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Comparative Analysis of the Challenges in the Enforcement of Judicial Judgments and Arbitral Awards on Public Blockchain Networks: A Perspective from UNCITRAL and Iranian Law

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1. Round 1

1.1. Reviewer 1

Reviewer:

The manuscript does not contain a dedicated methodology section, despite making extensive comparative and normative claims. A separate section should explain the research design, the criteria used to select UNCITRAL instruments, the Iranian statutes and judicial materials examined, the temporal scope of the legal analysis, and the method used to compare international standards with Iranian law. The authors should clarify whether they employed doctrinal legal research, comparative functional analysis, qualitative content analysis, or a law-and-technology framework. They should also identify the databases, official repositories, judicial decisions, regulations, policy documents, and secondary sources reviewed. The absence of a transparent methodology prevents readers from assessing the completeness, reproducibility, and analytical rigor of the study.

In the opening paragraph, the manuscript states that blockchain's defining characteristics include "transparency, enhanced cybersecurity, and, most significantly, decentralization." This formulation is overly general and risks presenting contingent technical characteristics as universal properties of all blockchain systems. The authors should distinguish public permissionless blockchains from private, consortium, permissioned, and hybrid distributed-ledger systems. They should also explain that transparency, immutability, and security vary according to protocol design, consensus architecture, governance arrangements, key management, bridge dependencies, smart-contract vulnerabilities, and network concentration. Because the article focuses specifically on public blockchain networks, that scope should be defined at the outset and maintained consistently throughout the manuscript.

In the second paragraph of the Introduction, the sentence "Because no central authority possesses the ability to access, alter, or invalidate confirmed transactions, conventional enforcement mechanisms become largely ineffective" is stated too

categorically. Conventional enforcement may remain possible where assets are held through custodial exchanges, regulated intermediaries, hosted wallets, token issuers, stablecoin administrators, bridge operators, or other identifiable actors. The authors should distinguish enforcement against self-custodied assets on a permissionless network from enforcement involving custodial or otherwise governable digital assets. This distinction is central to the article's thesis because the feasibility of attachment, freezing, tracing, or transfer depends significantly upon the technological and institutional structure through which the debtor controls the asset.

The article repeatedly uses the expression "judicial judgments," including in the title of Section 3 and throughout the Introduction. This terminology is redundant and should be replaced with the more conventional terms "court judgments," "judicial decisions," or simply "judgments," depending on the intended meaning. More importantly, the manuscript frequently treats court judgments and arbitral awards as though they raise identical enforcement questions. The authors should distinguish the legal bases for enforcing domestic judgments, foreign judgments, domestic arbitral awards, and foreign arbitral awards. These categories involve different procedural requirements, jurisdictional rules, recognition mechanisms, public-policy controls, and sources of legal authority. The analysis should therefore be reorganized to avoid conflating fundamentally different enforcement regimes.

In the third paragraph of the Introduction, the manuscript attributes to UNCITRAL a general position concerning "the functional equivalence of different technological solutions." The authors should identify the precise UNCITRAL instrument, article, explanatory note, working-group document, or official guidance supporting this proposition. References to "UNCITRAL" as a single undifferentiated authority are insufficient for a scholarly legal analysis because UNCITRAL has adopted multiple model laws, legislative guides, conventions, explanatory materials, and working papers with different scopes and legal statuses. Every substantive claim concerning UNCITRAL's approach should be linked to a specifically identified instrument and, where possible, to the relevant provision or paragraph.

The article applies the UNCITRAL Model Law on Electronic Transferable Records broadly to cryptocurrencies and other blockchain-based assets. The authors should justify this extension more carefully because electronic transferable records represent a legally specific category associated with instruments or documents that traditionally require possession for the exercise or transfer of rights. Not every cryptocurrency, utility token, governance token, non-fungible token, or smart-contract entitlement necessarily falls within that category. Section 3.2 should therefore identify the types of blockchain assets to which the Model Law may plausibly apply and explain the limits of applying its control-based framework to digital assets outside its substantive scope.

In Section 3.2, the manuscript states that "UNCITRAL has therefore acknowledged" the need for "judicial enforcement oracles, governable smart contracts, and comparable technological interfaces." This assertion should be verified and precisely sourced. If these mechanisms are proposals derived from academic literature rather than formally endorsed UNCITRAL mechanisms, the text must clearly distinguish the authors' normative recommendations from UNCITRAL's adopted position. The current wording risks attributing a specific technical policy to an international institution without demonstrating that such a policy appears in an authoritative instrument. This distinction is especially important in a comparative legal study whose credibility depends upon accurately characterizing international standards.

Section 4 should provide a more exact analysis of Iranian positive law. The paragraph beginning "The first and most fundamental challenge concerns the legal characterization of digital assets as property" refers generally to Article 11 of the Civil Code and the Civil Judgments Enforcement Act but does not systematically examine the relevant statutory provisions, doctrinal classifications, judicial interpretations, or administrative regulations. The authors should explain how Iranian law defines property, financial value, ownership, possession, intangible rights, movable property, and attachable assets. They should also analyze whether crypto-assets could be classified under existing doctrines before concluding that legislative reform is indispensable. The current analysis is conceptually plausible but insufficiently grounded in the detailed structure of Iranian private and enforcement law.

Authors revised the manuscript and uploaded the document.

1.2. Reviewer 2

Reviewer:

The paragraph beginning “Beyond the technical dimension, arbitration law presents additional challenges” asserts that “UNCITRAL acknowledges that parties may employ smart contracts to facilitate the automatic execution of arbitral awards.” This is a particularly important claim and requires precise documentary support. The authors should identify the exact UNCITRAL text in which this position appears and clarify whether it constitutes an adopted legal standard, a working-group discussion, a secretariat note, or merely an emerging proposal. They should also distinguish the legal enforcement of an arbitral award from voluntary or pre-programmed contractual performance following an arbitral determination. Automatic execution through a smart contract does not necessarily constitute enforcement in the formal legal sense, particularly where recognition proceedings, public-policy review, due-process objections, or annulment proceedings remain available.

In Section 2, the manuscript characterizes immutability as meaning that blockchain transactions are “permanently” recorded and technically resistant to alteration. The analysis should be technically refined by distinguishing probabilistic finality from deterministic finality, protocol-level reversibility from application-layer remedies, chain reorganizations from legally compelled reversals, and hard forks from ordinary transaction cancellation. The current presentation risks treating immutability as an absolute binary condition. A more accurate analysis would explain that blockchain immutability is socio-technical and governance-dependent, rather than metaphysically absolute. This refinement is essential because the legal argument concerning enforceability rests heavily on the asserted impossibility of modifying or reversing transactions.

In Section 2.1, the manuscript states that “victims of cryptocurrency fraud frequently remain unable to recover their assets despite obtaining favorable judicial judgments.” This is presented as an empirical finding, but no empirical methodology, dataset, sample, case series, or judicial statistics are provided. The authors should either supply verifiable empirical evidence or reformulate the statement as a proposition reported in the legal and technical literature. Similar unsupported expressions—including “frequently,” “numerous studies,” “recent scholarship,” and “many enforcement proceedings”—appear throughout the manuscript. Every empirical or prevalence-related claim should be substantiated by identifiable data or replaced with appropriately qualified doctrinal language.

The discussion in Section 2.1 would benefit from a more systematic distinction among several remedies that are currently treated together: reversal of a completed transaction, freezing of an address, attachment of the debtor’s legal interest, compelled disclosure of private keys, transfer through a custodial intermediary, monetary substitution, tracing of substituted assets, and restitution from third-party recipients. These mechanisms differ legally and technically. For example, a court may be unable to reverse the historical ledger while still being able to order the debtor to transfer an equivalent quantity of assets or impose sanctions for non-compliance. The authors should develop a taxonomy of enforcement remedies and evaluate the legal basis, technical feasibility, and limitations of each remedy separately.

In Section 2.2, the manuscript suggests that the location of blockchain nodes may determine the governing law or the enforceability of a judgment. This proposition requires substantial refinement. The location of validating nodes may be legally irrelevant in many disputes because nodes ordinarily do not possess or control the assets involved in a transaction. The authors should distinguish among the debtor’s domicile, the creditor’s domicile, the location of a custodian, the place of business of an exchange, the governing law of the contractual relationship, the location of the private-key holder, the issuer’s jurisdiction, and the alleged situs of the digital asset. The article should critically evaluate which connecting factors are legally meaningful instead of assuming that node distribution itself determines jurisdiction.

The statement in Section 2.2 that a judgment debtor may keep cryptocurrency “in cold wallets located beyond the practical reach of domestic enforcement authorities” reflects an insufficiently precise understanding of the relationship between wallets and asset location. A wallet does not ordinarily contain the blockchain asset itself; rather, it stores or facilitates control over cryptographic credentials associated with ledger entries. The authors should avoid language that treats digital assets as physically stored inside a device or wallet. This conceptual correction is essential to the jurisdictional analysis because the legal situs of a crypto-asset cannot be inferred merely from the physical location of a hardware wallet or storage device.

In Section 3, the manuscript describes possession of a private cryptographic key as constituting “legal control” over the corresponding digital asset under the UNCITRAL Model Law on Electronic Transferable Records. This proposition is too

simplified. The authors should examine the Model Law's requirements for identifying a record as authoritative, maintaining its integrity, establishing exclusive control, and reliably identifying the person exercising control. Mere possession or knowledge of a private key may not always establish lawful control, particularly where keys are stolen, shared, compromised, held by custodians, divided through multi-party computation, or used in multi-signature arrangements. The manuscript should distinguish factual technical capability from legally recognized control and ownership.

Authors revised the manuscript and uploaded the document.

2. Revised

Editor's decision: Accepted.
Editor in Chief's decision: Accepted.