

# Legal Analysis of the Application of International Standards in Arbitration Involving Digital Assets

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Fecha de recepción: 17 de diciembre de 2024

Fecha de aprobación: 4 de noviembre de 2025

Doi: <https://doi.org/10.12804/revistas.urosario.edu.co/acdi/a.15149>

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Para citar este artículo: Osmanova, Dinara., Momysheva, Farkhiya., Kapsalyamova, Saule., Abdizhami, Aitugan., Sharivkhan, Zhardenbek y Aigul, Rakhimbekova. "Legal Analysis of the Application of International Standards in Arbitration Involving Digital Assets". *Anuario Colombiano de Derecho Internacional* 19, (2026): 1-33. <https://doi.org/10.12804/revistas.urosario.edu.co/acdi/a.15149>

*Abstract:* This article investigates the legal status and unique characteristics of digital assets within the context of international arbitration. With the rise of blockchain technology, cryptocurrencies, and smart contracts, digital assets have become an integral part of the global economy; however, their decentralized and anonymous nature poses significant challenges for existing arbitration standards. The study examines the applicability of international arbitration standards, such as the New York Convention and UNCITRAL Model Law, to disputes involving digital assets and proposes adaptations to enhance dispute resolution. The article addresses jurisdiction, confidentiality, and data protection issues; it provides examples of arbitration cases, and offers recommendations for improving law enforcement practices. The findings lay the foundation for developing legal mechanisms that ensure the legitimacy and predictability of arbitration processes involving digital assets.

*Keywords:* Digital assets; international arbitration; blockchain technology; cryptocurrencies; smart contracts.

### Análisis jurídico de la aplicación de estándares internacionales en el arbitraje relacionado con activos digitales

*Resumen:* este artículo investiga el estado jurídico y las características únicas de los activos digitales en el contexto del arbitraje internacional. Con el auge de la tecnología *blockchain*, las criptomonedas y los contratos inteligentes, los activos digitales se han convertido en una parte integral de la economía global; sin embargo, su naturaleza descentralizada y anónima presenta importantes desafíos para los estándares de arbitraje existentes. El estudio examina la aplicabilidad de los estándares internacionales de arbitraje, como la Convención de Nueva York y la Ley Modelo de Uncitral en disputas relacionadas con activos digitales y propone adaptaciones para mejorar la resolución de disputas. El artículo aborda cuestiones de jurisdicción, confidencialidad y protección de datos, presenta ejemplos de casos de arbitraje y ofrece recomendaciones para mejorar las prácticas de aplicación de la ley. Los hallazgos sientan las bases para el desarrollo de mecanismos legales que garanticen la legitimidad y la previsibilidad de los procesos de arbitraje relacionados con activos digitales.

*Palabras clave:* activos digitales; arbitraje internacional; tecnología *blockchain*; criptomonedas; contratos inteligentes.

## Análise jurídica da aplicação de normas internacionais na arbitragem de ativos digitais

*Resumo:* este artigo investiga o estado jurídico e as características singulares dos ativos digitais no contexto da arbitragem internacional. Com o surgimento da tecnologia blockchain, das criptomoedas e dos contratos inteligentes, os ativos digitais se tornaram parte integrante da economia global; contudo, sua natureza descentralizada e anônima apresenta desafios significativos às normas de arbitragem existentes. O estudo examina a aplicabilidade de padrões internacionais de arbitragem, como a Convenção de Nova York e a Lei Modelo da UNCITRAL, em disputas envolvendo ativos digitais e propõe adaptações para melhorar a resolução de controvérsias. O artigo aborda questões de jurisdição, confidencialidade e proteção de dados, apresenta exemplos de casos de arbitragem e oferece recomendações para o aperfeiçoamento das práticas de aplicação da lei. Os resultados estabelecem bases para o desenvolvimento de mecanismos jurídicos que garantam a legitimidade e a previsibilidade dos processos de arbitragem relacionados a ativos digitais.

*Palavras-chave:* ativos digitais; arbitragem internacional; tecnologia blockchain; criptomoedas; contratos inteligentes.

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## Relevance of the Topic

The rise of digital assets and their integration into the international economy and legal system in recent years have led to significant changes in various fields of law. With the rapid development of blockchain technology, cryptocurrencies, and smart contracts, a new category of financial instruments has emerged, requiring a rethinking of existing legal norms and arbitration standards. Ethan Katsh and Amy J. Schmitz<sup>1</sup> emphasize that digital assets, initially created as decentralized and anonymous financial instruments, fall outside traditional regulations, creating considerable challenges for international arbitration. As digital assets become increasingly integrated into the global economic circulation, there is a growing need for effective legal mechanisms for their protection, especially in the context of cross-border transactions. Christian Aschauer and Maud Piers<sup>2</sup> note that the unique characteristics of digital assets, such as anonymity and decentralization, demand a special approach to ensure legal certainty and predictability in international arbitration processes.

## Research Objectives

This research aims to analyze the applicability of international arbitration standards for resolving disputes involving digital assets and to identify necessary adaptations for effective law enforcement practices. Paul H. Cohen<sup>3</sup> stresses that traditional arbitration standards do not always protect the rights of participants in digital disputes due to the specific nature of assets that lack physical form and are not tied to a particular jurisdiction. The study will examine existing legal norms and propose recommendations for their adaptation to digital assets to meet the global market needs.

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<sup>1</sup> Ethan Katsh and Amy J. Schmitz, *Digital Justice: Technology and the Internet of Disputes* (Oxford: Oxford University Press, 2018).

<sup>2</sup> Christian Aschauer and Maud Piers, "Arbitration and New Technologies," in *The Cambridge Handbook of Smart Contracts, Blockchain Technology and Digital Platforms*, ed. Larry A. DiMatteo et al. (Cambridge: Cambridge University Press, 2019).

<sup>3</sup> Paul H. Cohen, "Arbitration of Digital Assets Disputes," in *The Guide to Blockchain and Digital Assets*, ed. Joanna Diane Caytas (London: Global Legal Group, 2017), 45–58.

The main objectives of the study are:

- To explore the legal status of digital assets in international jurisdictions and its impact on arbitration disputes.
- To analyze potential procedural and jurisdictional obstacles in arbitration disputes related to digital assets.
- To propose changes and adaptations to international arbitration standards to ensure effective protection of participants' rights in disputes involving digital assets.

## Research Methodology

The research methodology is based on comparative legal analysis, case law analysis, and interpretation of legal norms regulating digital assets and international arbitration. A comparative legal approach allows for the analysis of various countries' experience, such as the USA, the EU states, Switzerland, and Kazakhstan, in regulating digital assets and their status within arbitration. Reinmar Wolff<sup>4</sup> and Pablo Cortés<sup>5</sup> highlight that the key issue is the heterogeneity of digital asset regulations, requiring an interdisciplinary approach to adapt arbitration standards.

To examine the applicability of international arbitration standards to digital assets, a case analysis approach was used, based on real arbitration disputes involving cryptocurrencies and tokens. This method reveals existing issues in law enforcement practice, such as the lack of universal mechanisms for enforcing arbitration decisions on digital assets, as highlighted by Marc D. Veit<sup>6</sup> in his studies.

## Scope Note

While concrete, multi-level solutions are part of our research agenda, a comprehensive topic development exceeds the national scope and length of this article, given the necessary involvement of States, international organizations, and arbitral institutions currently debating the issue. Accordingly, we outline the framework and provide a concise roadmap, reserving the detailed design for a separate paper.

<sup>4</sup> Reinmar Wolff, *Yearbook on International Arbitration* (2020).

<sup>5</sup> Pablo Cortés, *The Law of Consumer Redress in an Evolving Digital Market* (2018).

<sup>6</sup> Marc D. Veit, "Arbitration and Cryptocurrency Disputes," *Journal of International Arbitration* 36, no. 5 (2019).

## Overview of International Arbitration Standards and Their Applicability

International arbitration serves as a cornerstone for resolving disputes arising from cross-border transactions, ensuring a platform where parties from different legal systems can seek neutral and equitable solutions. One of the key instruments in this domain is the New York Convention<sup>7</sup>, which has been pivotal in establishing consistent recognition and enforcement of arbitral awards across participating jurisdictions. This convention has not only promoted legal predictability but also bolstered the principles of rule of law and fair process in international commerce.

### The New York Convention (1958) and Its Role in Recognizing Arbitration Awards

The New York Convention, officially titled The Convention on the Recognition and Enforcement of Foreign Arbitral Awards, was established to create a unified legal framework that obligates member states to recognize and enforce arbitration awards issued in other contracting states. This landmark treaty has fundamentally shaped the landscape of international arbitration by ensuring that parties engaged in cross-border transactions have confidence that their disputes, when resolved through arbitration, will be respected and enforceable. The Convention has played a crucial role in providing stability to international economic relations, facilitating investment flows, and supporting the enforcement of rights involving tangible assets such as real estate and financial instruments. However, as new assets have emerged, particularly digital assets like cryptocurrencies and blockchain-based tokens, the Convention's adaptability has come into question. Legal scholars such as Aschauer have analyzed the Convention's responsiveness to these evolving forms of property and highlighted potential gaps that may impact its efficacy.

Case Studies and Legal Comparative Case studies illustrate both successes and challenges in applying the New York Convention to various types of assets. One notable example is the enforcement of awards involving digital assets, which has often face jurisdictional and procedural challenges.

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<sup>7</sup> United Nations, *Convention on the Recognition and Enforcement of Foreign Arbitral Awards* (New York, 1958).

Maud Piers<sup>8</sup> emphasizes that the ambiguous legal status of digital assets can create enforcement hurdles, especially when the underlying jurisdictional definitions of these assets vary significantly. In instances where cryptocurrencies were the subject of arbitration, courts have faced difficulties aligning these with traditional enforcement mechanisms.

## Adapting the Convention for Digital Assets

The need for the Convention to evolve in response to digital asset developments is increasingly evident. Reinmar Wolff<sup>9</sup> (notes that without a universally accepted definition and classification of digital assets, the enforcement of awards involving such assets could be undermined. Ensuring that international arbitration remains effective requires adopting guidelines or amendments that address the unique nature of digital properties.

This introductory analysis lays the groundwork for understanding the foundational implications of international arbitration and the potential adjustments needed to align it with modern legal challenges involving digital assets. Further detailed examinations of case law and comparative regulatory approaches will shed light on these complexities.

## UNCITRAL Model Law and Arbitration Guidelines

The UNCITRAL Model Law on International Commercial Arbitration has been a significant instrument in harmonizing arbitration laws across various jurisdictions. Its purpose is to establish a cohesive set of arbitration standards that can be adopted by states to promote uniformity and efficiency in international arbitration proceedings. However, as the digital economy has expanded, challenges for applying these standards to disputes involving digital assets have emerged.

## Application to Digital Assets

The Model Law provides a flexible framework for arbitration, which has proven effective in many traditional commercial disputes. However, when it comes to digital assets —ranging from cryptocurrencies to

<sup>8</sup> Maud Piers, “Arbitrating Blockchain Disputes: Issues of Jurisdiction, Applicable Law and Enforcement,” *International Business Law Journal*, no. 3 (2019): 355–374.

<sup>9</sup> Wolff, *Yearbook*.

Non-Fungible Tokens (NFT)— certain gaps become apparent. The decentralized, borderless nature of these assets complicates their classification and the determination of applicable laws. Reinmar Wolff<sup>10</sup> discusses the limitations of the Model Law in adequately addressing the unique characteristics of digital assets, such as their fluid ownership structures and the complex technology underpinning them.

For example, cases involving NFT, which are distinct regarding indivisibility and representation of ownership over digital or physical items, often raise questions around jurisdiction and applicable law. The enforceability of arbitration awards in such cases depends heavily on how a digital asset is defined (whether as a property, financial instrument, or otherwise), an area where the Model Law currently lacks specificity.

### Case Analysis and Limitations

Instances where the UNCITRAL Model Law has succeeded or failed to encompass the nuances of digital asset disputes underscore its strengths and limitations. In arbitration involving blockchain-based transactions, arbitrators have occasionally struggled to interpret the technical details embedded within smart contracts, complicating the process of rendering enforceable awards. Maud Piers<sup>11</sup> points out that while the Model Law's general principles support fairness and procedural integrity, they do not sufficiently address the procedural and evidentiary challenges posed by digital assets.

In some cases, parties have sought arbitration solutions that rely on blockchain technology itself—so-called blockchain arbitration—to resolve disputes involving digital assets. However, this raises questions regarding the compatibility of such technologically advanced solutions with the standards of traditional arbitration under the Model Law. The absence of clear guidance on how to reconcile these modern practices with existing international standards presents a substantial gap that needs to be addressed.

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<sup>10</sup> Wolff, *Yearbook*.

<sup>11</sup> Piers, *Arbitrating*.

## Addressing Potential Limitations

The insights of scholars like Reinmar Wolff<sup>12</sup> and Maud Piers<sup>13</sup> underscore the need for the Model Law to evolve. One approach could be the integration of supplementary guidelines focused on digital asset arbitration. These guidelines would clarify the treatment of digital assets, establish standard procedures for evidence presentation in digital formats, and offer recommendations for technical expert involvement to bridge the knowledge gap between legal and technological domains.

## Regulatory Adaptations

Moreover, jurisdictions adopting the Model Law have used various approaches to incorporating regulations that cover digital assets. While some, such as the European Union, have made strides in developing comprehensive frameworks (e.g., the Markets in Crypto-Assets Regulation, [MiCA]), others remain behind, creating discrepancies in how arbitration awards involving digital assets are treated. These inconsistencies highlight the pressing need for harmonized adaptations of the Model Law to prevent jurisdictional conflicts and promote uniform enforcement practices.

## Principles of Neutrality, Fairness, and Party Autonomy

The principles of neutrality, fairness, and party autonomy are at the core of international arbitration, serving as safeguards to ensure that the arbitration process remains impartial and equitable. These principles are critical for fostering trust and cooperation among parties from different jurisdictions. However, the advent of digital assets, characterized by their anonymity and decentralized nature, presents unique challenges that put pressure on these foundational concepts.

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<sup>12</sup> Wolff, *Yearbook*.

<sup>13</sup> Piers, *Arbitrating*.

## Neutrality and Fairness in Arbitration Involving Digital Assets

Neutrality ensures that arbitrators and institutions conduct unbiased arbitration, regardless of the parties' nationalities or the dispute subject matter. Fairness mandates that each party has an equal opportunity to present its case, ensuring that the outcome is fair and balanced. Amy J. Schmitz<sup>14</sup> explores these challenges, noting that digital assets, by design, can obscure the identities of parties and complicate the assessment of ownership and intent, raising questions about how neutrality and fairness are maintained in such contexts.

For example, disputes involving decentralized finance (DeFi) platforms often involve pseudonymous participants. This anonymity, while providing certain benefits such as enhanced privacy, can disrupt the procedural integrity of arbitration by making it difficult to verify the identities of involved parties. Some jurisdictions have attempted to address this by mandating disclosure practices that adhere to Know-Your-Customer (KYC) regulations, but these measures are not universally applied, leading to inconsistencies in enforcement and procedural fairness.

Niuscha Bassiri<sup>15</sup> emphasizes that without standardized identity verification protocols, arbitrators face difficulties in maintaining fairness. The reliance on blockchain records and pseudonymous digital wallets may lead to challenges in presenting evidence and substantiating claims. For instance, if one party's identity is hidden, it may disrupt the balance of power, potentially undermining the neutrality of the proceeding.

## Party Autonomy and Its Limitations

Party autonomy allows parties to shape their arbitration proceedings by choosing the applicable rules, language, venue, and even arbitrators. This flexibility is one of the most attractive aspects of international arbitration. However, when applied to digital assets, party autonomy faces obstacles due to the complex nature of technology and the cross-border, often stateless, environment in which digital assets exist.

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<sup>14</sup> Amy J. Schmitz, *The Transformation of Arbitration Through Technology and Data Protection Standards* (University of Missouri Journal, 2019).

<sup>15</sup> Niuscha Bassiri, *Anonymity and Participant Identification in Digital Arbitration* (Hanotiau & van den Berg Journal, 2020).

The work of Reinmar Wolff<sup>16</sup> highlights that digital assets, especially those maintained on public blockchains, can bypass traditional jurisdictional limits. Parties might choose arbitration venues that align with specific blockchain protocols or smart contract conditions, but this can lead to jurisdictional conflicts when enforcing awards in countries that have not adopted consistent digital asset regulations.

## The Anonymity Challenge

The anonymity inherent in digital assets poses a direct challenge to these core arbitration principles. For instance, if a dispute over a stolen cryptocurrency or the fraudulent use of NFT arises, identifying the actual parties involved becomes complex. This issue is magnified in cases where arbitrators are expected to maintain the confidentiality of proceedings while ensuring that the evidence presented is legitimate and the involved parties are identifiable.

Some scholars, including Pablo Cortés<sup>17</sup>, suggest that the use of blockchain-based identity solutions might provide a partial answer to this dilemma. These solutions could integrate digital signatures and decentralized verification processes that keep anonymity to a certain degree while enabling sufficient verification for arbitration purposes.

## Refinements to Neutrality Standards

To adapt to these unique challenges, there are growing calls for refining arbitration standards to better handle digital asset cases. Potential measures include incorporating advanced technical procedures, such as cryptographic evidence verification and expert testimony from blockchain analysts. Using such measures, as discussed by Amy J. Schmitz<sup>18</sup>, could enhance procedural fairness by ensuring that evidence derived from digital sources is both credible and understood.

<sup>16</sup> Reinmar Wolff, *Smart Contracts and Their Implications for Arbitration, Arbitration and Dispute Resolution Journal* 28, no. 4 (2021): 311–27.

<sup>17</sup> Pablo Cortés, *The Impact of Technology on Consumer Arbitration Rights, University of Leicester Arbitration Review* (2018).

<sup>18</sup> Amy J. Schmitz, “Fairness and Accountability in Digital Asset Arbitration: A Critical Examination,” *Dispute Resolution Journal* 76, no. 2 (2021): 45–60.

In conclusion, while the principles of neutrality, fairness, and party autonomy form the backbone of international arbitration, their application to digital asset disputes requires thoughtful refinement. Jurisdictions and arbitration bodies must collaborate to create harmonized guidelines that address anonymity and cross-border challenges while preserving the integrity of the arbitration process. The next section will further explore the specific jurisdictional and procedural challenges that arise in arbitrating disputes involving digital assets.

## **Challenges in Applying International Standards to Digital Assets**

The digital asset ecosystem, encompassing cryptocurrencies, NFT, and other blockchain-based instruments, has disrupted traditional concepts in international arbitration. This disruption highlights the need for adaptation when applying international standards to cases involving digital assets. The decentralized nature, anonymity, and cross-border characteristics of digital assets create significant jurisdictional and procedural complexities that challenge existing arbitration frameworks.

## **Jurisdiction and Cross-Border Nature of Digital Assets**

Determining jurisdiction in digital asset disputes is particularly challenging due to their decentralized and borderless nature. Unlike traditional assets, which are linked to physical locations or clear legal jurisdictions, digital assets often exist on global networks without a clear connection to any specific country. Pablo Cortés<sup>19</sup> discusses how this unique aspect complicates the establishment of jurisdiction that can lead to conflicts between states over the application of laws in cross-border cases.

Jurisdictional issues are further exacerbated by the involvement of multiple countries in blockchain transactions, each potentially applying different laws to the same asset. For instance, a smart contract executed on a blockchain may involve parties from different jurisdictions, raising questions about which country's legal system should govern the arbitration.

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<sup>19</sup> Cortés, *The Impact of Technology*.

The absence of harmonized international rules specifically addressing digital assets can lead to inconsistent enforcement of arbitration awards.

Real-world cases illustrate these challenges. In some instances, courts have refused to recognize or enforce awards involving digital assets due to the lack of a clear legal framework or due to disputes over the appropriate jurisdiction. Maud Piers<sup>20</sup> highlights that the fragmentation of legal approaches to digital assets across different countries can create substantial barriers to the recognition and enforcement of arbitration awards, potentially undermining the effectiveness of the New York Convention and the UNCITRAL Model Law.

### **Anonymity of Parties and Complexity of Identifying Dispute Participants**

The anonymity that digital assets provide adds another layer of complexity to arbitration. Blockchain technology inherently supports pseudonymous transactions, where users are represented by cryptographic addresses rather than verifiable identities. This anonymity, while beneficial for privacy, poses significant challenges for arbitrators tasked with identifying the parties involved in a dispute. Niuscha Bassiri<sup>21</sup> points out that traditional arbitration relies on clear identification of participants to ensure procedural integrity, but digital assets often disrupt this requirement.

To address these challenges, some arbitration bodies and regulatory frameworks have begun exploring the use of identity verification systems that can bridge the gap between maintaining user privacy and satisfying legal requirements. For example, blockchain-based identity verification tools have been proposed as a means of linking cryptographic addresses with real-world identities, ensuring that arbitration can proceed with verified participants while preserving some degree of anonymity.

However, enforcing such measures introduces potential conflicts with data protection laws and privacy regulations, such as the General Data Protection Regulation (GDPR) in the European Union. The trade-off between privacy and transparency remains a contentious issue. Amy J.

<sup>20</sup> Maud Piers, “Data Privacy and Digital Asset Arbitration: Navigating the GDPR,” *Journal of International Arbitration* 39, no. 5 (2022): 703–724.

<sup>21</sup> Niuscha Bassiri, *Ensuring Fairness in the Use of Technology for Online Arbitration* (Hanotiau & van den Berg Series, 2021).

Schmitz<sup>22</sup> discusses how these regulatory measures may limit the adoption of identity verification tools in arbitration, hindering the efforts to balance fairness and confidentiality.

## Confidentiality and Data Protection in Arbitration

Arbitration traditionally offers a level of confidentiality that is appealing to parties involved in sensitive disputes. However, the rise of digital asset arbitration introduces new challenges related to data protection and confidentiality. Maud Piers<sup>23</sup> has noted that the inherent transparency of blockchain (all transactions are recorded on an immutable ledger) conflicts with the confidential nature of arbitration proceedings.

Data protection laws such as GDPR require stringent handling of personal data, and this presents issues for arbitrators working with blockchain records. The challenge lies in balancing the need for transparency to verify transactions and ownership with the need to protect personal information and keep arbitration confidential. One proposed solution involves the use of cryptographic techniques, such as zero-knowledge proofs, to verify data without revealing sensitive information.

## Solutions and Technological Innovations

Blockchain-based arbitration platforms have emerged as alternative solutions for handling disputes involving digital assets. These platforms leverage smart contracts to automate parts of the arbitration process, ensuring that awards can be executed programmatically. However, as Reinmar Wolff<sup>24</sup> highlights, such platforms raise questions about whether they align with traditional arbitration principles and whether their awards can be recognized under existing international conventions.

Innovations such as decentralized arbitration networks have potential advantages, including increased speed and reduced costs. However, they also pose risks, such as ensuring compliance with due process standards and aligning with established legal norms. For arbitration involving digital assets to remain effective, there needs to be an ongoing dialogue

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<sup>22</sup> Schmitz, *The Transformation of Arbitration*.

<sup>23</sup> Piers, "Data Privacy and Digital Asset Arbitration".

<sup>24</sup> Reinmar. *Yearbook*.

among legal experts, regulators, and technologists to create a framework that incorporates technological advancements while respecting international arbitration standards.

## Legal Status of Digital Assets in International Law

The classification and treatment of digital assets vary significantly across jurisdictions, impacting how disputes involving these assets are managed in arbitration. The absence of uniform definitions and regulatory approaches complicates cross-border enforcement and poses challenges for international arbitration bodies. A detailed examination of these variations reveals the need for clearer international guidelines to support arbitration involving digital assets.

### Definition and Classification of Digital Assets

The legal definition of digital assets is inconsistent, leading to variations in how they are treated under national and international law. In some jurisdictions, digital assets are classified as property, while in others, they are considered financial instruments or commodities. Philipp Schaumann<sup>25</sup> emphasizes that these divergent classifications have significant implications for the arbitration process, as they determine the applicable laws and regulations.

For example, in the United States, the treatment of digital assets depends on the regulatory body involved. The Securities and Exchange Commission (SEC) classifies certain digital tokens as securities, subjecting them to securities law, whereas the Commodity Futures Trading Commission (CFTC) might classify others as commodities. In contrast, the European Union, through frameworks like the proposed MiCA, aims to create a more harmonized approach, defining digital assets as crypto-assets with specific subcategories.

The classification also influences the applicability of arbitration laws and whether digital assets can be seized or enforced as part of an arbitral award. For instance, an asset classified as property in one jurisdiction may not be recognized as such in another, complicating cross-border

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<sup>25</sup> Philipp Schaumann, "The Legal Classification of Digital Assets: Implications for Arbitration," *Law and Technology Review* 15, no. 2 (2020): 145–162.

enforcement. Reinmar Wolff<sup>26</sup> points out that the lack of a common framework may create gaps in the legal treatment of these assets, potentially undermining the effectiveness of international arbitration.

## Approaches of Different Countries and Their Impact on Arbitration Disputes

The legal landscape for digital assets is marked by a patchwork of regulatory approaches, which can lead to conflicts in arbitration cases. Marc D. Veit<sup>27</sup> analyzes how the differences in national regulations impact the enforcement of arbitration awards, with some countries adopting progressive regulations while others remain restrictive or ambiguous.

In the United States, a combination of state and federal regulations governs digital assets, creating a complex legal environment. For instance, New York's BitLicense regime imposes strict requirements on cryptocurrency businesses, impacting arbitration proceedings involving entities under its jurisdiction. Conversely, countries like Japan have enacted more comprehensive and unified regulations, treating digital assets as legal property under the financial services law. This makes arbitration processes smoother for disputes involving digital assets within their jurisdiction.

The European Union's MiCA aims to create consistent regulations across member states, potentially simplifying arbitration involving digital assets. However, until such regulations are fully adopted and enforced, discrepancies between member states may still pose challenges. Maud Piers<sup>28</sup> has suggested that harmonizing these approaches at the international level could streamline arbitration processes, reduce jurisdictional conflicts, and improve the enforcement of awards involving digital assets.

## Case Studies Highlighting the Challenges

Case studies illustrate how differing legal definitions can affect arbitration outcomes. For example, an arbitration involving a European entity and a U.S.-based counterpart might face conflicting legal interpretations

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<sup>26</sup> Reinmar, *Yearbook*.

<sup>27</sup> Marc D. Veit, *Switzerland's Role in Defining Legal Frameworks for Digital Arbitration* (Lalive Arbitration Series, 2020).

<sup>28</sup> Piers, "Arbitrating Blockchain Disputes".

regarding the classification of a digital token. Such cases often require arbitrators to make determinations that straddle different regulatory regimes, leading to complex enforcement scenarios. Christian Aschauer<sup>29</sup> has noted that this can result in awards that are enforceable in one jurisdiction but not in another, diminishing the predictability and reliability of arbitration outcomes.

## Potential for Harmonized International Approaches

To address these challenges, legal scholars, including Mohamed Abdel Wahab<sup>30</sup>, advocate for the development of international model laws or conventions that provide clear definitions and guidelines for digital assets. Such instruments could help unify the treatment of digital assets in arbitration, facilitating consistent enforcement and reducing jurisdictional conflicts.

The UNCITRAL Model Law on International Commercial Arbitration could serve as a foundation for such harmonization, with potential amendments or supplementary provisions specifically addressing digital assets. By defining these assets within an international legal framework, arbitration institutions and parties could benefit from greater clarity and consistency, enhancing the efficacy of arbitration in a rapidly evolving digital landscape.

## Legal Conflicts and Status of Digital Assets in Kazakhstan and Central Asia

The changing status of digital assets presents unique challenges for countries in Central Asia, including Kazakhstan, which is emerging as a significant player in the global digital economy. These challenges appear as regulatory gaps, inconsistent definitions, and legal conflicts that impact the arbitration of disputes involving digital assets. Understanding how Kazakhstan and neighboring countries in Central Asia are adapting their legal frameworks is essential for comprehending the regional impact on international arbitration.

<sup>29</sup> Christian Aschauer, “Digital Assets and the Role of Arbitration: Challenges and Opportunities,” *Journal of International Dispute Settlement* 11, no. 3 (2020): 295–317.

<sup>30</sup> Mohamed Abdel Wahab, “The Role of Data in Online Arbitration and Security Concerns,” *Zulficar & Partners Law Journal* (2020).

## Current Legal Framework in Kazakhstan

Kazakhstan has taken progressive steps toward integrating digital assets into its legal system. The country's legislation, primarily through amendments to the Law on Informatization and related regulations, acknowledges digital assets as a distinct category. However, these amendments still lack comprehensive definitions that align with international standards. Mohamed Abdel Wahab (2020)<sup>31</sup> argues that without harmonized legal definitions, it becomes difficult to arbitrate disputes involving digital assets, especially when such disputes extend beyond national borders.

In 2022, Kazakhstan made strides by introducing regulations that govern the operation of digital mining and the circulation of cryptocurrencies. Despite this progress, the legal status of assets such as NFT and decentralized finance tokens remains unclear. This ambiguity poses a risk for arbitration proceedings, where the enforceability of awards may be challenged due to conflicting interpretations of what constitutes a digital asset under Kazakh law.

## Comparative Analysis with Central Asia

Kazakhstan's approach can be contrasted with that of its neighbors, such as Uzbekistan and Kyrgyzstan. Uzbekistan has taken a more cautious approach, focusing on licensing frameworks and imposing stringent conditions on crypto exchanges and mining operations. This regulatory strategy impacts arbitration by ensuring that any digital asset-related dispute involving Uzbek parties must navigate these conditions, potentially limiting the jurisdiction of international arbitration bodies.

In Kyrgyzstan, the regulatory environment is less developed, with digital assets existing in a legal gray area. The absence of clear laws complicates arbitration, as the recognition and enforcement of awards involving digital assets may not be supported by the existing legal framework. Maud Piers<sup>32</sup> points out that the lack of consistency within a region can lead to jurisdictional challenges, making it difficult for arbitration bodies to apply uniform principles across borders.

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<sup>31</sup> Wahab, "The Role of Data in Online Arbitration."

<sup>32</sup> Piers, "Arbitrating Blockchain Disputes".

## Implications for Cross-Border Arbitration

The regional disparities in digital asset regulation present challenges for cross-border arbitration involving Central Asian countries. A case involving a Kazakh company and an entity from a jurisdiction with well-defined digital asset regulations may face significant hurdles in achieving enforceable outcomes. For instance, if an arbitration award is issued in favor of a party under a more robust legal regime, enforcing that award in Kazakhstan or neighboring states could be problematic due to differing interpretations of digital assets.

Marc D. Veit<sup>33</sup> highlights that these inconsistencies can result in awards that are either unenforceable or subject to lengthy legal battles. This uncertainty undermines the predictability of arbitration as a dispute resolution mechanism, which is a cornerstone of international commerce.

## Ongoing Legislative Efforts and Recommendations

After recognizing these challenges, Kazakhstan and other Central Asian countries have begun exploring legislative reforms aimed at clarifying the legal status of digital assets. Draft proposals include more explicit definitions and frameworks for the ownership, transfer, and arbitration of disputes involving digital assets. However, Reinmar Wolff<sup>34</sup> emphasizes that regional legislative efforts must align with broader international conventions to be effective, as digital asset disputes often transcend national boundaries.

A harmonized regional approach, potentially developed through cooperation with international bodies like UNCITRAL or the International Centre for Settlement of Investment Disputes (ICSID), could support a more cohesive framework. This would make arbitration processes smoother by ensuring that digital asset-related awards are more consistently recognized and enforced.

In conclusion, while Kazakhstan and Central Asia are taking steps to adapt their legal frameworks to the rise of digital assets, substantial gaps and inconsistencies remain. Addressing these challenges requires coordinated legislative action and alignment with international arbitration standards to support award enforcement and reduce jurisdictional conflicts.

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<sup>33</sup> Marc D. Veit, “Arbitrating Cryptocurrency Disputes: Enforcement Challenges and Practical Considerations”, *Journal of International Arbitration*, 2019.

<sup>34</sup> Wolff, *Smart Contracts and Their Implications*.

## Jurisdictional and Procedural Issues in Digital Asset Arbitration

The unique characteristics of digital assets, such as decentralization and pseudonymity, pose significant jurisdictional and procedural challenges for arbitration. These challenges affect the ability of arbitration institutions to assert authority over disputes, and complicate procedural norms that traditionally rely on more defined geographical and legal parameters.

### Jurisdiction and the Cross-Border Nature of Digital Assets

One of the primary challenges in arbitrating disputes involving digital assets is determining jurisdiction. Digital assets often operate on decentralized networks, such as blockchain, that transcend national boundaries and do not have a clear geographic nexus. Pablo Cortés<sup>35</sup> has highlighted the difficulties that arise when attempting to assert jurisdiction over disputes that involve parties from multiple countries, where the digital asset in question is stored or transacted on global platforms with no single governing law.

The cross-border nature of digital assets complicates the choice of law and forum. Parties may find themselves disputing which country's legal framework should be applied to an arbitration proceeding. For example, an NFT purchase facilitated by a U.S.-based platform, but involving parties from Europe and Asia could lead to conflicting claims over jurisdiction. Marc D. Veit<sup>36</sup> argues that without harmonized rules for determining jurisdiction in digital asset cases, arbitral tribunals may struggle to justify their authority, particularly if enforcement is sought in countries that do not recognize digital assets under their legal systems.

One proposed solution is the development of specialized arbitration clauses tailored for digital assets. These clauses would specify the governing law and jurisdiction agreed upon by the parties. However, enforcing such clauses can be difficult when one party challenges the arbitration based on differing interpretations of jurisdiction in their home country.

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<sup>35</sup> Cortés, *The Law of Consumer*.

<sup>36</sup> Veit, *Arbitrating Cryptocurrency Disputes*.

## Anonymity of Parties and the Complexity of Identifying Dispute Participants

The pseudonymous nature of blockchain technology adds another layer of complexity. In traditional arbitration, identifying the parties involved is a straightforward process that ensures procedural fairness and compliance. However, digital assets allow individuals and entities to interact using cryptographic addresses, making it difficult to verify identities. Niuscha Bassiri<sup>37</sup> discusses how this can undermine the transparency and accountability expected in arbitration proceedings.

To address these issues, certain arbitration bodies have suggested incorporating Know-Your-Customer (KYC) protocols as part of the arbitration process. KYC measures could help ensure that parties can be properly identified, enhancing procedural integrity. However, Amy J. Schmitz<sup>38</sup> warns that such measures may conflict with privacy laws, such as the General Data Protection Regulation (GDPR) in the European Union, creating additional legal and ethical dilemmas.

Technological solutions, such as blockchain-based identity verification systems, have been proposed as a compromise. These systems could allow parties to keep a degree of anonymity while providing verified identities for arbitration purposes. However, the integration of such technology into arbitration practice raises questions about cost, accessibility, and compatibility with existing procedural rules.

## Procedural Adaptations for Digital Asset Arbitration

The procedural rules of arbitration may need to evolve to accommodate the complexities of digital assets. Current rules do not often account for the technical aspects of blockchain, smart contracts, or digital wallets, which can complicate evidentiary procedures. For example, presenting evidence involving a disputed smart contract may require technical expertise to interpret the code and its execution. Reinmar Wolff<sup>39</sup> points out

<sup>37</sup> Niuscha Bassiri, *Anonymity in Arbitration: Legal Challenges and Solutions*, *Arbitration International* 35, no. 4 (2019): 501–522.

<sup>38</sup> Amy J. Schmitz, *The Transformation of Arbitration Through Technology and Data Protection Standards* (University of Missouri Journal, 2019).

<sup>39</sup> Wolff, *Smart Contracts and Their Implications*.

that procedural adaptations, such as the inclusion of expert testimony or technical audits, are essential for fair and effective arbitration involving digital assets.

Some arbitration institutions have started to adapt their procedural rules to include provisions for digital evidence and the use of technology experts. The International Chamber of Commerce (ICC) and other prominent arbitration bodies are exploring ways to standardize the treatment of digital assets during proceedings, including the use of blockchain records as evidence, and protocols for verifying the authenticity of digital documents.

Another procedural adaptation is the potential use of blockchain itself as a method for conducting arbitration. Blockchain-based arbitration platforms, which operate on smart contracts, can automate parts of the arbitration process, including the submission of evidence and the issuance of awards. Maud Piers<sup>40</sup> notes that while these platforms offer advantages in terms of transparency and cost-effectiveness, they also pose risks related to enforcement and adherence to traditional arbitration principles.

### **The Future of Jurisdiction and Procedure in Digital Asset Arbitration**

As digital assets continue to integrate into global markets, arbitration bodies and legal scholars are advocating for a more standardized approach to jurisdiction and procedure. Christian Aschauer<sup>41</sup> emphasizes that collaboration among technology developers, legal experts, and international regulatory bodies is key to creating arbitration practices that can effectively handle the unique characteristics of digital assets.

Proposals for future development include international agreements or model laws that incorporate specific rules for digital assets. Such frameworks would help streamline jurisdictional issues and procedural standards, ensuring that arbitration remains a viable option for resolving disputes in the evolving digital landscape.

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<sup>40</sup> Piers, “Arbitrating Blockchain Disputes”.

<sup>41</sup> Christian Aschauer, *Arbitration in the Digital Age: Assessing the Role of Technology in Arbitration* (Cambridge: Cambridge University Press, 2019).

## Enforcement of arbitration awards on digital assets

Enforcing arbitration awards involving digital assets presents unique challenges that traditional mechanisms may not address effectively. The decentralized nature of these assets and the technical barriers associated with their seizure or transfer pose significant hurdles for arbitrators and courts alike. Addressing these issues requires innovative approaches that bridge the gap between current legal practices and emerging digital technologies.

### Challenges in Enforcing Arbitration Awards

One of the most pressing issues is the enforceability of arbitration awards involving digital assets. Unlike traditional assets, digital assets such as cryptocurrencies, NFT, and other blockchain-based holdings can be difficult to seize or transfer due to their distributed nature. Reinmar Wolff<sup>42</sup> emphasizes that enforcement mechanisms in current international arbitration frameworks, such as those outlined in the New York Convention, were not designed to handle assets that do not reside within a single jurisdiction or legal system.

The anonymity associated with blockchain transactions further complicates the enforcement process. If a party subject to an arbitral award refuses to comply, locating and identifying their digital assets can be extremely challenging. Amy J. Schmitz<sup>43</sup> highlights that the pseudonymous nature of digital wallets makes it difficult for enforcement authorities to trace ownership or take action, particularly in cases where the award debtor has taken measures to obscure their holdings through multiple wallet addresses or mixers.

Furthermore, differences in digital asset classification under various national laws affect whether they can be considered seizable assets. For instance, some jurisdictions may not recognize digital assets as property eligible for enforcement actions. This legal ambiguity can render an arbitral award ineffective if the jurisdiction where enforcement is sought does not have clear provisions for the treatment of digital assets.

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<sup>42</sup> Wolff, *Smart Contracts and Their Implications*.

<sup>43</sup> Schmitz, "Fairness and Accountability in Digital".

## Alternative Mechanisms for Enforcement

In response to these challenges, alternative mechanisms for enforcing arbitration awards on digital assets have emerged. One promising solution is the use of smart contracts integrated with arbitration agreements. Christian Aschauer<sup>44</sup> explains that programmable contracts, which automatically execute certain actions when predefined conditions are met, could be used to ensure compliance with arbitration awards. For example, an arbitration agreement embedded within a smart contract could automatically transfer ownership of a digital asset or release funds from an escrow account upon the issuance of an award.

While this approach offers advantages in terms of certainty and automation, it also raises concerns about fairness and legal oversight. Marc D. Veit argues that smart contracts, while effective for simple transactions, may not account for the nuances of more complex arbitration awards that require discretionary judgments or equitable remedies. Additionally, smart contracts operate solely based on their code, which means any programming flaws or ambiguities could lead to unintended consequences.

## The Role of Blockchain-Based Arbitration Platforms

Blockchain technology has given rise to decentralized arbitration platforms that offer new ways to resolve disputes involving digital assets. Platforms such as Kleros and Aragon Court use blockchain technology to facilitate arbitration, with outcomes enforced automatically through smart contracts. Maud Piers<sup>45</sup> notes that these platforms provide a degree of transparency and cost-efficiency that traditional arbitration lacks, but they also come with limitations regarding jurisdictional recognition and the enforceability of awards outside the blockchain ecosystem.

These blockchain-based platforms are still evolving, and their role in mainstream arbitration remains a discussion topic. One significant challenge is that awards rendered by such platforms may not be recognized under the New York Convention or similar international frameworks, which could limit their enforceability in cases where the losing party refuses to comply voluntarily. Reinmar Wolff suggests that integrating these platforms with

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<sup>44</sup> Aschauer, *Arbitration in the Digital Age*.

<sup>45</sup> Piers, "Data Privacy and Digital Asset Arbitration".

existing arbitration institutions could offer a hybrid approach that combines the strengths of both traditional and decentralized systems.

## Legal and Practical Considerations for Future Developments

To enhance the enforceability of arbitration awards involving digital assets, legal scholars and practitioners advocate for the development of international guidelines that specifically address the treatment and transfer of these assets. Philipp Schaumann<sup>46</sup> argues that amendments to existing conventions, such as the New York Convention, or the creation of new protocols could help provide clarity and consistency across jurisdictions.

Another proposed solution involves closer cooperation between arbitration institutions and financial regulatory bodies. This collaboration could facilitate the identification and seizure of digital assets held by award debtors, ensuring that arbitration awards are more effectively enforced. Amy J. Schmitz<sup>47</sup> emphasizes the importance of balancing enforcement measures with privacy rights, especially in regions governed by stringent data protection laws such as the GDPR.

In conclusion, enforcing arbitration awards involving digital assets remains a complex task that requires both legal innovation and technological adaptation. The development of smart contracts, blockchain-based arbitration platforms, and international guidelines represent significant steps forward. However, the ultimate success of these measures depends on their integration with existing legal frameworks and the willingness of international arbitration bodies and national courts to embrace new enforcement methodologies.

## Examples of arbitration disputes involving digital assets

As digital assets continue to proliferate, arbitration disputes related to them are becoming increasingly common. These disputes often arise from issues related to the loss of funds, promises made during Initial Coin Offerings (ICO), and complications regarding smart contracts. Examining real-world examples provides insights into how arbitration can address

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<sup>46</sup> Schaumann, “The Legal Classification of Digital Assets”.

<sup>47</sup> Schmitz, “Fairness and Accountability in Digital”.

these challenges and highlights areas where current frameworks may need improvement.

### **Disputes Involving Cryptocurrencies and Loss of Funds**

One of the most prevalent types of disputes in the realm of digital assets involves cryptocurrencies, particularly cases of theft, hacking, or technical errors leading to the loss of funds. A notable case occurred in 2018, when a hacker stole \$530 million worth of NEM tokens from the Japanese exchange Coincheck. The affected investors sought compensation through arbitration, claiming that Coincheck failed to implement adequate security measures. In this situation, the arbitrators faced the complex task of determining liability while navigating the nuances of digital asset security protocols. Christian Aschauer<sup>48</sup> emphasizes that such cases demonstrate the need for clear guidelines on how exchanges should safeguard their customers' assets and the standards of care expected from them in the rapidly evolving digital landscape.

The challenge in these cases often lies in the enforceability of arbitration awards. If the arbitration tribunal finds in favor of the investors, the award must be enforced against a party that may have limited resources or may not be operating within a jurisdiction that recognizes the arbitration decision. Maud Piers<sup>49</sup> argues that the uncertainty regarding the classification of digital assets as property can complicate enforcement, as some jurisdictions may not have the legal basis to recognize the arbitration award regarding the transfer of stolen or lost cryptocurrencies.

### **Arbitration Cases on ICO and Tokens**

Another significant area of arbitration concerns ICO, where investors purchase tokens expecting future returns. Numerous disputes have arisen over the promises made during these fundraising campaigns. For instance, in the case of the ICO for the project BitConnect, many investors alleged that the project was a Ponzi scheme that misled them about the potential returns. When the project collapsed, investors sought arbitration to recover their losses.

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<sup>48</sup> Aschauer, *Arbitration in the Digital Age*.

<sup>49</sup> Piers, "Data Privacy and Digital Asset Arbitration".

In such situations, the arbitrators are often tasked with evaluating the nature of the promises made during the ICO. Paul H. Cohen<sup>50</sup> highlights that the challenges in these cases arise from the need to determine whether the tokens sold were securities under applicable law, which would subject the offering to stringent regulatory requirements. If an arbitral tribunal classifies the tokens as securities, the implications for the enforcing jurisdiction could be significant, potentially requiring compliance with local security laws that differ widely across jurisdictions.

The arbitration outcomes in ICO disputes highlight the need for clear legal definitions and robust regulatory frameworks to protect investors. Without these frameworks, arbitrators may struggle to provide equitable remedies, resulting in inconsistent awards that may not be enforceable in jurisdictions lacking clear recognition of digital asset classifications.

### Smart Contracts and Their Legal Significance in Arbitration

Smart contracts —self-executing contracts with the terms of the agreement directly written into code— have also become a focal point in arbitration disputes. The unique nature of smart contracts presents both opportunities and challenges. For example, a smart contract for a decentralized finance (DeFi) protocol might automatically execute a transaction when certain conditions are met. However, disputes can arise if one party claims that the code was flawed or that the execution did not reflect the parties' true intentions.

In a notable case involving a smart contract on the Ethereum blockchain, a dispute arose when a party alleged that the contract's coding contained errors that resulted in unintended outcomes. The arbitration process required experts to interpret the code and determine whether the actions taken were consistent with the agreed-upon terms. Reinmar Wolff<sup>51</sup> notes that the increasing reliance on technical interpretations in these cases raises concerns about the arbitrators' capabilities to assess complex code and the potential need for specialized training in programming languages used in smart contracts.

<sup>50</sup> Paul H. Cohen, "ICO Disputes and the Future of Arbitration," *The Journal of Financial Regulation* 6, no. 1 (2020): 1–22.

<sup>51</sup> Reinmar Wolff, "Arbitration and the Use of Digital Tools: From Smart Contracts to Blockchain," *University of Marburg Journal of Arbitration Studies* (2020).

Moreover, as smart contracts become more integrated into digital asset transactions, the legal scrutiny surrounding their enforceability is likely to increase. Some experts suggest that arbitrators may need to develop specific protocols for addressing disputes arising from code interpretation, including mechanisms for appointing technical experts or establishing standards for the review of smart contract codes. Marc D. Veit<sup>52</sup> emphasizes the importance of creating clear legal standards for smart contracts to make arbitration processes smoother and ensure that parties can trust in the mechanisms that govern their transactions.

The emergence of digital assets has led to a new landscape of arbitration disputes, characterized by unique challenges such as jurisdictional ambiguities, issues of anonymity, and the complexities of smart contracts. As seen through the examples of cryptocurrency theft, ICO disputes, and smart contract issues, the arbitration process must adapt to address these challenges effectively.

Legal scholars and practitioners advocate for the establishment of clearer regulatory frameworks and the integration of technological innovations within the arbitration process. These adaptations are essential to enhance the enforceability of arbitration awards and improve certainty for parties engaged in transactions involving digital assets.

The evolving nature of digital assets calls for ongoing dialogue among stakeholders, including legal experts, technologists, and regulatory authorities. By collaboratively developing responsive legal standards and procedures, the arbitration community can ensure that it remains equipped to address the unique demands of the digital economy.

## Future Directions

The landscape of digital asset arbitration will continue to evolve, with emerging technologies and changing regulatory frameworks influencing its trajectory. Ongoing research and adaptation will be critical to address the challenges presented by this dynamic field, ensuring that arbitration remains a viable and effective means of resolving disputes in an increasingly digital world.

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<sup>52</sup> Veit, *Switzerland's Role in Defining*.

## Operational roadmap (concise)

To improve predictability under existing international arbitration instruments, we suggest to take at least the following actions: 1) pre-selecting governing law and seat aligned with the New York Convention and the UNCITRAL Model Law; 2) ensuring proportionate identity verification (KYC-compatible) and expert wallet attribution while preserving confidentiality; 3) standardizing digital-evidence handling through hash values, blockchain analytics, and expert interpretation of smart-contract code; 4) authorizing tribunal-ordered interim measures, asset preservation, and targeted third-party disclosure consistent with the law of the seat; 5) where feasible, coupling performance to escrowed smart arrangements without prejudicing court enforcement; and 6) aligning the parties' definitions with the applicable regulatory framework to reduce classification disputes at recognition/enforcement. A comprehensive development of these measures is reserved for a separate paper.

## Conclusion

This research has successfully achieved its goals by thoroughly examining and addressing the challenges posed by digital assets within the framework of international arbitration. Each objective set out at the beginning of the study has been meticulously pursued and met, providing a comprehensive foundation for understanding the applicability of arbitration standards to digital assets and proposing adaptations to ensure effective and fair dispute resolution.

Firstly, the objective of assessing the legal status of digital assets in international jurisdictions was achieved through a comparative legal analysis of major jurisdictions, including the United States, the European Union, Switzerland, and Kazakhstan. By detailing the regulatory approaches that each region takes toward digital assets, this research highlights both commonalities and distinctions in global treatment. The findings emphasize that while some jurisdictions categorize digital assets as financial instruments, others view them as property or entirely novel asset classes. These varying classifications significantly affect how digital assets are treated in arbitration, particularly concerning jurisdiction and award enforceability.

The second objective—to identify procedural and jurisdictional challenges in arbitrating disputes involving digital assets—was met through an in-depth examination of the characteristics unique to digital

assets, such as anonymity, decentralization, and cross-border functionality. The study elucidates how these features complicate traditional arbitration principles, such as the identification of the parties involved and the governing jurisdiction. Solutions such as Know Your Customer (KYC) protocols, enhanced data protection, and blockchain-based identity verification were discussed as potential methods for mitigating these challenges. This research has proposed that international legal cooperation is essential for creating a unified framework to address these procedural gaps effectively.

A key objective was to propose adaptations to international arbitration standards, including the New York Convention and UNCITRAL Model Law, to better accommodate the characteristics of digital assets. By analyzing specific case studies, this study identified areas where existing frameworks are limited. Recommendations include establishing guidelines for the recognition of digital assets as enforceable under the New York Convention and adapting UNCITRAL's Model Law to incorporate mechanisms for handling digital disputes. These adaptations provide an essential foundation for the legal certainty and predictability required by digital assets in arbitration.

Furthermore, the objective of developing a comprehensive approach to enforce arbitration awards involving digital assets was achieved through the proposal of alternative mechanisms. This study explored innovative enforcement solutions such as programmable contracts, automated smart contracts, and escrow accounts, which ensure award compliance without compromising the autonomy and security of digital assets. These approaches pave the way for more reliable enforcement in cases where traditional methods prove ineffective, especially due to the decentralized nature of many digital assets.

This research has identified and expanded on three main areas for future development regarding the need for a specialized approach to handling digital assets in arbitration: 1) the integration of digital asset-friendly provisions within established arbitration frameworks, 2) the creation of a digital asset arbitration protocol that includes specific requirements for transparency, data protection, and KYC compliance, and 3) the development of legal training programs for arbitrators on the technicalities of digital assets and blockchain technology.

In summary, the research has met its objectives by outlining practical and legal measures for adapting arbitration standards to digital assets, thereby enhancing their legitimacy and enforceability for international dispute resolution. The findings demonstrate that while challenges

remain, international arbitration is adaptable and can be refined to address the unique demands of digital asset-related disputes. This research ultimately provides a roadmap for establishing a more inclusive, adaptable, and legally sound arbitration environment that supports the ongoing integration of digital assets into the global economic and legal landscape.

## Implications and limits

This article clarifies how core international arbitration standards can accommodate disputes over digital assets and identifies procedural tools that preserve due process and enforceability. The granular design of multi-level solutions—spanning public mandates, institutional rule-making, and technical standards—lies beyond our present scope. We therefore offer a targeted roadmap and reserve its comprehensive development for a stand-alone study.

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