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Smart Contracts in Indian Insolvency: Bridging Legal Gaps with Blockchain Innovation

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ABSTRACT

India's Insolvency and Bankruptcy Code has significantly reformed insolvency resolution, yet it faces persistent challenges such as procedural delays, inefficiencies, and limited transparency. This paper explores the potential of blockchain technology and smart contracts in addressing these limitations. By leveraging blockchain's decentralized, immutable, and transparent nature, along with the automation capabilities of smart contracts, various insolvency processes – such as creditor claims verification, asset liquidation, and payouts – can be streamlined.

The paper begins with an overview of blockchain technology and its integration into legal frameworks globally. It examines how smart contracts can automate creditor management, prevent fraud, and facilitate real-time asset monitoring. A detailed analysis of the current IBC framework highlights the need for technological adoption to overcome existing inefficiencies. Case studies from jurisdictions like UAE and Singapore offer valuable insights into global best practices and their adaptability into India's legal landscape.

However, integrating blockchain into the IBC presents regulatory

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challenges, including the lack of recognition for blockchain-based records under Indian law, data privacy concerns, and enforcement of smart contracts. The paper concludes by proposing targeted legal reforms and practical steps to enable the adoption of blockchain within the IBC framework, paving the way for a more efficient and transparent insolvency ecosystem.

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I. INTRODUCTION

Filing for bankruptcy and navigating the entire process is tedious, long and burdensome. To establish an effective, time-bound resolution system for insolvency and bankruptcy cases, India implemented the Insolvency and Bankruptcy Code (IBC) in 2016. It serves as a crucial tool for updating and harmonising the nation's insolvency laws. The IBC promotes a better business climate and streamlines insolvency procedures ensuring faster resolutions. However, despite the evident

advantages of the IBC, the system remains hampered by inefficiencies, such as lengthy proceedings, manual claim processing, and intricate asset liquidation procedures. These challenges burden courts, debtors, and creditors alike, creating bottlenecks that prevent the system from operating as intended.

Integrating blockchain technology and smart contracts into the IBC framework presents a solution to these inefficiencies. Blockchain, a decentralized and tamper-proof digital ledger, allows parties to interact securely without intermediaries. Its distributed ledger technology can automate many aspects of insolvency proceedings, reducing delays and human errors. Smart contracts, which are self-executing agreements stored on the blockchain, can further enhance efficiency by enabling debtors to digitally submit all necessary documents, records, and certificates for initiating insolvency proceedings.[1]

Additionally, these technologies can streamline crucial processes such as asset liquidation, payment distribution, and creditor management, ensuring faster, more transparent, and cost-effective resolutions. By addressing the structural weaknesses of the current IBC framework, blockchain and smart contracts can significantly improve the effectiveness of India's insolvency system.

In light of the above, this paper aims to investigate how India's IBC can be enhanced with blockchain and smart contracts to automate insolvency procedures. Many of the current inefficiencies in the IBC's operations,

[1] Ryan M. Mardini, 'Point of Intersection Where Blockchain Meets Bankruptcy: Can the Ingenuity of Blockchain Restructure and Streamline the Bankruptcy Process' (2020) Wayne St UJ Bus L.

like the manual processing of creditor claims and the delays in asset liquidation, could be addressed through the integration of these technologies[2]. Blockchain's decentralized and immutable ledger can improve insolvency proceedings by enabling real-time asset tracking, preventing fraudulent transfers, and ensuring transparency in asset valuation and liquidation. By recording asset movements on a tamper-proof ledger, stakeholders can access up-to-date financial data, reducing disputes over ownership and valuation. Smart contracts further enhance efficiency by automating key processes. Predefined conditions can trigger automatic fund distributions, ensuring creditor priority without manual intervention. Additionally, blockchain-based records can streamline creditor claims verification by integrating with government databases, minimizing errors and preventing fraudulent submissions.

While blockchain and smart contracts offer significant advantages, their adoption within the IBC framework faces a number of regulatory challenges. This paper will explore these legal obstacles, including the current lack of recognition for smart contracts and blockchain-based records under Indian law, and examine the necessary reforms to facilitate their integration into insolvency proceedings.

II. BLOCKCHAIN TECHNOLOGY AND SMART CONTRACTS

Blockchain connects, secures, and shares records across several computer networks. It can be considered a software platform, technological infrastructure, or protocol. This database, or ledger, keeps

[2] Insolvency and Bankruptcy Board of India, 'Quinquennial of Insolvency and Bankruptcy Code, 2016' (2021) <https://ibbi.gov.in/uploads/whatsnew/1d8b31fc65f7ac6f09a973be8f12f868.pdf> accessed 15 October 2024.

a record of all transactions and is easily auditable. The Blockchain infrastructure, like other ledgers, records a chronological list of signed transactions between networks.[3] The infrastructure uses a consensus approach to validate and time stamp all transactions. Instead of a central authority verifying or accepting transfer documents, each network ensures that the proposed transferor is listed as the asset owner in the "block" and that the transferee is now the owner.

A blockchain is a type of digital record keeping system where information is stored in blocks that are securely linked together in chronological order. The control is distributed across a network of computers, called nodes, rather than a single central authority. Each node has access to the entire blockchain, which prevents failures or corruption from any one point of control. This improves data integrity while reducing dependency on intermediaries.[4] When a transaction takes place, the network checks that both the debit and credit entries match. The transaction can be seen by anyone with the public "key" (similar to a username), while a private "key" (like a password) is needed to carry out the transaction. Once data is stored on a blockchain, it cannot be altered or deleted. This immutability is achieved through a process called cryptographic hashing,

[3] Nick Szabo, 'Smart Contracts: Building Blocks for Digital Markets' (1996) <https://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart_contracts_2.htm> accessed 15 October 2024.

[4] A. S. Konoplev and others, 'A Blockchain Decentralized Public Key Infrastructure Model' (2019) <https://link.springer.com/article/10.3103/S0146411618080175> accessed 15 October 2024.

which makes it almost impossible to tamper with the information without affecting the entire blockchain.[5]

Blockchain also employs advanced cryptography algorithms to safeguard transactions and limit data access to authorised users. Consensus techniques such as Proof of Work (PoW) or Proof of Stake (PoS) aid the preservation of the system's integrity by requiring nodes to come to an agreement before adding a new block.[6] Blockchains are equipped to store or reference other forms of information, including what are essentially small computer programs — which technologists often refer to as *smart contracts*. Nick Szabo was the first person to propose the idea of 'smart contracts.'[7] He said that smart contracts is the idea of embedding specific types of contractual terms "in the hardware and software of a computer program"[8], which are built in such a way that breach of contract is extremely expensive for the violating party.

Smart contracts enable the automatic execution of contracts without the need for intermediaries. These contracts are stored on the blockchain and can be created, exchanged, and executed automatically on decentralised networks.[9] Since these self-executing contracts operate on

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[5] Gousia Habib and others, 'Blockchain technology: Benefits, challenges, applications, and integration of blockchain technology with cloud computing' (2022) 14(11) Future Internet <https://www.mdpi.com/1999-5903/14/11/341> accessed 15 October 2024.

[6] Ibid.

[7] Nick Szabo, 'Smart Contracts: Building Blocks for Digital Markets' (1996) <https://www.fon.hum.uva.nl/rob/Courses/InformationInSpeech/CDROM/Literature/LOTwinterschool2006/szabo.best.vwh.net/smart_contracts_2.htm> accessed 15 October 2024.

[8] Ibid.

[9] Alex Lipton and Stuart Levi, 'An Introduction to Smart Contracts and their Potential and Inherent Limitations' (*Harvard Law School Forum on Corporate Governance*, 26 May 2018)

a blockchain, they inherit its key properties, including immutability — once created, they cannot be altered. This ensures that contractual terms remain tamper-proof and transparent. Their automatic execution also speeds up transactions, reduces reliance on enforcement mechanisms, and lowers costs.

In this way, blockchain technology and smart contracts can help to expedite creditor claims. Smart contracts can enforce creditor priority, initiate payments, and update records on an immutable ledger. This minimises the need for manual intervention and reduces errors. These features are particularly beneficial for managing complex claims involving multiple creditors, ensuring that payments are executed accurately and efficiently.

Automation ensures that payments are efficiently disbursed to necessary parties after an asset is liquidated, eliminating the need for intermediaries. Smart contracts can also help automate asset liquidation, particularly when assets are tokenised on a blockchain.[10] They can be programmed to initiate asset sales when predetermined conditions are satisfied, reducing delays and simplifying the liquidation procedure. Automation ensures that payments to appropriate parties are delivered efficiently after an asset is liquidated, eliminating the need for

<https://corpgov.law.harvard.edu/2018/05/26/an-introduction-to-smart-contracts-and-their-potential-and-inherent-limitations/> accessed 15 October 2024.

[10] Ross Buckley and others, 'Blockchain and its Applications: A Conceptual Legal Primer' (2023) 26(2) JIEL <https://academic.oup.com/jiel/article/26/2/363/7069623> accessed 15 October 2024.

intermediaries.[11] Secure and traceable payments are also one of blockchain's primary strengths. Smart contracts automatically distribute payments once certain conditions — such as work completion or asset transfer — are met, significantly minimizing disagreements and enforcement delays. This improves the efficiency and transparency of payment processes.[12]

III. THE INSOLVENCY AND BANKRUPTCY CODE: CURRENT FRAMEWORK AND LIMITATIONS

Enacted in 2016, the IBC offers a unified framework for resolving insolvency for corporates, partnerships, and individuals. It seeks to promote entrepreneurship, improve credit availability, and ensure timely resolution of financial distress – either through restructuring or liquidation – while maximizing asset value and balancing stakeholder interests.[13] Insolvency professionals manage this process by verifying claims, taking control of the debtor's assets, and maintaining procedural transparency.[14]

A key mechanism under the IBC is the Corporate Insolvency Resolution Process (CIRP), which mandates resolution within 180 days (extendable

[11] Heather Hughes, 'Blockchain and the Future of Secured Transactions Law' (2020) Stanford Journal of Blockchain Law & Policy <https://stanford-jblp.pubpub.org/pub/blockchain-secured-transactions/release/1> accessed 15 October 2024.
[12] Zhen Er Low, 'Execution of Judgements on the Blockchain- A Practical Legal Commentary' (2021) 34(1) Harvard Journal of Law & Technology<https://jolt.law.harvard.edu/digest/execution-of-judgements-on-the-blockchain-a-practical-legal-commentary> accessed 15 October 2024.
[13] Insolvency and Bankruptcy Code 2016.
[14] S. Sivakumar, 'Insolvency and Bankruptcy Framework: India Perspective' (2022) 9(2) KLRI Journal of Law and Legislation <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4025389> accessed 15 October 2024.

by 90 days).[15] If the resolution fails, liquidation proceedings are initiated. The Committee of Creditors (CoC), composed of financial creditors, evaluates and approves resolution plans.[16] The Code aims to resolve inefficiencies from the earlier fragmented legal frameworks by consolidating insolvency and bankruptcy laws under one legislation.[17] However, despite this structured approach, the IBC still grapples with inefficiencies like delays and manual claim verification. Integrating blockchain and smart contracts into these processes could automate claim validation, enhance transparency, and reduce procedural delays – strengthening the IBC's core objectives through technological innovation as we will see below.

While the IBC is designed for time-bound resolution, delays frequently occur, especially in cases involving large corporations. These delays often arise due to the complexity of claims, involvement of multiple stakeholders with competing interests, and prolonged legal challenges. The NCLT is often overburdened with cases, leading to blockages in adjudication. In many instances, proceedings have seen extensions beyond the prescribed 270-day limit, which defeats the Code's purpose of expediting resolutions.[18] Judicial pendency remains a persistent issue,

[15] Insolvency and Bankruptcy Code 2016.
[16] S. Sivakumar, 'Insolvency and Bankruptcy Framework: India Perspective' (2022) 9(2) KLRI Journal of Law and Legislation <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4025389> accessed 15 October 2024.
[17] Pramod Rao, 'Critique of the Insolvency & Bankruptcy Code, 2016' (2016) NLS Bus L Rev 2(1) <https://repository.nls.ac.in/cgi/viewcontent.cgi?article=1035&context=nlsblr > accessed 15 October 2024.
[18] Medha Shekar and Anuradha Guru, 'Theoretical Framework of Insolvency Law' Insolvency and Bankruptcy Board of India,

with NCLT benches struggling to manage the increasing number of cases. This slows down the resolution process and reduces recovery rates for creditors.[19]

Moreover, the process of claim verification and asset distribution is still largely manual, which can lead to errors, delays, and disputes among creditors. Information asymmetry also persists, as insolvency professionals must rely on the debtor's records and disclosures, which may not always be accurate or complete.[20] Information utilities, although intended to improve access to verified financial data, have not yet achieved their full potential, resulting in gaps in the timely authentication of creditor claims.[21] Not only that but in cases involving multiple creditors or cross-border insolvencies, coordination becomes difficult, leading to delays in decision-making. The priority disputes among operational and financial creditors are another source of friction that often complicates proceedings.

While the IBC represents a significant step forward in India's legal framework for insolvency, its current limitations – delays, manual processes, and coordination challenges – highlight the need for technological innovation. Integrating blockchain technology and smart contracts into the IBC could transform the insolvency process, bringing

<https://ibbi.gov.in/uploads/resources/158497d3735f154918648288e56dfebc.pdf> accessed 15 October 2024.

[19] ibid.

[20] Pramod Rao, 'Critique of the Insolvency & Bankruptcy Code, 2016' (2016) NLS Bus L Rev 2(1) <https://repository.nls.ac.in/cgi/viewcontent.cgi?article=1035&context=nlsb> accessed 15 October 2024.

[21] ibid.

greater transparency, efficiency, and automation.[22] This would not only enhance the effectiveness of the IBC but also reinforce India's position as a competitive business environment by improving recovery rates and minimizing insolvency timelines.

Blockchain technology, with its decentralized, immutable, and transparent features, holds the potential to address many of the current limitations in the IBC framework. Smart contracts could automate key aspects of the insolvency process, enhancing efficiency while minimizing manual errors.[23] A blockchain-based platform could streamline the submission and verification of creditor claims, ensuring that records are authentic and accessible to all stakeholders. Smart contracts could automate the distribution of liquidation proceeds based on predefined rules, ensuring that payments are made efficiently and in accordance with the approved resolution plan.[24] Blockchain's transparency could mitigate the problem of information asymmetry by providing a shared ledger of all financial transactions and assets of the distressed company. This would enable creditors to make more informed decisions during the insolvency process. The use of blockchain could reduce the burden on NCLT by automating routine processes such as claim verification, thereby shortening the time required for resolution. This would help address the issue of judicial pendency and ensure more timely insolvency resolutions.[25] Blockchain could also play a key role in cross-border

[22] Primavera De Filippi and Aaron Wright, 'Smart Contracts as Legal Contracts' *Blockchain and the Law: The Rule of Code* (2018) Harvard University Press <https://www.jstor.org/stable/j.ctv2867sp.7> accessed 15 October 2024.
[23] ibid.
[24] ibid.
[25] Pramod Rao, 'Critique of the Insolvency & Bankruptcy Code, 2016' (2016) NLS Bus L Rev 2(1)

insolvencies by providing a platform for seamless cooperation among courts, creditors, and insolvency professionals across jurisdictions. This would address the coordination challenges often faced in cross-border insolvency cases.[26]

IV. POTENTIAL APPLICATIONS OF BLOCKCHAIN AND SMART CONTRACTS IN THE IBC

Blockchain technology and smart contracts have immense potential to address key inefficiencies in insolvency resolution under the IBC. By offering decentralized and automated solutions, technologies enhance transparency, speed up processes, and reduce human intervention – essential in complex insolvency proceedings. The following sections explore how these innovations can be integrated into the IBC framework to streamline insolvency resolution.

One of the most time-consuming aspects of insolvency resolution is the verification of creditor claims. Under the current system, insolvency professionals manually validate each creditor's claim, often resulting in delays due to incomplete or disputed information.[27] A blockchain-based ledger could serve as a tamper-proof storage of all creditor claims, ensuring that records are accurate, immutable and easily accessible.

<https://repository.nls.ac.in/cgi/viewcontent.cgi?article=1035&context=nlsblr> accessed 15 October 2024.

[26] Medha Shekar and Anuradha Guru, 'Theoretical Framework of Insolvency Law' Insolvency and Bankruptcy Board of India, <https://ibbi.gov.in/uploads/resources/158497d3735f154918648288e56dfebc.pdf> accessed 15 October 2024.

[27] Insolvency and Bankruptcy Board of India, 'Quinquennial of Insolvency and Bankruptcy Code, 2016' (2021) <https://ibbi.gov.in/uploads/whatsnew/1d8b31fc65f7ac6f09a973be8f12f868.pdf> accessed 15 October 2024.

Through a blockchain platform, creditors could submit their claims along with supporting documents, which can be cross-verified using external data providers.[28] Once verified, these claims would be permanently recorded on the blockchain, eliminating the risk of duplication or manipulation. Smart contracts could then be used to automatically prioritize and process these claims in accordance with the pre-defined legal framework under the IBC, greatly reducing the need for manual oversight and accelerating the resolution process.[29]

The liquidation of assets is another component of insolvency resolution, often hampered by delays and inefficiencies in tracking and transferring assets. Blockchain can provide a comprehensive ledger to track the ownership and movement of a debtor's assets in real time.[30] By registering assets on the blockchain, insolvency professionals and creditors can monitor changes in ownership and ensure that assets are not unlawfully transferred during insolvency proceedings. Blockchain also allows for tokenizing physical assets into digital units that can be easily transferred or sold.[31] For example, real estate or machinery can be tokenized and auctioned, ensuring transparent and efficient asset liquidation.[32] This digital process minimizes disputes over ownership,

[28] ibid.
[29] Insolvency and Bankruptcy Code 2016.
[30] Ryan M. Mardini, 'Point of Intersection Where Blockchain Meets Bankruptcy: Can the Ingenuity of Blockchain Restructure and Streamline the Bankruptcy Process' (2020) Wayne St UJ Bus L.
[31] Gunardi Lie and Lewiandy, 'Blockchain Application on Property Law: Meeting Legal Certainty for Creditors in Bankruptcy Cases' (2022) 17(2) IJCJS <https://ijcjs.com/menu-script/index.php/ijcjs/article/view/524/382> accessed 10 October 2024.
[32] ibid.

reduces the time taken to sell assets, and enhances creditor recovery rates.

Currently, the distribution of proceeds from asset sales is handled manually, often leading to delays. Smart contracts can automate these payouts, ensuring that creditors receive their share promptly and in accordance with the approved resolution plan.[33] Once assets are liquidated, smart contracts can automatically distribute payments to creditors based on their priority and the agreed resolution plan.[34] For instance, if a secured creditor is entitled to 60% of the proceeds, the smart contract will execute the payment directly to their account without any manual intervention.[35] Automated payouts reduce the possibility of human errors, ensuring compliance with the resolution plan approved by the CoC and the adjudicating authority.

Apart from this, fraudulent activities such as asset stripping and misrepresentation of liabilities are significant challenges in insolvency cases. Blockchain's transparent and immutable ledger can prevent such malpractices by ensuring that all transactions and records are publicly accessible and verifiable by stakeholders. Once data is recorded on a blockchain, it cannot be altered, ensuring that any fraudulent activity is easily detectable. This feature enhances the integrity of the insolvency

[33] ibid.
[34] Primavera De Filippi and Aaron Wright, 'Smart Contracts as Legal Contracts' *Blockchain and the Law: The Rule of Code* (2018) Harvard University Press <https://www.jstor.org/stable/j.ctv2867sp.7> accessed 15 October 2024.
[35] Ryan M. Mardini, 'Point of Intersection Where Blockchain Meets Bankruptcy: Can the Ingenuity of Blockchain Restructure and Streamline the Bankruptcy Process' (2020) Wayne St UJ Bus L.

process, making it more difficult for promoters to mislead creditors or illegally dispose of assets.[36]

India currently lacks a robust cross-border insolvency regime, mainly due to the complexity of such cases, requiring coordination between multiple jurisdictions with differing legal systems. Adopting the UNCITRAL Model Law on Cross-Border Insolvency offers a viable solution to these challenges by promoting cooperation and consistency in cross-border proceedings. Blockchain technology can further enhance this framework by providing a unified, decentralized ledger accessible to stakeholders across jurisdictions.[37] This would allow real-time access to relevant data, eliminating the need for duplicate filings and reducing inconsistencies between legal systems.[38] Existing blockchain-based solutions in cross-border finance, such as IBM's TradeLens – though discontinued, it is an illustrative example of supply chain transparency – and Ripple's payment system, demonstrate how decentralized ledgers can facilitate seamless international collaboration. By enabling synchronized data sharing and transaction tracking, blockchain can simplify cross-border insolvency processes, ensuring faster resolutions, lowering administrative costs, and improving coordination between courts and insolvency professionals across borders.

[36] ibid.
[37] Insolvency and Bankruptcy Board of India, 'Quinquennial of Insolvency and Bankruptcy Code, 2016' (2021) <https://ibbi.gov.in/uploads/whatsnew/1d8b31fc65f7ac6f09a973be8f12f868.pdf> accessed 15 October 2024.
[38] ibid.

V. REGULATORY AND LEGAL CHALLENGES

For a smart contract to be legally enforceable, it must fulfil the essential elements of a valid contract – such as mutual consent, lawful consideration, and competent parties – as outlined in Chapter II of the Indian Contract Act, 1872.[39] While smart contracts can reduce reliance on intermediaries by automating the execution of contractual terms, they do not completely eliminate the need for legal oversight, particularly in cases of dispute or ambiguity.

One of the key legal challenges lies in defining what constitutes a "smart contract" under existing law. It has been widely suggested that their enforceability should depend on the legal validity of the underlying agreement, governed by the applicable contract laws of each jurisdiction. In India, this means that the terms coded into a smart contract must align with the principles of the Contract Act, including offer, acceptance, and lawful object.[40]

Electronic contracts have gained legal recognition globally, forming the foundation for modern digital transactions. In the United States, the Electronic Signatures in Global and National Commerce (ESIGN) Act[41] of 2000, and the Uniform Electronic Transactions Act (UETA), adopted by forty-seven states in 1999, legitimized the use of electronic signatures and records. These statutes facilitated the growth of e-commerce and digital banking by ensuring that contracts executed electronically carry the same legal validity as their physical counterparts.

[39] Indian Contract Act 1872.
[40] ibid.
[41] Electronic Signatures in Global and National Commerce (ESIGN) Act 2000.

Similarly, in India, Section 4 to 7 the Information Technology Act, 2000[42] recognize the legal validity of electronic records, electronic signatures, and their preservation. The Act was amended in 2008 to introduce the term "digital signature", reinforcing the legitimacy of digitally executed agreements. The European Union followed suit with regulations such as the General Data Protection Regulation (GDPR) in 2016, which, although primarily focused on data protection, also created an enabling environment for secure digital transactions across member states.

Despite these advancements, the legal recognition of blockchain-based agreements – particularly smart contracts – remains uncertain. While these laws support electronic contracts in general, they do not explicitly address whether blockchain-generated cryptographic signatures or automated executions under smart contracts fulfil the legal criteria of consent, authorship, or enforceability. As a result, although there is no statutory bar against accepting transactional records and supporting documents generated via blockchain platforms, lawmakers have yet to develop clear standards or amendments that specifically validate smart contracts under existing legal frameworks.

While smart contracts can, in principle, meet contract formation requirements, their enforceability is complicated by coding errors. In the absence of a traditional controlling contract, courts may face challenges in interpreting disputes arising from incorrectly coded smart contracts.

[42] Information Technology Act 2000.

If a coding error exists, courts may struggle to ascertain the true intent of the parties, often referred to as a "meeting of minds."

As mentioned above, currently, there is no comprehensive legal framework governing cryptocurrency transactions or the use of blockchain-based smart contracts in India. One of the key legal hurdles lies in the interpretation of electronic signatures under Indian law. Section 35 of the Information Technology Act[43] provides that only electronic signatures issued by government-designated Certifying Authorities are legally recognized. Since blockchain-based smart contracts rely on cryptographic hash keys for authentication – rather than signatures issued by authorized certifiers – their legal enforceability remains uncertain.

Further, Section 90 of the Bhartiya Sakshya Adhiniyam, 2023[44], states that while the authenticity of an electronic record may be presumed, the identity of the sender must still be proven. This creates an additional barrier for smart contracts authenticated through blockchain, as the encryption mechanism used may not satisfy the evidentiary standards required in court if not aligned with the Information Technology Act.[45]

These legal ambiguities raise concerns about the admissibility and enforceability of smart contracts in insolvency proceedings under the IBC. While blockchain technology offers intrinsic advantages – such as

[43] Information Technology Act 2000, s. 35.
[44] Bhartiya Sakshya Adhiniyam 2023, s. 90.
[45] STA Law Firm, 'The Enforceability of Smart Contracts in India' (*Mondaq*, 13 December 2019) <https://www.mondaq.com/india/contracts-and-commercial-law/874892/the-enforceability-of-smart-contracts-in-india> accessed 10 October 2024.

transparency, immutability, and security – that a significantly improve record-keeping and reduce information asymmetry in insolvency cases, its full integration into the Indian insolvency framework is impeded by the lack of statutory recognition. A clear legal and regulatory roadmap that aligns blockchain authentication methods with existing digital signature laws would be essential to unlocking the technology's potential within the IBC ecosystem.

Nonetheless, the Indian government has shown growing interest in blockchain adoption. In December 2021, the Indian government released a revised "National Strategy on Blockchain"[46] with the aim of establishing a robust blockchain infrastructure to support the development and adoption of application-based technologies, including smart contracts. While the strategy acknowledged the potential of self-executing electronic contracts, it stops short of providing a concrete legal framework for their regulation or enforceability. At this stage, the strategy represents an encouraging policy direction rather than binding legal recognition. It highlights the government's intent to promote the use of smart contracts for more efficient and automated business processes, framing them as a form of pre-emptive self-help. However, until formal legislation or regulatory guidelines are introduced, the legal standing of smart contracts in India remains largely interpretative and dependent on traditional contract law principles.

[46] Ministry of Electronics & Information Technology, 'National Strategy on Blockchain' (2021) <https://www.meity.gov.in/writereaddata/files/National_BCT_Strategy.pdf> accessed 10 October 2024.

Furthermore, through statutory measures, the Code provides a comprehensive framework for regulating Information Utilities. In accordance with particular technical specifications, IUs offer "core services." Notably, the guidelines state that the goal of these standards is to be platform and technology-neutral, meaning that each "IU can exercise its own choice" and that no "specific choice of technology or platform" should be given preference. This is crucial because, without any limitations, IUs may be able to adopt and test new technologies – such as blockchain – to carry out their duties under the Code. When multiple IUs – each maintaining their own financial records – need to share and update data at the same time, using a shared blockchain system can offer a more secure and efficient solution. A decentralized blockchain network, accessible to all registered IUs, would ensure immutability, consistency, and real-time access to transactional data – core principles that align with the IBC's regulatory emphasis on transparency, data integrity, and reducing information asymmetry. By leveraging blockchain to generate unique user IDs and maintain tamper-proof transactional records, identity verification and record-keeping processes for creditors, corporate debtors (CD), and other IU users can be significantly enhanced.

Although the theoretical advantages of blockchain are well-recognized, practical adoption by IUs in India remains limited. However, the Indian government has taken steps toward promoting blockchain integration. For instance, the Ministry of Electronics and Information Technology (MeitY) launched the "Vishvasya" Blockchain Technology Stack in 2024, aimed at providing Blockchain-as-a-Service for use in regulated domains, including finance and legal infrastructure. These developments

suggest a growing institutional appetite for blockchain adoption, and launching dedicated pilot programs with clear regulatory guidelines for IU implementation under the IBC would be a crucial step toward operationalizing this vision.

The use of blockchains in asset management, especially real estate, has shown efficiency improvements in other industries as well. These gains may be mirrored in the context of insolvency resolution, which could encourage stakeholders to invest in stressed assets in India[47]. According to the Code, Resolution Professionals (RPs) and other relevant parties must identify, verify, preserve, value, and maintain records of a CD's assets. "Reduce costs, increase operational efficiency, improve transparency, and facilitate a range of innovative investments"[48] are perhaps possible outcomes of using blockchain systems for the management of such stressed assets. These could fill important informational gaps and facilitate a speedy insolvency resolution by enabling a transparent record-keeping of a CD's assets, with this information being accessible in real-time to all relevant stakeholders in a tamper-proof format.[49]

[47] Insolvency and Bankruptcy Board of India, 'Quinquennial of Insolvency and Bankruptcy Code, 2016' (2021) <https://ibbi.gov.in/uploads/whatsnew/1d8b31fc65f7ac6f09a973be8f12f868.pdf> accessed 15 October 2024.
[48] 'Blockchain: Forging the Future of Asset Management' (*BDO*, 17 August 2020) <https://www.bdo.com/insights/industries/financial-services/blockchain-forging-the-future-of-asset-management> accessed 15 October 2024.
[49] ibid.

VI. GLOBAL PERSPECTIVES FROM UAE AND SINGAPORE

Blockchain technology and smart contracts are transforming legal frameworks worldwide, including insolvency laws. Notably, the United Arab Emirates (UAE) and Singapore have pioneered integrating these technologies into legal processes, offering insights into potential applications in India's insolvency landscape.

The UAE, particularly Dubai, has positioned itself as a global blockchain hub, launching the world's first blockchain court in 2018. This initiative aims to streamline legal processes by using smart contracts to automate administrative tasks and enforceable agreements. In insolvency cases, smart contracts can execute creditor payouts based on predefined rules, reducing manual errors and delays in processing claims. Blockchain technology ensures that all transactions, claims, and asset transfers are recorded immutably, preventing disputes related to the authenticity of records.[50]

The Dubai International Financial Centre (DIFC) Courts have partnered with Smart Dubai to create a blockchain-powered dispute resolution framework. This arrangement focuses on cross-border disputes, aiming to speed up resolution and minimize legal uncertainties.[51] In the context

[50] Charles Ho Wang Mak, 'Navigating the Multi-Jurisdiction Landscape of Blockchain and Competition Law' (*Kluwer Competition Law Blog*, 18 February 2023) <https://competitionlawblog.kluwercompetitionlaw.com/2023/02/18/navigating-the-multi-jurisdiction-landscape-of-blockchain-and-competition-law/> accessed 10 October 2024.

[51] Julien Chaisse and Jamieson Kirkwood, 'Smart Courts, Smart Contracts, and the Future of Online Dispute Resolution' (2022) Stanford Journal of Blockchain Law & Policy <https://stanford-jblp.pubpub.org/pub/future-of-odr/release/1> accessed 15 December 2024.

of insolvency, such technology can facilitate cooperation between jurisdictions by providing a unified ledger accessible to all stakeholders.[52]

The UAE's integration of blockchain into legal procedures highlights the importance of transparency and automation in reducing legal bottlenecks. By allowing the enforcement of smart contracts that govern creditor agreements and asset distributions, the system minimizes human intervention and speeds up the insolvency process.

Similarly, Singapore has also embraced blockchain technology across various sectors, including finance and legal services. Although there is no formal blockchain-based insolvency framework, the use of blockchain in automating financial agreements and asset tracking serves as a pioneer to its potential application in insolvency cases.[53] This automation can be extended to insolvency proceedings by verifying creditor claims, prioritizing payments, and tracking asset liquidation in real-time. Singapore's regulatory environment supports these innovations, with the Monetary Authority of Singapore (MAS) enabling a legal framework that recognizes smart contracts as enforceable agreements.[54]

[52] ibid.
[53] Dharma Sadasivan, 'Cryptocurrency, the Blockchain, and Legal Regulation in Singapore' (*BR Law*, 7 May 2018) <https://www.brlawcorp.com/news-and-insights/cryptocurrency-the-blockchain-and-legal-regulation-in-singapore> accessed 15 October 2024.
[54] Pietro Ortolani, 'The Impact of Blockchain Technologies and Smart Contracts on Dispute Resolution: Arbitration and Court Litigation at the Crossroads' (2019) 24(2) Uniform Law Review <https://academic.oup.com/ulr/article/24/2/430/5490658> accessed 10 October 2024.

India's IBC can benefit significantly from these global perspectives by adopting blockchain and smart contracts. The UAE's experience demonstrates the effectiveness of automating administrative tasks and enforcing legal agreements through smart contracts. India could implement smart contracts to automate creditor payouts, prioritize claims, and streamline asset liquidation processes. This would not only reduce delays but also ensure greater accuracy in the distribution of proceeds. Both the UAE and Singapore leverage blockchain's immutable ledger to enhance transparency and prevent disputes over the authenticity of records. Incorporating blockchain into India's insolvency framework could reduce fraudulent activities such as asset stripping, ensuring that all transactions are publicly verifiable and tamper-proof.

As also seen in Singapore, blockchain's decentralized nature facilitates coordination across jurisdictions. India can utilize this technology to streamline cross-border insolvency cases by providing a shared platform for international stakeholders. This would address current challenges related to the recognition and enforcement of foreign insolvency judgments. India can also look to Singapore's regulatory environment, where smart contracts are recognized as enforceable under existing legal frameworks. The IBC could incorporate similar provisions to provide legal recognition to blockchain records and smart contracts, paving the way for modernizing the insolvency process.

VII. CONCLUSION

The integration of blockchain technology and smart contracts into India's IBC presents an opportunity to address the systemic flaws in insolvency proceedings, such as delays, human errors, and disputes over

asset distribution. Blockchain's transparent, decentralized, and immutable ledger ensures that all stakeholders have access to accurate and real-time data, reducing the risks of fraudulent asset transfers, hidden liabilities, and tampering with financial records. Smart contracts can automate key processes, including creditor claims verification and payout distributions, expediting the resolution timeline and minimizing human intervention. These technologies could make insolvency proceedings more efficient, cost-effective, and reliable.

However, the successful adoption of these technologies requires overcoming significant regulatory and legal challenges. India does not currently recognize blockchain-based records or smart contracts as legally enforceable, creating a barrier to their integration into the insolvency process. Amendments to the IBC will be necessary to accommodate these technologies, providing legal recognition to blockchain-based agreements and outlining clear dispute resolution mechanisms for smart contracts. Furthermore, the Digital Personal Data Protection Act must align with blockchain's decentralized framework to address privacy and security concerns, ensuring compliance without undermining the technology's benefits.

Lessons from the UAE and Singapore offer valuable insights into how India can approach the integration of blockchain into their insolvency framework. The UAE's focus on smart courts and blockchain-powered legal processes highlights the importance of transparency and automation, while Singapore's efforts demonstrate how a conducive regulatory environment can facilitate the use of new technologies in cross-border transactions. By adopting similar strategies, India can

enhance cooperation in cross-border insolvencies, making it easier to track and manage assets across borders.

Incorporating blockchain into the IBC will require collaboration between regulators, legal professionals, and technology providers. The IBBI will need to develop guidelines and frameworks for blockchain adoption, ensuring consistency in its application. Training programs for insolvency professionals and judges will also be essential to ensure effective implementation.

In conclusion, the adoption of blockchain and smart contracts under the IBC has the potential to revolutionize insolvency proceedings, making them faster, more transparent, and resistant to fraud. However, this transformation will require significant regulatory reforms, careful planning, and collaboration among various sectors. Once implemented successfully, blockchain technology will not only improve the efficiency of India's insolvency framework but also enhance the country's standing as the perfect destination for foreign investment by fostering a reliable environment for businesses.