

Arbitrating Cryptocurrency Disputes: Enforceability, Procedure, And Emerging Legal Challenges

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ABSTRACT

The rise of cryptocurrency, with its decentralised, borderless, and pseudonymous nature, poses significant challenges to traditional dispute resolution mechanisms. This paper examines how arbitration can effectively resolve cryptocurrency disputes, focusing on three interrelated dimensions: enforceability, procedural adaptation, and emerging legal challenges. It considers whether blockchain-based contracts and arbitration agreements are legally binding under domestic law and the New York Convention, explores procedural innovations for managing pseudonymous parties, digital asset tracing, and secure evidence handling, and assesses remedies, including token transfers, asset valuation, and enforcement against decentralised or anonymous entities. Using doctrinal and comparative analysis of institutional rules and leading crypto disputes, the study finds that arbitration offers a viable solution but requires specialised expertise, procedural innovation, and legislative clarity. The paper recommends adopting Crypto Integrated Arbitration Rules to ensure enforceability, procedural certainty, and effectiveness in resolving disputes within the evolving digital asset economy.

Keywords: Cryptocurrency Arbitration, Enforceability, Procedural Innovation, Digital Asset Disputes, Decentralised Finance (DeFi)

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1. INTRODUCTION

The cryptocurrency and blockchain ecosystem, founded on principles of decentralisation, disintermediation, and censorship resistance, operates largely in a legal grey area.¹ Traditional litigation is often ill-equipped to address disputes arising in this space due to inherent tensions: the borderless nature of blockchain conflicts with the territorial limits of national courts; the pseudonymity of wallet addresses challenges the requirement for identifiable parties; and the immutable execution of code limits judicial discretion.² This gap generates significant legal uncertainty, deterring institutional adoption and exposing individual participants to risk.³

¹ A. Narayanan, J. Bonneau, E. Felten, A. Miller, & S. Goldfeder, *Bitcoin and Cryptocurrency Technologies* (Princeton University Press, Princeton 2016) NJ. See also G. W. Peters & E. Panayi, 'Understanding Modern Banking Ledgers through Blockchain Technologies: Future of Transaction Processing and Smart Contracts on the Internet of Money' *Banking & Finance Law Review* (2016) (31) (1) 1–28.

² P. De Filippi, & A. Wright, *Blockchain and the Law: The Rule of Code* (Harvard University Press, Cambridge, 2018).

³ A. Zohar, 'Bitcoin: Under the Hood', *Communications of the ACM*, (2015) (58) (9) 104–113.

Arbitration, as a consensual, private, and flexible alternative dispute resolution (ADR) mechanism, offers a promising solution. Its core features, party autonomy, neutrality, confidentiality, and cross-border enforceability under the 1958 New York Convention, align closely with the global, private, and technologically mediated nature of cryptocurrency transactions.¹ Nonetheless, applying traditional arbitral frameworks to the digital asset space is far from straightforward, given the novel technical and legal characteristics of blockchain-based agreements.

This paper examines how arbitration can be adapted to address cryptocurrency disputes, focusing on enforceability, procedural innovations, and emerging legal challenges. It explores issues of contract formation, evidentiary standards, procedural rules, and the practical enforcement of awards against decentralised entities, such as DAOs, which differ fundamentally from conventional commercial disputes.² The study argues that arbitration can fulfil its potential as the preferred dispute resolution framework in the crypto economy, provided it evolves through tailored rules, specialised expertise, and legislative clarity.

2. CLARIFICATION OF CONCEPTS

To provide clarity and ensure a shared understanding of the key terms employed in this study, several concepts central to cryptocurrency arbitration are defined. Given the novelty of digital assets and blockchain-based transactions, both their ordinary and technical meanings are presented. This dual approach helps situate the discussion within a broader legal and practical context, while also addressing the specialised challenges that arise in cross-border arbitration of digital asset disputes.

2.1 Cryptocurrency Arbitration

Cryptocurrency arbitration refers broadly to the use of arbitration to resolve disputes arising from transactions involving digital currencies or tokens. In everyday terms, it is a private method of settling disagreements without resorting to courts, typically chosen by parties to save time, reduce costs, and maintain confidentiality. It applies to any conflict involving the buying, selling, or transfer of cryptocurrencies between parties, including issues relating to contracts, payments, and investment.

In the context of international dispute resolution, cryptocurrency arbitration is a specialised form of alternative dispute resolution (ADR) where disputes involving blockchain-based assets, smart contracts, and decentralised financial structures are adjudicated by an arbitral tribunal. It addresses unique challenges such as pseudonymous parties, cross-border jurisdictional issues, and the enforceability of digital contracts under domestic law and instruments like the New York Convention. Arbitration provides procedural flexibility to handle digital evidence, virtual hearings, and technological expertise requirements.³

2.2 Enforceability

Enforceability generally refers to the capacity of a legal instrument, such as a contract, agreement, or court order⁴ to be recognised and implemented in practice. In ordinary usage, it reflects the idea that a legal obligation can be legally compelled, ensuring that the parties are bound to comply with the terms agreed upon or the outcome of a dispute.

In cryptocurrency arbitration, enforceability concerns whether arbitral awards and smart contract obligations can be legally executed and recognised under domestic legislation, international conventions, and cross-border enforcement mechanisms. It includes the validity of arbitration clauses, the recognition of awards under the New York Convention, and the ability to enforce remedies against decentralised entities, pseudonymous participants, or volatile digital assets.⁴

2.3 Procedural Innovation

Procedural innovation refers to the introduction of new methods or approaches in the conduct of legal proceedings to improve efficiency, fairness, or accessibility. In everyday terms, it is the adaptation of procedures to suit changing circumstances, technologies, or participant needs.

¹ G. B. Born, *International Commercial Arbitration* (Kluwer Law International 3rd edn The Hague 2020). See also L. Mistelis, *Concise International Arbitration* (Kluwer Law International 3rd edn, The Hague 2017).

² W. A. Kaal, & M. Dell'Erba, 'Arbitrating in the Digital Asset Space: Legal Challenges and Opportunities' *Journal of International Arbitration* (2021) (38) (5) 567–592. See also V. Lo, & J. Loh, 'Smart Contracts and Arbitral Enforcement' *Journal of Dispute Resolution* (2022) (2) 101–129.

³ *Ibid.*

⁴ K. Werbach, & N. Cornell, 'Contracts Ex Machina' *Duke Law Journal* (2017) (67) (2) 313–382. See also M. Finck, *Blockchain Regulation and Governance: Financial Markets and Beyond* (Cambridge University Press, Cambridge 2018).

Within cryptocurrency arbitration, procedural innovation encompasses adaptations to traditional arbitral rules to address the challenges of digital asset disputes. This includes mechanisms for verifying blockchain records, secure handling of digital evidence, conducting virtual hearings, managing pseudonymous parties, and integrating technical expertise into tribunal decision-making. Procedural innovation ensures that arbitration remains effective and credible despite the novelty and complexity of crypto-related disputes.¹

2.4 Digital Asset Disputes

Digital asset disputes are conflicts arising from ownership, transfer, or use of digital property or currency. In everyday terms, these are disagreements about who owns or controls assets such as cryptocurrency tokens, virtual coins, or digital rights in online platforms.

Technically, digital asset disputes involve legal controversies arising from blockchain-based instruments, including smart contracts, tokenised securities, NFTs, and decentralised finance (DeFi) structures. These disputes may involve questions of contract validity, fiduciary duties, asset valuation, custody, and governance within decentralised protocols. They are characterised by cross-border elements, technological complexity, and reliance on cryptographic verification.²

2.5 Decentralised Finance (DeFi)

Decentralised Finance, or DeFi, broadly refers to financial services that operate without traditional intermediaries such as banks, brokers, or custodians. In ordinary terms, it is a system where financial transactions occur directly between participants using technology, typically through the internet.

Technically, DeFi is an ecosystem of blockchain-based protocols that allow lending, borrowing, trading, and investing in a peer-to-peer manner, often governed by smart contracts and DAOs. Disputes in DeFi arise from issues such as protocol failures, governance decisions, smart contract bugs, and security breaches. DeFi's decentralised and pseudonymous nature creates legal and procedural complexities, particularly regarding arbitration, enforceability of awards, and liability attribution.³

2.6 Smart Contract

A smart contract is commonly understood as a digital agreement that automatically performs actions once certain conditions are met. In simple terms, it is a computer programme that enforces agreed-upon terms between parties without human intervention.

Legally, a smart contract is a computer protocol deployed on a blockchain that executes predefined obligations automatically and may constitute a legally binding contract if consent, consideration, and intent to create legal relations are established. In arbitration, smart contracts are both substantive instruments and evidentiary sources, raising issues regarding interpretation, enforceability, and remedies such as token transfer or automatic execution of obligations.⁴

2.7 Digital Code

Digital code refers to a set of instructions or software that directs how a computer or system operates. In general terms, it is the “language” computers follow to execute tasks. In the context of cryptocurrency arbitration, digital code includes the executable instructions that govern blockchain transactions, smart contracts, and automated processes for asset transfer or governance within decentralised protocols. Digital code serves as both evidence and a means of enforcing obligations. Its interpretation, verification, and integration into arbitral remedies require specialised technical knowledge and procedural adaptation (De Filippi & Wright, 2018; Narayanan et al., 2016).⁵

2.8 Digital Space

¹ De Filippi & Wright (n2). See also 2021 ICC Arbitration Rules, International Chamber of Commerce, Paris.

² Narayanan & others (n1). See also W. A. Kaal, & M. Dell’Erba, ‘Arbitrating in the Digital Asset Space: Legal Challenges and Opportunities’ *Journal of International Arbitration* (2021) (38) (5), pp. 567–592.

³ Ibid.

⁴ Werbach & Cornell, (n7) See also S. Meyer, ‘Smart Contract Templates: Legal Status and Standardisation’, *Uniform Law Review*, (2019) (24) (1) 84–101.

⁵ De Filippi & Wright (n2).

The digital space generally refers to the virtual environment created by the internet and computer networks where electronic communication, data storage, and online transactions occur. In everyday terms, it is the realm in which individuals, organisations, and technologies interact digitally rather than physically, encompassing online platforms, virtual marketplaces, and social networks.

In the context of cryptocurrency and blockchain, the digital space is the ecosystem in which digital assets are created, transferred, and stored, including blockchain networks, decentralised applications (dApps), and distributed ledgers. It encompasses both the technological infrastructure (servers, nodes, protocols) and the virtual environment in which smart contracts execute, transactions occur pseudonymously, and dispute resolution mechanisms like arbitration operate. Legal recognition and enforcement in the digital space are complicated by its borderless, decentralised, and pseudonymous characteristics, requiring adapted procedural rules and specialised technical expertise for arbitration.¹

3. THE LEGAL CONTEXT OF CRYPTOCURRENCY DISPUTES

3.1 Nature of Crypto Transactions and Blockchain

Cryptocurrencies are digital assets created and transferred on decentralised ledger technologies, commonly referred to as blockchain. A blockchain is a distributed database maintained by a network of computers (nodes) that reach consensus through predefined protocols, thereby enabling transactions without reliance on central intermediaries.² Transactions on a blockchain are recorded in blocks, cryptographically linked in an append-only structure that is tamper-resistant once validated.³ The underlying attributes of blockchain, including decentralisation, immutability, programmability through smart contracts, and pseudonymity, render crypto transactions qualitatively different from traditional financial contracts.⁴ Smart contracts, which are self-executing code that automatically performs predefined actions upon satisfaction of specified conditions, raise challenging questions about traditional conceptions of contract formation and enforceability in law.⁵

These technological characteristics produce legal uncertainty because, unlike conventional contracts, cryptographic identifiers replace the requirement for identifiable legal persons; and the immutability of blockchain records limits judicial remedies that require modification or withdrawal of transactions.⁶ As a result, disputes arising from crypto transactions implicate not only private contractual rights but also public policy considerations, such as regulatory compliance, consumer protection, and systemic risk in financial markets.

3.2 Jurisdictional and Regulatory Challenges

Jurisdictional competence is foundational in dispute resolution: courts exercise adjudicative authority over persons and subject matters within defined territorial limits. Cryptocurrencies, in contrast, operate across borders by design, with no centralised locus of control or single governing jurisdiction.⁷ This borderless characteristic complicates the application of national laws, as conflicting regulatory approaches and enforcement priorities may arise. For example, while some jurisdictions adopt permissive frameworks for crypto trading and innovation, others impose restrictive regimes or outright bans.⁸ The resulting regulatory fragmentation complicates determinations of applicable law, proper forum, and enforceable remedies.

Additionally, pseudonymity, where users transact under cryptographic keys rather than verified legal identities, challenges conventional processes for identifying and serving parties. National courts often rely on personal service rules and established doctrines of jurisdiction, which may be ill-adapted to blockchain environments where parties are anonymous or constantly shifting.⁹ These factors contribute to forum-shopping incentives and

¹ M. Finck, *Blockchain Regulation and Governance: Financial Markets and Beyond* (Cambridge University Press, Cambridge 2018); P. De Filippi, & A. Wright, *Blockchain and the Law: The Rule of Code* (Harvard University Press Cambridge 2018); and A. Narayanan, J. Bonneau, E. Felten, A. Miller, & S. Goldfeder, *Bitcoin and Cryptocurrency Technologies* (Princeton University Press Princeton (2016).

² Narayanan & others (n1).

³ M. Crosby, P. Pattanayak, S. Verma, & V. Kalyanaraman, 'Blockchain Technology: Beyond Bitcoin' *Applied Innovation Review* (2016) (2) 6–10.

⁴ De Filippi & Wright (n2).

⁵ S. Meyer, 'Smart Contract Templates: Legal Status and Standardisation' *Uniform Law Review* (2019) 24(1) 84–101.

⁶ Werbach & Cornell, (n7).

⁷ A. Zohar, 'Bitcoin: Under the Hood' *Communications of the ACM* (2015) (58) (9) 104–113.

⁸ D. W. Arner, J. Barberis, & R. P. Buckley, 'FinTech and RegTech: Impact on Regulators and Banks' *Journal of Banking Regulation* (2017) (19) (4) 1–14.

⁹ Finck (n13).

uncertainty over whether judicial or administrative authorities can or will exercise jurisdiction. Such ambiguities undermine predictability and increase transactional risk in the digital asset economy.

3.3 International treaty on cryptocurrency

Cryptocurrency business currently operates without a single, comprehensive body of international law governing its creation, exchange, custody, or dispute resolution. Unlike international trade, investment, or commercial arbitration, which benefit from well-established multilateral conventions, crypto-asset activities are regulated primarily through domestic statutes and administrative rules.¹ This fragmentation produces legal uncertainty in cross-border transactions, particularly where decentralised technologies deliberately transcend territorial boundaries. As a result, market participants face inconsistent standards on licensing, consumer protection, asset classification, and dispute resolution, undermining predictability and legal certainty in global crypto commerce.

3.4 Influence of international soft-law and standards-setting bodies

In the absence of binding international law, international standards and soft-law instruments have assumed a central regulatory role. Bodies such as the Financial Action Task Force (FATF), IOSCO, and the Basel Committee issue guidelines that, while formally non-binding, exert significant coercive force through compliance monitoring and peer review.² FATF's framework on Virtual Assets and Virtual Asset Service Providers, in particular, has reshaped national laws on customer due diligence, transaction monitoring, and cross-border transfers. These standards demonstrate that crypto regulation is increasingly shaped by transnational norms, even as formal treaty-based harmonisation remains elusive.³

3.5 Regional regulatory convergence and its limits

Regional initiatives, most notably the European Union's Markets in Crypto-Assets Regulation (MiCA), represent the most advanced attempt at comprehensive crypto regulation.⁴ Such instruments promote regulatory convergence within defined jurisdictions and influence external markets through extraterritorial effects. However, regional regimes cannot resolve global jurisdictional conflicts or ensure uniform treatment of decentralised actors operating simultaneously across multiple legal systems. The coexistence of robust regional frameworks alongside divergent national approaches further underscores the structural limitations of relying solely on territorial regulation for inherently borderless crypto activities.

3.6 Implications for dispute resolution and enforcement

This regulatory pluralism has direct consequences for dispute resolution, particularly in arbitration. Questions of applicable law, public policy, enforceability of awards,⁵ and regulatory compliance arise with heightened complexity in crypto disputes.⁶ The lack of harmonised substantive standards increases the risk of inconsistent outcomes and enforcement challenges under instruments such as the New York Convention. Arbitration increasingly functions as a stabilising mechanism in this fragmented landscape, yet traditional arbitration rules were not designed to address issues such as pseudonymity, smart contracts, or decentralised governance structures, exposing a normative and procedural gap.

3.7 Case for international legal development and Crypto Integrated Arbitration Rules (CIAR)

Taken together, these dynamics support the argument that cryptocurrency business is governed not by a single body of international law, but by a complex interaction of national legislation, regional regulations, and international soft-law standards, particularly in financial regulation, anti-money laundering, and market integrity.⁷ This evolving but incoherent framework highlights the need for more structured international legal coordination. In the interim, the development of specialised instruments such as Crypto Integrated Arbitration Rules (CIAR) offers a pragmatic response, providing tailored procedural standards, technological expertise, and regulatory sensitivity suited to crypto disputes. CIAR can thus function as both a bridge and a catalyst:

¹ International Organization of Securities Commissions (IOSCO), Policy Recommendations for Crypto and Digital Asset Markets (IOSCO, Madrid 2023).

² Financial Action Task Force (FATF), Guidance for a Risk-Based Approach to Virtual Assets and Virtual Asset Service Providers (FATF, Paris 2019, updated 2021).

³ Ibid.

⁴ Basel Committee on Banking Supervision, Prudential Treatment of Cryptoasset Exposures (Bank for International Settlements, Basel 2022).

⁵ Convention on the Recognition and Enforcement of Foreign Arbitral Awards (New York Convention) 1958.

⁶ European Union, Regulation (EU) 2023/1114 on Markets in Crypto-Assets (MiCA) [2023] OJ L150/40.

⁷ Philipp Paech, 'The Governance of Blockchain Financial Networks' *Modern Law Review* (2017) (80) 1073.

addressing immediate dispute-resolution needs while laying normative groundwork for future international legal harmonisation in the cryptocurrency domain.

3.8 Traditional Litigation vs Arbitration

Traditional litigation before domestic courts is often slow, formalistic, and territorially confined. Procedural rules may not readily accommodate digital evidence from distributed ledgers, and judicial unfamiliarity with blockchain technology can inhibit effective resolution of technical disputes.¹ Moreover, litigation exposes proprietary business information to public record, which can deter commercial parties who value confidentiality.

Arbitration, by contrast, offers several features that appear inherently attractive for resolving cryptocurrency disputes. It is a consensual process with parties able to select arbitrators with relevant expertise, choose flexible procedures, and agree on applicable substantive law and place of arbitration.² Importantly, arbitral awards enjoy cross-border enforceability under the New York Convention (1958), which is widely ratified, potentially easing enforcement against assets and counter-parties across jurisdictions.³ Confidentiality, streamlined procedures, and technological neutrality also align with the needs of global crypto market participants.

Nevertheless, arbitration is not a panacea. The decentralised and pseudonymous nature of participants raises questions about the validity of arbitration agreements, service of process, and the enforceability of awards against entities that lack legal personality in any one jurisdiction. Arbitration's traditional reliance on documentary evidence and witness testimony may also strain to accommodate on-chain forensic evidence and digital asset valuation.⁴ Consequently, while arbitration holds promise as a flexible alternative to litigation, its effective deployment in the crypto space demands careful calibration of substantive and procedural norms.

4. THE SEAT OF ARBITRATION IN A VIRTUAL WORLD

The legal seat, or *lex arbitri*, is a foundational element of arbitration, as it determines the procedural law applicable to the arbitration, the scope of judicial supervision, and the enforcement of arbitral awards.⁵ Traditionally, the seat is linked to a physical location where courts have authority to oversee aspects such as appointment of arbitrators, interim measures, and challenges to awards. In the context of cryptocurrency disputes, however, parties may be globally dispersed and interact entirely through blockchain networks, rendering physical proximity irrelevant. Despite the virtual nature of transactions, the choice of seat remains crucial, as it anchors the arbitration in a legal framework capable of supporting enforceability, procedural certainty, and judicial intervention where necessary.

Selecting an appropriate seat for crypto arbitration requires careful consideration of a jurisdiction's regulatory environment, technological literacy of its judiciary, and openness to digital assets. Jurisdictions such as Switzerland, Singapore, and England & Wales have developed relatively crypto-friendly legal regimes, offering clarity on issues such as smart contract enforceability, digital asset recognition, and the validity of electronic signatures.⁶ Courts in these jurisdictions have demonstrated a willingness to interpret emerging technologies within existing legal principles, thereby enhancing predictability for parties. The choice of seat also affects which national procedural rules apply, the extent of court intervention, and the practical enforceability of awards under international conventions, most notably the New York Convention (1958).

The virtual nature of blockchain transactions presents additional challenges for traditional concepts of territoriality and jurisdiction. While parties may interact globally without a physical nexus, the seat functions as a legal anchor, providing a point of reference for procedural legitimacy and dispute resolution. Arbitrators must navigate not only technological complexities but also the interaction between the *lex arbitri* and the laws of the place where assets are located or participants reside.⁷ Consequently, in the digital asset economy, the choice of seat is both a strategic and legal consideration, balancing enforceability, procedural efficiency, and the capacity of the local legal system to engage meaningfully with innovative financial instruments.

¹M. Raskin, 'The Law and Legality of Smart Contracts' *Georgetown Law Technology Review* (2020) (4) 305–341.

²Born (n4).

³L. Mistelis, *Concise International Arbitration* (Kluwer Law International 3rd edn The Hague (2017)).

⁴Kaal, & Dell'Erba, (n5).

⁵Born (n4).

⁶M. L. Moses, 'The Intersection of Arbitration and Digital Assets: Choosing the Right Seat' *Journal of International Dispute Settlement* (2021) (12) (2) 203–228. See also W. A. Kaal, & M. Dell'Erba, 'Arbitrating in the Digital Asset Space: Legal Challenges and Opportunities' *Journal of International Arbitration* (2021) (38) (5) 567–592.

⁷Finck (n13). See also De Filippi, P. & Wright, A. (2018) *Blockchain and the Law: The Rule of Code*, Harvard University Press, Cambridge, MA.

5. ENFORCEABILITY OF ARBITRATION IN THE CRYPTO SPACE

The enforceability of arbitration in cryptocurrency disputes turns first on the legal validity of smart contracts and embedded arbitration clauses. Smart contracts, although expressed in code rather than natural language, may satisfy the traditional requirements of contract formation, offer, acceptance, consideration, and intention to create legal relations, where the parties' consent can be objectively inferred.¹ Courts in several jurisdictions have increasingly recognised that contractual obligations may be concluded electronically, and that code-based performance does not, of itself, negate legal enforceability.² However, uncertainty persists where arbitration clauses are incorporated by reference, embedded within code, or triggered automatically, raising questions as to whether parties have provided sufficiently informed consent to arbitrate.

Recognition and enforcement of arbitral awards arising from crypto disputes further depend on domestic arbitration law and the New York Convention (1958). While the Convention adopts a technologically neutral approach, challenges may arise where courts are asked to assess the validity of arbitration agreements concluded through decentralised platforms or involving digital assets unfamiliar to domestic legal systems.³ Issues such as the determination of the governing law, the place of arbitration, and public policy objections related to regulatory compliance or financial stability may affect enforceability. Nonetheless, where procedural safeguards are observed and awards are framed in conventional legal terms, there is growing judicial willingness to enforce crypto-related arbitral awards under existing international frameworks.⁴

A more complex challenge arises in disputes involving decentralised autonomous organisations (DAOs) and anonymous or pseudonymous parties. DAOs often lack recognised legal personality under domestic law, complicating questions of capacity to arbitrate and enforcement of awards against identifiable assets or persons.⁵ Similarly, pseudonymity hinders service of process, joinder of parties, and post-award enforcement. While arbitration offers greater flexibility than litigation in addressing these issues, through procedural innovation and party agreement, the absence of clear legislative guidance remains a significant obstacle. Without mechanisms to attribute legal responsibility within decentralised structures, enforceability risks becoming illusory, underscoring the need for doctrinal clarification and targeted regulatory reform.⁶

6. PROCEDURAL ADAPTATIONS FOR CRYPTOCURRENCY ARBITRATION

A central procedural challenge in cryptocurrency arbitration concerns the handling of evidence derived from blockchain technology. Unlike traditional documentary or testimonial evidence, blockchain records consist of cryptographically secured, time-stamped, and immutable transaction data distributed across multiple nodes.⁷ While such records offer a high degree of reliability, their technical complexity raises questions about admissibility, interpretation, and probative value. Arbitrators must assess on-chain data, wallet addresses, transaction hashes, and smart contract code, often without the benefit of established evidentiary rules tailored to digital assets. Pseudonymity further complicates proceedings, as parties may be identifiable only through cryptographic keys rather than legal names, affecting disclosure, witness examination, and attribution of responsibility.⁸ Procedural flexibility, long a strength of arbitration, allows tribunals to adapt evidentiary standards, rely on expert testimony in blockchain forensics, and adopt secure digital methods for storing and reviewing sensitive crypto-related evidence.

The increasing prevalence of virtual hearings and cross-border disputes has further reshaped arbitral procedure in the crypto context. Cryptocurrency disputes are inherently international, often involving parties, assets, and networks spread across multiple jurisdictions. Virtual hearings, conducted via secure online platforms, have become essential for ensuring efficiency and accessibility, particularly where no physical seat bears a meaningful connection to the dispute.⁹ However, procedural rules must address issues such as cybersecurity, data protection, witness integrity, and the authentication of digital evidence presented remotely. Institutional rules have begun to respond by expressly permitting electronic submissions, remote hearings, and tribunal-led procedural innovation, but the application of these rules to crypto disputes remains uneven (ICC, 2021). Ensuring procedural fairness

¹ Werbach & Cornell (n7).

² Meyer (n17).

³ Born (n4).

⁴ Mistelis (n31).

⁵ Finck (n13).

⁶ Kaal & Dell'Erba (n5).

⁷ Narayanan & others (n1).

⁸ Finck (n13).

⁹ Born (n4).

while accommodating technological realities requires clear protocols and proactive case management by arbitral tribunals.

A further and decisive procedural adaptation lies in the need for specialised expertise among arbitrators. Cryptocurrency disputes frequently involve technical issues, such as smart contract execution, token valuation, decentralised governance mechanisms, and blockchain consensus protocols, that fall outside traditional legal training.¹ Arbitrators lacking technological literacy may struggle to assess evidence, evaluate expert testimony, or craft effective remedies. As a result, parties increasingly seek arbitrators with interdisciplinary expertise, combining arbitration experience with knowledge of blockchain technology and digital finance. This trend raises broader questions about arbitrator appointment, training, and institutional capacity. Without sufficient technical competence at the tribunal level, procedural flexibility risks undermining rather than enhancing fairness and legitimacy. Consequently, the development of specialist arbitrator pools and tailored procedural guidelines is critical to the credibility and effectiveness of cryptocurrency arbitration.²

7. REMEDIES AND AWARD ENFORCEMENT

One of the most distinctive remedial challenges in cryptocurrency arbitration concerns the possibility of ordering specific performance through code, such as the transfer or reversal of digital tokens. Unlike traditional commercial disputes, performance in crypto transactions may be automated through smart contracts that execute without further human intervention. Arbitrators may therefore be asked to issue awards that compel the execution of code-based obligations or recognise the finality of self-executing transactions.³ While arbitration law generally permits tribunals to order specific performance, practical enforcement depends on whether parties retain control over private keys or smart contract parameters. Where code execution is irreversible, tribunals may be constrained to substitute monetary remedies, highlighting the tension between legal discretion and technological determinism.⁴

The valuation of cryptocurrencies for the purpose of awarding damages presents a further difficulty due to extreme price volatility and market fragmentation. Determining the appropriate valuation date, whether at the time of breach, commencement of arbitration, or award, can materially affect quantum.⁵ Arbitrators must also consider whether to reference spot prices from centralised exchanges, decentralised platforms, or composite indices, each of which may produce divergent valuations. In the absence of settled jurisprudence, tribunals often rely on expert evidence and principles of reasonableness to ensure that damages neither overcompensate nor unfairly prejudice either party. This evidentiary complexity underscores the need for clear reasoning and transparent methodology in crypto-related awards.⁶

Enforcing arbitral awards against decentralised autonomous organisations (DAOs) or anonymous participants remains one of the most intractable challenges in the crypto space. DAOs frequently lack legal personality, making it difficult to identify respondents, attach assets, or pursue recognition and enforcement proceedings under domestic law.⁷ Similarly, pseudonymous actors may hold assets in wallets unlinked to identifiable individuals or jurisdictions. While arbitration offers procedural flexibility, enforcement ultimately depends on domestic courts and asset location. Absent legislative clarification or mechanisms for attributing legal responsibility within decentralised systems, enforcement risks becoming illusory, reinforcing the need for innovative legal frameworks and regulatory engagement to support effective remedies in cryptocurrency arbitration.⁸

8. EMERGING LEGAL AND POLICY CHALLENGES

Cryptocurrency arbitration operates within an environment of persistent technological, legal, and regulatory uncertainty. Rapid technological innovation, such as evolving consensus mechanisms, layer-two protocols, and automated governance structures, often outpaces legal frameworks, leaving arbitrators to resolve disputes

¹ De Filippi & Wright (n2).

² Kaal, & Dell'Erba, (n5).

³ Werbach & Cornell (n7).

⁴ De Filippi & Wright (n2).

⁵ Meyer (n17).

⁶ Born (n4).

⁷ Finck (n13).

⁸ Kaal, & Dell'Erba, (n5).

involving technologies that lack settled legal classification.¹ Regulatory approaches to cryptocurrencies vary widely, ranging from permissive innovation-driven regimes to restrictive or prohibitive models, creating uncertainty as to legality, compliance obligations, and public policy constraints.² In practice, arbitrators must grapple with issues such as whether disputed transactions contravene financial regulation, sanctions regimes, or anti-money laundering laws, and whether such violations trigger public policy defences at the enforcement stage. These uncertainties increase procedural risk and may discourage parties from relying on arbitration without clearer regulatory guidance.

Cross-border coordination and jurisdictional conflict present further challenges. Cryptocurrency disputes frequently involve parties, assets, and digital infrastructure spread across multiple jurisdictions, none of which may have a dominant connection to the dispute. This creates difficulties in identifying the applicable law, the competent supervisory courts, and the forum for enforcement.³ Conflicting regulatory mandates, such as differing classifications of digital assets as commodities, securities, or property, may result in parallel proceedings, inconsistent outcomes, or strategic forum shopping. From a practical perspective, arbitrators must also contend with difficulties in securing interim relief, coordinating with national courts, and enforcing awards where assets are held in decentralised or self-custodied wallets beyond the reach of traditional enforcement mechanisms.⁴

These challenges have significant implications for both institutional and ad hoc arbitration. Arbitral institutions face pressure to modernise rules to address issues such as digital evidence, cybersecurity, virtual hearings, and disputes involving anonymous or decentralised entities. While some institutions have introduced technology-friendly procedures, the absence of crypto-specific guidance may undermine consistency and predictability.⁵ Ad hoc arbitration, although flexible, may exacerbate risks where parties fail to anticipate procedural complexities unique to the crypto environment. Practically, arbitrators and counsel must invest in technical expertise, robust procedural planning, and early case management to avoid due process challenges. Without institutional innovation and policy coherence, arbitration risks losing its comparative advantage as an efficient and reliable dispute resolution mechanism in the digital asset economy.⁶

9. RECOMMENDATIONS

To address the distinctive challenges posed by cryptocurrency disputes, this paper proposes the development of Crypto Integrated Arbitration Rules (CIAR) designed to complement existing institutional and ad hoc frameworks rather than replace them. These rules should expressly recognise the legal validity of blockchain-based contracts and arbitration agreements, including those embedded in smart contracts, provided that objective evidence of party consent exists. Clear guidance on contract formation, electronic consent, and incorporation by reference would reduce uncertainty at the jurisdictional and enforcement stages. In addition, CIAR should provide default provisions on the seat of arbitration, governing law, and language where parties are pseudonymous or fail to make express choices, thereby mitigating procedural disputes that frequently delay proceedings in the crypto space.

Procedurally, CIAR should introduce tailored mechanisms for handling digital evidence and decentralised participation. This includes explicit recognition of blockchain records as admissible evidence, protocols for verifying on-chain data, and standards for the use of forensic experts in digital asset tracing. The rules should also mandate cybersecurity safeguards, secure digital evidence repositories, and clear procedures for virtual hearings to protect due process and data integrity. Given the technical complexity of crypto disputes, CIAR should encourage early case management conferences focused on identifying technological issues, narrowing expert evidence, and determining appropriate methods for valuation and interim relief. Such procedural clarity would enhance efficiency while preserving arbitral flexibility.

Finally, CIAR should address remedies and enforcement challenges unique to decentralised systems. The rules should clarify the scope of arbitrators' powers to order specific performance involving digital assets, including

¹ De Filippi & Wright (n2).

² Arner, Barberis, & Buckley (n20).

³ Finck (n13).

⁴ Born, (n4).

⁵ ICC (2021) ICC Arbitration Rules, International Chamber of Commerce, Paris.

⁶ Kaal, & Dell'Erba, (n5).

conditional or alternative monetary remedies where code-based execution is irreversible. They should also provide guidance on valuation methodologies for volatile assets and recommend enforcement strategies where respondents are DAOs or anonymous participants, including asset-based enforcement and attribution of responsibility within decentralised governance structures. While arbitration cannot resolve all enforcement deficiencies without legislative support, the adoption of CIAR by arbitral institutions and practitioners would significantly enhance predictability, legitimacy, and confidence in arbitration as the preferred dispute resolution mechanism for the global digital asset economy.

10. CONCLUSION

Cryptocurrency disputes expose the structural limits of existing legal and dispute resolution frameworks, which remain anchored in territoriality, identifiable parties, and traditional forms of assets. This paper has demonstrated that while no single body of international law presently governs cryptocurrency business, the interaction of national legislation, regional regulatory regimes, and international soft-law standards has created a fragmented normative environment that complicates dispute resolution and enforcement. Within this context, arbitration has emerged as the most viable mechanism for resolving cross-border cryptocurrency disputes due to its flexibility, neutrality, and global enforceability.

However, the effectiveness of arbitration in the crypto space cannot be assumed. Traditional arbitral doctrines and procedural rules were not designed to accommodate smart contracts, pseudonymous actors, decentralised governance structures, or the volatility of digital assets. Without deliberate adaptation, arbitration risks replicating the same uncertainties that undermine litigation in this field. The analysis therefore underscores the need for procedural innovation, enhanced technical expertise among arbitrators, and greater regulatory sensitivity in arbitral decision-making.

Ultimately, the development of Crypto Integrated Arbitration Rules offers a pragmatic and normatively sound response to these challenges. Such rules can bridge the gap between technological innovation and legal certainty, promote consistency in arbitral outcomes, and reinforce the enforceability of awards in a rapidly evolving digital economy. Pending the emergence of a coherent international legal framework for cryptocurrency, specialised arbitration regimes are likely to play a central role in shaping trust, accountability, and dispute resolution in the global crypto ecosystem.