083.
[10] Lawrence Emma, 'Blockchain and Smart contracts for secure and transparent transactions' (*ResearchGate* December 2024)
[11] Max Raskin, 'The law and legality of Smart Contracts' (2017) 1 Georgetown Law Technology review 305. https://www.ilsa.org/ILW/2018/CLE/Panel%20%2311%20-%20THE%20LAW%20AND%20LEGALITY%20OF%20SMART%20CONTRACTS%201%20Georgetown%20Law%20Technology%20Rev.._.pdf
[12] Kahchawa & partners, 'The Future of Technology in Arbitration: AI and Blockchain' (2023) Mondaq https://www.mondaq.com/india/arbitration-dispute-resolution/1376104/the-future-of-technology-in-arbitration-ai-and-blockchain
[13] Prosper Anagbogu, 'Online Dispute Resolution' (November 2, 2024) SSRN https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5018885.
[14] Andrea Pereira, 'Legal Challenges in the Metaverse' (*RecordOfLaw* February 20, 2025) https://recordoflaw.in/legal-challenges-in-the-metaverse/ accessed 21st April 2025.

intellectual property law, determining liability and responsibility, and enforcement and dispute resolution challenges, are also being observed.[15] Moreover, its compatibility with established arbitration norms remains largely contested. Concerns relating to procedural fairness, jurisdiction, anonymity of parties, and statutory enforcement; such as whether the code-encoded smart contracts satisfy the mandatory "in writing" requirement for a valid arbitration agreement under legal frameworks like Section 7 of the Arbitration and Conciliation Act, 1996, (**"Act"**)[16] raise important legal questions that warrant critical examination.[17] Consequently, an effective dispute resolution mechanism is required for the successful functioning of these virtual economies. It is posited that blockchain not only provides an effective platform for the development and trade in virtual economies but also provides for an effective dispute resolution mechanism in the form of decentralised arbitration.[18]

While traditional arbitration is a confidential, structured, and party-centric mechanism for the resolution of disputes arising from an agreement that binds the parties, where the arbitrator is bound to deliver the decision according to the law and under the existing agreement,[19] blockchain arbitration leverages blockchain technology to not only efficiently solve disputes but also solve them in a quick, cost-effective, and transparent manner.[20]

Existing scholarship on blockchain and dispute resolution has largely focused on smart contract enforceability, decentralised governance, and the technological efficiency of blockchain-based systems.[21] Similarly, literature on virtual economies predominantly examines regulatory challenges, taxation, and intellectual property concerns.[22] However, limited attention has been paid

[15] Ghasam Adhab Atiyah, 'Enforcement of smart contracts in cross-jurisdictional transactions' (2024) International Journal of Law and Management.
[16] The Arbitration and Conciliation Act, 1996 (26 of 1996) s 7.
[17] Ankit Kapoor, 'Legal and Policy concerns with Blockchain-based arbitration' (2022) 2 NUJS Journal on Dispute Resolution 107.
[18] The Rise of Blockchain Arbitration' (*Aceris Law* December 2018) https://www.acerislaw.com/the-rise-of-blockchain-arbitration/ accessed 18th January 2025.
[19] IR Scott, 'ADR: Principles and Practice by Henry J. Brown and Arthur L. Marriott' (1995) 11 Arbitration International 459-462.
[20] ibid.
[21] Mohammad Mustafa Ibrahimy, Alex Norta, Peeter Normak, 'Blockchain-based governance models supporting corruption-transparency: A systematic literature review, Blockchain: Research and Applications' Volume 5 Issue 2 2024 Science Direct.
https://doi.org/10.1016/j.bcra.2023.100186.
[22] Unnikrishnan, Anusha. 'Analyzing the impact of emerging technologies on intellectual property rights (IPR): a comprehensive study on the challenges and opportunities in the digital age.' 29 Law & World (2024): 66.

to the suitability of blockchain arbitration as a legally viable dispute resolution mechanism for disputes arising specifically within virtual economies. Hence, there exists a significant gap in analysing whether blockchain arbitration can reconcile its decentralised, code-driven nature with foundational principles of arbitration such as consent, due process, and enforceability, particularly in disputes arising from virtual economies.

This article discusses the effectiveness of blockchain arbitration as a dispute resolution mechanism in the face of emerging virtual technologies and the challenges faced by it across six parts. Part II discusses the evolution of virtual economy. Part III analyses the challenges faced by conventional Arbitration methods. Part IV describes Blockchain Arbitration and the ways in which the integration of Blockchain technology in the realm of Arbitration can help overcome traditional challenges. Part V critically analyses the effectiveness of the technology's integration, identifying a few shortcomings and Part VI concludes by providing a probable way forward.

II. THE RISE OF VIRTUAL ECONOMY AND THE EMERGENCE OF ASSOCIATED DISPUTES

By definition, virtual is "anything that exists in essence or effect, although it does not have actual fact or form."[23] In this context, 'Virtual Economy' refers to the new economic frontier that lies beyond a digital curtain and encompasses a diverse landscape of platforms, volatile assets like cryptocurrencies and NFTs and other ambitious pioneers operating in a virtual domain.[24] It is an entire realm of digital activity and opportunity.

With the advent of the twenty-first century and the digitalisation and virtualisation of economy, business leaders adapted to this change by using digital platforms technologies as the basis of their business model.[25] As a result, today one can buy digital art, outfits for online avatars, and even a parcel of digital real estate to build a virtual home.[26] These transactions take place with the help of exchange of virtual currencies or virtual assets like cryptocurrency or NFTs respectively.

[23] Oxford Advanced Learner's Dictionary (10th edn, 2024).
[24] 'The Virtual Economy' (*Atelier Services*) https://atelier.net/virtual-economy/ accessed 30th June 2025.
[25] Dorina Bala, 'The impact of Digital platforms on business models' (*ResearchGate* December 2018) https://www.researchgate.net/publication/330681585_The_impact_of_Digital_Platforms_on_Business_Models_An_empirical_investigation_on_innovative_start-ups accessed 17th June 2025.
[26] Jun Hong Tan, 'Blockchain "Arbitration" for NFT-Related Disputes' (2023) 16(1) CONTEMP. ASIA ARB. J. 145.

Ethereum network is one such decentralised and developed platform that employs the use of blockchain technology to help regulate transactions revolving around NFTs.[27] It uses the ERC-721 standard, a technical framework defining a set of rules for creating and managing tokens.[28] This standard enables the creation of tokens with unique characteristics that make them non-fungible. NFTs have started to be enabled on other blockchains as well, including Flow, a layer-1 blockchain platform designed for speed and Binance Smart Chain, a decentralised blockchain platform compatible with the Ethereum to help facilitate NFT transactions in cost-effective manner.[29] However, this rapid growth in the use of NFTs and the virtual economy has led to several disputes.

Firstly, the theft of digital assets has become a prevalent practice, with more than two billion million worth of cryptocurrency funds reportedly being stolen in 2024 alone.[30] The rise of NFT assets like artwork has also elicited fraudulent practices in the industry. Minters impersonating the actual creations defraud the buyers into buying the copied artwork instead of the original piece.[31] Additionally, the creation and selling of real-life works depicted in NFTs have led to intellectual property disputes in two main forms.[32]

First, since they can be created from pre-existing works without the owner's consent, they have the potential to infringe intellectual property rights and result in a dispute over who owns the asset. Second, consider the owner has granted permission to use their intellectual property to create a particular NFT, thus granting the copyright of the original asset. In this scenario, on sale of the NFT, the purchaser only receives the ownership of that asset and not the underlying copyright of the original asset vested with the owner of the original work.

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[27] Ante, Lennart. 'Non-fungible token (NFT) markets on the Ethereum blockchain: Temporal development, cointegration and interrelations.' 32 Economics of Innovation and New Technology (2023): 1216-1234.
[28] ERC-721 Non Fungible Token Standard, (2023), https://ethereum.org/"en/developers/docs/standards/tokens/erc-721.
[29] Demystifying Non- Fungible Tokens, The European Union Blockchain Observatory & Forum https://forum.eu/sites/default/files/reports/DemystifyingNFTs_Nove.
[30] Chainalysis Team, 'Report: $2.2 Billion Stolen from Crypto Platforms in 2024, but Hacked Volumes Stagnate Toward Year-End as DPRK Slows Activity Post-July' (*Chainalysis Blog*, 19 December 2024) <https://www.chainalysis.com/blog/crypto-hacking-stolen-funds-2025/> accessed 29 August 2026.
[31] Bijan Stephen, 'NFT Mania Is Here, and so Are the Scammers'(2021) THE VERGE https://www.theverge.com/2021/3/20/22334527/nft-scams-artists-opensea-rarible-marble-cards-fraud-art accessed 18th April, 2025.
[32] Pravertna Sulakshya, 'NFT and its Relationship with IPR' (2021) Mondaq https://www.mondaq.com/india/fin-tech/1132188/nft-and-its-relationship-with-ipr#:~:text=If%20and%20when%20copyright%20is,sold%20in%20the%20first%20place accessed 18th April, 2025.

For example, a person who paid thousands of dollars to purchase the NFT of an animated digital cartoon, Nyan Cat, owns a copy of it. The original copyright is still in the hands of Christopher Torres, who made the original doodle of Nyan Cat.[33] Such nuances can further lead to ownership and infringement disputes. These disputes are inherently cross-border, technologically complex, and often involve pseudonymous parties, making conventional litigation ill-suited.[34]

Arbitration, by contrast, offers a more flexible and adaptive mechanism to address such conflicts. Specifically, blockchain-based arbitration operates through decentralized protocols and smart contracts that automatically enforce dispute outcomes, such as releasing escrowed crypto assets or reallocating tokenized rights, without reliance on cross-border court enforcement. By evaluating cryptographically verified transaction histories and metadata on-chain, decentralized arbitrators can settle disputes involving pseudonymous entities and ambiguous IP licensing without jurisdictional friction. Hence, a blockchain-based dispute resolution mechanism to resolve such disputes seems like a logical addition to contemporary legal systems.

Further, the volatile nature of virtual assets makes speed a critical factor. Cryptocurrency values can fluctuate drastically within days,[35] making protracted litigation impractical. Arbitration's capacity for expedited proceedings ensures that parties can obtain timely relief before the underlying asset's value shifts dramatically. Moreover, arbitration's confidentiality can protect sensitive commercial information that parties may not wish to disclose publicly, a concern heightened in disputes involving digital platforms and intellectual property.

III. ANALYSING THE EFFECTIVENESS OF CONVENTIONAL ARBITRATION IN RESOLVING VIRTUAL ECONOMY DISPUTES

Although conventional arbitration proceedings are less tedious and more efficient than traditional court litigation, they face some key challenges. The cost of these proceedings is one such

[33] Pravertna Sulakshya, 'NFT and its Relationship with IPR' (2021) Mondaq https://www.mondaq.com/india/fin-tech/1132188/nft-and-its-relationship-with-ipr#:~:text=If%20and%20when%20copyright%20is,sold%20in%20the%20first%20place accessed 18th April, 2025.

[34] Nanjwan Yale Damap and Kangdim Dingji Maza, 'Jurisdictional Challenges in Cryptocurrency Disputes: Navigating the Legal Maze of a Borderless Technology' (2025) 17(1) African journal of Stability & Development 132-160.

[35] Tai Tan Mai & Martin Crane, 'Volatility and returns connectedness in cryptocurrency markets: Insights from graph-based methods' (*ScienceDirect* 15 December 2003) HTTPS://WWW.SCIENCEDIRECT.COM/SCIENCE/ARTICLE/PII/S0378437123009044 accessed 19th August 2025.

challenge. Despite arbitration being less expensive than traditional court litigation, it still incurs high costs.[36] The emphasis on costs has tended to be on institutional arbitration (for which data is more readily available), even though party costs account for nearly 85% of all expenditures related to traditional arbitration.[37] High arbitration costs pose a distinct challenge in virtual economy disputes, where transaction values may fluctuate rapidly or be comparatively modest at the time of dispute initiation. In such cases, the cost of initiating and sustaining arbitral proceedings may exceed the economic value of the disputed digital asset itself, thereby undermining access to justice.

Another factor is the time taken by arbitration proceedings, especially international arbitration proceedings. Data from major arbitral institutions demonstrates that arbitration proceedings commonly extend well beyond a year,[38] with many international arbitrations lasting close to or over two years.[39] Such prolonged timelines are fundamentally incompatible with the operational realities of blockchain-based environments.[40] As digital assets may appreciate or depreciate significantly within short timeframes, delays in adjudication can distort the economic reality underlying the dispute, complicate valuation, and undermine the effectiveness of any eventual remedy.[41]

In addition to the long duration and expensive nature of the proceedings, another shortcoming faced by arbitration is the enforcement of the awards rendered by the Arbitral Tribunal. Conventional arbitration is premised on identifiable legal persons capable of consenting to arbitration and being subjected to enforceable awards.[42] In blockchain-based transactions,

[36] 'Arbitration is cheaper-Myth or Reality'(*Expert Insights* 31 October 2023) https://www.charlesrussellspeechlys.com/en/insights/expert-insights/dispute-resolution/2023/arbitration-is-cheaper--myth-or-reality/ accessed 17th August 2025.

[37] Leon Trakman & Hugh Montgomery, 'The "Judicialization" of International Commercial Arbitration: Pitfall or Virtue?' (2017) 30(2) Leiden Journal of International law. 405.

[38] International chamber of Commerce, ICC Dispute Resolution 2020 Statistics (2021), https://nyiac.org/wp-content/uploads/2021/09/ICC-Dispute-Resolution-2020-Statistics.pdf.

[39] Singapore International Arbitration Centre, 'Costs and Duration Study' (2016), https://siac.org.sg/wp-content/uploads/2022/08/SIAC-Releases-Costs-and-Duration-Study_10-Oct-%202016.pdf.

[40] Giudici G Milne A. & Vinogradov D. 'Cryptocurrencies: market analysis and perspectives' (2020) 47, J. Ind. Bus. Econ.1-18.

[41] Brayden Lindrea, 'Bored Ape NFT price hits lowest in over two and a half years' (*Cointelegraph* April 2024) https://cointelegraph.com/news/bored-ape-yacht-club-floor-price-lowest-point-since-august-2021 accessed 19th May 2025.

[42] Jun Hong Tan, 'Blockchain "Arbitration" for NFT-Related Disputes' (2023) 16 (1) Contemporary Asia Arbitration Journal 145-186.

however, parties frequently operate through pseudonymous wallet addresses, making it difficult to ascertain identity, establish valid consent, or determine the seat and governing law of arbitration, creating structural barriers that institutional arbitration is ill-equipped to handle.[43] While modern institutional rules can adapt to complex commercial arrangements, they fundamentally depend on identifying legal persons, designating a physical or legal seat of arbitration,[44] and relying on national courts under the New York Convention[45] for off-chain asset execution. In decentralized, cross-border token ecosystems, establishing valid consent and determining governing law under traditional institutional frameworks leads to an immediate jurisdictional deadlock under the '*kompetenz-kompetenz*' principle, as tribunals cannot establish jurisdiction over unidentifiable entities.

More critically, even if an institutional tribunal renders an award against a pseudonymous entity, it lacks the technical capacity to enforce compliance directly on-chain. Institutional arbitration remains bound to state-backed legal machinery, whereas blockchain arbitration integrates dispute resolution directly into the smart contract protocol. By replacing off-chain legal enforcement with automated, cryptographic execution, blockchain-native arbitration resolves the core enforcement and jurisdictional failures that institutional frameworks inherently cannot bridge.

IV. THE EMERGENCE OF BLOCKCHAIN ARBITRATION AND ITS POTENTIAL TO ADDRESS TRADITIONAL CHALLENGES

During the transition from pre digital age, characterised by single-function devices and traditional retail to the post digital era, characterised by ever changing digital life and technologies like smart homes and smart cars, virtual economies and smart contracts are becoming the norm.[46] Consequently, the field of arbitration is bound to be impacted as well as demonstrated through its

[43] Flore Guillaume & Sven Riva 'Blockchain Dispute Resolution for Decentralized Autonomous Organizations: The Rise of Decentralized Autonomous Justice' (*ResearchGate* February 2022). https://www.researchgate.net/publication/358889700_blockchain_dispute_resolution_for_decentralized_autonomous_organizations_the_rise_of_decentralized_autonomous_justice accessed 27th July 2025.
[44] The Arbitration and Conciliation Act, 1996 (26 of 1996) s 16; International Centre for Dispute Resolution (ICDR), ICDR International Arbitration Rules (1 January, 2022) art 21.
[45] New York Convention, 'The Convention on the Recognition and Enforcement of Foreign Arbitral Awards' (7 June, 1959).
[46] Monish Darda, 'What are Smart Contracts' (*Icertis*) https://www.icertis.com/research/blog/what-are-smart-contracts/# accessed 23rd May 2025.

facilitation by technologies like blockchain especially in international disputes involving virtual economies and their assets like NFTs and cryptocurrency.

Blockchain technology is a decentralised, distributed ledger system that records transactions securely and transparently across a network of immutable nodes.[47] It ensures security and transparency by linking data of the transaction in blocks in a chronological order, forming a continuous chain.[48] Blockchain Arbitration refers to the use of blockchain to securely store the proceedings' records as well as its application to new kinds of adjudication and smart contract enforcement.[49] Arbitration proceedings conducted on a blockchain platform involve the selection of arbitrators at random from a limited number of experts that are members of the platform.

Blockchain Arbitration platforms include Kleros, Jur, and Aragon Court which use cryptographic security, crowdsourced jurors, and smart contract-based enforcement to resolve conflicts. These systems rely on decentralized decision-making, where a panel of randomly selected jurors reviews the dispute and renders a verdict based on blockchain-stored evidence.[50] Since arbitration decisions are recorded on the blockchain, they become immutable, transparent, and final. The decentralised and tamper-resistant nature of the technology ensures equal access to information, thereby minimising the risk of bias or manipulation.[51]

One of the key advantages of decentralised arbitration is its speed and efficiency. Traditional legal proceedings can take months or years, whereas blockchain-based resolutions can be concluded within days or even hours.[52] The elimination of intermediaries significantly reduces costs, making dispute resolution accessible to smaller businesses and individuals. Additionally, since blockchain

[47] Marie Claude Nadeu, 'What is blockchain' (*McKinsey & Company* June 6 2026) https://www.mckinsey.com/featured-insights/mckinsey-explainers/what-is-blockchain accessed 25th May 2025.
[48] id n 26.
[49] Flore Guillaume & Sven Riva 'Blockchain Dispute Resolution for Decentralized Autonomous Organizations: The Rise of Decentralized Autonomous Justice' (*ResearchGate* February 2022). https://www.researchgate.net/publication/358889700_blockchain_dispute_resolution_for_decentralized_autonomous_organizations_the_rise_of_decentralized_autonomous_justice accessed 27th July 2025.
[50] Raghav Saha & Harshit Upadhyaya, 'Blockchain Arbitration in India: Adopting the Hybrid model envisaged by the Mexican 'Kleros' case (*IndiaCorpLaw* June 14 2022) https://indiacorplaw.in/2022/06/14/blockchain-arbitration-in-india-adopting-the-hybrid-model-envisaged-by-mexican-kleros-case/ accessed 25th June 2025.
[51] Alesia Zhuk, 'Applying blockchain to the modern legal system: Kleros as a decentralised dispute resolution system' (2023) 4 International Cyber Security Law Review 351-364.
[52] Andrew Galanty, 'New Technology Arbitration: Blockchain Arbitration and Data arbitrations' (*ResearchGate* September 2022). https://www.researchgate.net/publication/365615362_New_Technology_Arbitration_Blockchain_Arbitration_and_Data_Arbitration accessed 17th August 2025.

records all contract transactions immutably, evidence is readily available, minimising the risk of fraudulent claims and lengthy evidence-gathering processes.[53]

Under the Kleros protocol, disputes can be resolved in a matter of weeks. For example, issues before the Kleros Blockchain Court (one of Kleros, "**specialized courts**") are often resolved in three weeks. Following the appointment of jurors, the evidence submission stage lasts three days, followed by two twelve-day voting periods. An appeal, if filed, will be resolved within four days.[54] In this sense, blockchain arbitration does not merely offer convenience but becomes a necessity for markets where delay undermines the utility of any remedy. It transforms arbitration from a reactive system into a proactive mechanism capable of keeping pace with fast-moving technological and commercial realities.

Another vital aspect of blockchain arbitration is its relative cost-effectiveness. Savings in counsel fees as well as fees of third parties like institutions required to facilitate arbitration ensure that the proceedings are concluded in a comparatively cost-effective manner.[55] For instance, during proceedings conducted by Kleros, careful user experience design such as the inclusion of menus with predefined alternatives, provides a smooth onboarding of disputants and jurors without the additional layer of counsel representation.[56] In terms of juror participation, as of April 2023, the "General Court" simply requires a stake of tokens worth US$49.36.[57] As a result, blockchain arbitration eases access to justice by lowering the entry barriers that previously restricted arbitration to large corporate or cross-border disputes.

Further, the possibilities of bias in arbitration proceedings on a blockchain platform are significantly reduced as the trust of the parties involves a shift from the arbitrators or institutions personally selected to a digital mechanism designed for performing the same functions.[58] The basis for its legitimacy is "trust in the system, trust in the process, and trust in its fairness-and therefore

[53] id n 43
[54] Kleros Board, Kleros (2023) https://klerosboard.com/ accessed 19th April, 2025.
[55] Danrivanto Budhijanto & Prita Amalia, 'Blockchain Arbitration: roadmap to recognition and enforcement of arbitral award' (2025) 11(1) Cogent Social Sciences 1-19.
[56] Kleros Juror Tutorial, Kleros (2023) https://kleros.gitbook.io/docs/products/court/kleros-juror-tutorial accessed 19th April, 2025.
[57] id n 22.
[58] Nauful Ahmed Shiddiq & Mursal Maulana, 'Blockchain Arbitration in Confidentiality and impartiality priniples: lex digitalis arbitri' (2024) 8 (1) Unram law review 1-21.

a willingness to abide by outcomes."[59] Therefore, trust in arbitrators is replaced by confidence in the operation of a system as a whole.[60]

In addition to this, blockchain arbitration is characterised by its ability of self-enforceability, thereby removing the potential hindrance of opting for "coercive execution" of arbitral awards.[61] This is achieved with the implementation of an escrow mechanism in smaller valued or shorter duration virtual economy disputes. According to this mechanism, the funds are stored in two separate wallets and cannot be accessed by either party without the consent of the other. While many exist, one common technique used to bar unilateral access to funds is the multi-signature wallet.[62] A multi-signature wallet can be described as a lock having two keyholes, with the buyer and seller each having a key. The funds can only be released by joint instruction to the mechanism. In case of a dispute, the adjudicator is provided with a key to the escrow wallet and can facilitate access of the prevailing party to the funds by using their own key together with that of the prevailing party.

Thus, the escrow mechanism entails the automatic transfer of the assets and payments in the prevailing party's favour depending on the rendered award. Hence, blockchain arbitration eliminates the tedious process of involving third parties like national courts for the enforcement of the arbitral awards, consequently saving the parties' time, effort, and money. Further, disputes arising from smart contracts can be enforced using an Oracle-based arbitration system. An Oracle is a service that forms a bridge between smart contracts (on-chain) and activities taking place in the real world (off-chain).[63] When a clause in the smart contract provides for the deferral of a dispute to an arbitrator, the dispute can be resolved, and the award rendered by the arbitral tribunal can be posted to an Oracle. As a result, this external input will be sent as a signal to the smart contract, which will trigger the enforcement of the award rendered through the software script.[64]

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[59] Ethan Katsh & Orna Rabinovich-Einy, 'Blockchain and the Inevitability of Disputes: The Role for Online Dispute Resolution' (2019) (2) Journal of Dispute Resolution. 47.
[60] Primavera De Filippi., 'Blockchain as a Confidence Machine: The Problem of Trust & Challenges of Governance' (2020) 62 Technology in Society 1.
[61] id n 51.
[62] Pierto Ortolani, 'Recognition and enforcement of the Outcome of Blockchain Based Dispute Resolution' Blockchain and Private International Law 642.
[63] Sam Brown, 'Arbitration of cryptoasset and smart contract disputes: arbitration unchained?' (*Practical law* July 19 2023) https://www.cliffordchance.com/content/dam/cliffordchance/briefings/2023/08/arbitration-of-cryptoasset-and-smart-contract.pdf accessed 21st August 2025.
[64] ibid.

However, awards rendered by Blockchain Arbitration can also be challenged, and their enforceability questioned.

V. CHALLENGES FACED BY BLOCKCHAIN ARBITRATION

According to judicial decisions, the territorial jurisdiction for the execution of an award is determined by the place where the property or money is located as the award itself is executable as a court decree.[65] Since a virtual economy operates in an entirely digital realm, the assets are not considered to be part of any state. Lesser-valued disputes arising due to transactions of virtual assets are self-enforceable on a blockchain arbitration platform.[66] However, higher valued disputes or disputes spanning over a longer period are not self-enforceable.[67] As a result, the enforceability of such disputes can be questioned due to the mandate to mention the seat of arbitration in arbitral awards across multiple rules governing arbitration procedure.

Article I(1) The New York Convention states that "this Convention shall apply to the recognition and enforcement of arbitral awards made in the territory of a State other than the State where the recognition and enforcement of such awards are sought, and arising out of differences between persons, whether physical or legal."[68] Further, Section 31(4) of the Act,[69] as well as the UNCITRAL Arbitration Rules, 2021 (**"Rules"**) require the place of Arbitration to be mentioned in the arbitral award.[70]

Under Indian law, this creates a severe execution bottleneck because Section 36 of the Act treats enforceable awards as decrees of a civil court, yet smart-contract executions lack a physical seat,[71] written signatures under Section 31(1),[72] and legal mechanisms for judicial execution against off-chain assets in India. In addition to this, the Rules as well as the Act require the reasons to be stated

[65] *Daelim Industrial Co. Ltd. v Numaligarh Refinery Ltd*., (2009) SCC OnLine Del 511; *Religare Finvest Limited v Ranjit Singh Chouhan*, (2012) SCC OnLine Del 1224.
[66] Atul Aravind, 'Blockchain Arbitration: The Future?' (*Mappin ADR*) https://jgu.edu.in/mappingADR/blockchain-arbitration-the-future/ accessed 4th July 2024.
[67] Budhijanto, Danrivanto, Prita Amalia, and Naufal Ahmad Shiddiq 'Blockchain Arbitration: Roadmap to Recognition and Enforcement of Arbitral Award' 11 (1) Cogent Social Sciences (2025).
[68] New York Convention art I(1).
[69] The Arbitration and Conciliation Act, 1996 (26 of 1996) s 31(4).
[70] UN Commission on International Trade Law, 'Arbitration Rules' (9 July 2021) art 34(4).
[71] The Arbitration and Conciliation Act, 1996 s 36.
[72] The Arbitration and Conciliation Act, 1996 s 31(1).

upon which the arbitral award was based.[73] However, in blockchain arbitration, the jurors are not formally required to give reasons. For example, Kleros merely requires jurors to "give parties a statement of the grounds on which the decision is based," as well as "provide a short text explaining their vote."[74]

This dynamic highlights how blockchain arbitration engages with the principles of natural justice. While platforms observe *audi alteram partem* through transparent evidence submission windows and preserve *nemo judex in causa sua* via randomized, game-theoretic juror selection, the lack of comprehensive, reasoned awards conflicts with core procedural fairness. Under Section 31(3) of the Act,[75] an award lacking an intelligible adjudicatory rationale fails natural justice standards, leaving decentralized decisions vulnerable to set-aside proceedings under Section 34.[76]

Another challenge is the loss of confidentiality. Parties of the dispute prefer arbitration over traditional litigation due to the discretion in proceedings. However, this confidentiality is lost in blockchain arbitration wherein all the parties' information, including claims, arguments and their evidence is on a publicly available ledger system.[77] Further, party autonomy is put in peril as the arbitrators of the arbitral tribunal are selected by an automated system instead of the parties involved in the dispute. Although this system ensures the impartiality and neutrality of the arbitrators, it takes away the element of transparency in the appointment of arbitrators by not providing the criteria according to which the jurors are appointed.

VI. WAY FORWARD

Ensuring the enforceability of such new innovations is critical to facilitating the advancement of dispute resolution procedures. The conundrum of enforceability of awards rendered by blockchain arbitration can be resolved by the incorporation of some workarounds. A default seat can be designated for the proceedings conducted by the parties and the providers, as it is a prevalent

[73] The Arbitration and Conciliation Act, 1996 (26 of 1996) s 31(3); UN Commission on International Trade Law, 'Arbitration Rules' (9 July, 2021) art 34(3).
[74] Kleros, 'Dispute Resolution' The Kleros Handbook of Decentralised Justice (2020) 271.
[75] The Arbitration and Conciliation Act, 1996 s 31(3).
[76] The Arbitration and Conciliation Act, 1996 s 34.
[77] Rana Sajjad, 'Blockchain Arbitration: Promises and Perils' (2023) The American Review of International Arbitration of Columbia Law School. https://aria.law.columbia.edu/Blockchain-Arbitration-promises-and-perils/ accessed 21st April, 2025.

practice. For instance, under the 2022 ICDR rules, "All Arbitrations under these Rules shall take place in the forum specified by the agreement or if none, in Los Angeles County, California."[78] However, the default location shall be selected, bearing in mind the jurisdictions' take on the legality of crypto-assets and blockchain technology.

With respect to the requirement of stating reasons in the arbitral award, the parties may by mutual agreement waive this obligation, an option that is expressly permitted under the Act and the Rules,[79] though the risk of such unreasoned awards being challenged and set aside must be carefully weighed. Concerning the loss of confidentiality, the proceedings can be shifted to a permissioned blockchain platform. A permissioned blockchain platform can be described as a platform wherein it consists of only specific verified participants participating in blockchain, present and operating only amongst approved users. They ensure privacy of data and control, by giving access to a limited number of users. Hyperledger fabric, R3 Corda and Quorum are some examples of permissioned Blockchain platforms that can be accessed by only the approved users.

In conclusion, blockchain arbitration is emerging as an effective dispute resolution mechanism in light of the increasing virtual economy disputes despite the challenges it faces. It undoubtedly provides quick, inexpensive and transparent proceedings. In the era of growing international trade and commerce, the usage of blockchain arbitration eliminates the need for cumbersome procedural requirements as well as third parties for enforcement, thereby providing a robust arbitration framework for both domestic as well as cross-border disputes. Hence, while the adaptability of blockchain arbitration remains questionable due to regulatory and procedural constraints, addressing these hurdles provides a clear way forward. Gradually integrating permissioned blockchain platforms with established conventional standards will allow the system to offer speedy, enforceable, and economic justice.

[78] International Centre for Dispute Resolution (ICDR), ICDR International Arbitration Rules (1 January, 2022) art 19(1).
[79] The Arbitration and Conciliation Act, 1996 (26 of 1996) s 31(3)(a); UN Commission on International Trade Law, 'Arbitration Rules' (9 July, 2021) art 34(3).