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Smart Contracts: Advancements and a Glance on Legal Frameworks in India, USA, UK, and Indonesia

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ABSTRACT

Technological advancements, particularly in blockchain technology, have catalyzed a paradigm shift in the regulation of commercial contracts, prominently exemplified by smart contracts. This paper explores the transformative impact of smart contracts on contract law and regulatory frameworks. Beginning with an overview of smart contracts, defined as self-executing agreements operating on blockchain platforms, the study examines their operational mechanics and distinct advantages, including efficiency, transparency, and reduced transaction costs. However, concerns such as privacy risks and legal enforceability challenges are also addressed. This paper investigates the transformative impact of smart contracts on contract law and regulatory frameworks, driven by advancements in blockchain technology. Smart contracts, self-executing agreements on blockchain platforms, offer efficiency, transparency, and reduced transaction costs but also raise concerns about privacy and legal enforceability. Using a comparative case study approach, the study analyzes regulatory responses to smart contracts across jurisdictions. Countries like the United States and Singapore lead efforts in legal reform to integrate smart contracts into commercial law, while the European Union adopts a cautious approach balancing innovation with consumer protection. Additionally, the paper explores smart contracts under Islamic law, emphasizing principles like contractual consent and compliance with Shariah in digital transactions.

Keywords: Smart Contracts, Technological Development, Blockchain.

I. INTRODUCTION

A contract represents a fundamental agreement between two parties, expressing mutual consent to create legal obligations and rights. It arises from an offer made by one party and is formalized upon acceptance by the other, governing essential commercial actions like purchasing, renting, or contracting.³ The rapid advancement of technology, especially in commercial transactions,

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³ Daniel Markovits & Emad Atiq, *Philosophy of Contract Law*, in THE STANFORD ENCYCLOPEDIA OF PHILOSOPHY (Edward N. Zalta ed., Winter 2021 ed. 2021), <https://plato.stanford.edu/archives/win2021/entries/contract-law/>

has significantly influenced contract regulation. To keep pace with these developments and provide a stable regulatory framework that ensures predictability and security, there is a growing call for a unified global commercial law framework, as highlighted in studies such as those conducted by the White House.

Central to these technological advancements is the emergence of smart contracts, applications operating on blockchain technology.⁴ Unlike traditional contracts, smart contracts automate actions based on predefined terms, eliminating the need for intermediaries, central authorities, or legal oversight. This digital evolution streamlines processes, saving time, effort, and costs associated with conventional contract execution. Smart contracts represent a paradigm shift in contract enforcement, leveraging automated execution mechanisms to resolve legal disputes efficiently. Their integration into contemporary commerce underscores their necessity and transformative potential in replacing traditional contracting methods.⁵

II. THE CONCEPT OF SMART CONTRACT

The concept of smart contracts originated in the mid-1990s with Nick Szabo, an American legal scholar, computer programmer, and cryptographer. Smart contracts are essentially agreements written in code and stored on a blockchain, designed to streamline business operations by eliminating the high costs associated with traditional contract preparation, potential interference, opportunism, and the ambiguities of natural language. These contracts use automated algorithms to self-execute when specific conditions are met, ensuring automatic agreement fulfillment without reliance on centralized authorities.

It's important to note that a "smart contract" can function independently of a traditional legal contract, though it doesn't equate to one. The term "legal smart contract" is increasingly used to emphasize its enforceability within legal frameworks. In essence, a "legal smart contract" is a legally valid agreement, partly represented as formal documentation that performs contractual actions using a computer system, prioritizing transaction efficiency.

The foundational idea for smart contracts was further developed in 1997 with Szabo's ideal internet protocol, which aimed to enhance contract implementation efficiency while emphasizing compliance and the significance of contractual obligations (*pacta sunt servanda*). The technical prerequisites for Ethereum and the operational viability of smart contracts were

(last visited Jun 26, 2024).

⁴ Shafaq Naheed Khan et al., *Blockchain Smart Contracts: Applications, Challenges, and Future Trends*, 14 PEER-TO-PEER NETW. APPL. 2901 (2021), <https://doi.org/10.1007/s12083-021-01127-0> (last visited Jun 26, 2024).

⁵ Abderahman Rejeb et al., *Blockchain Technology in the Smart City: A Bibliometric Review*, 56 QUAL QUANT 2875 (2022), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8493053/> (last visited Jun 26, 2024).

laid out in 2008 with the advent of cryptocurrencies and blockchain technology.

The implementation of smart contracts began in 2013, gaining momentum from 2015 when Vitalik Buterin utilized Ethereum to execute the first fully functional and enforceable smart contract. This innovation allows transactions, like property transfers, to be automatically concluded once predefined blockchain conditions are met, bypassing the need for intermediaries such as lawyers or notaries.⁶ Ethereum ensures transaction reliability through its public ledger, enabling users to verify transaction origins and details. Each smart contract on Ethereum is associated with a unique address accessible only through cryptographic keys, offering secure and transparent transaction management. Participants can deactivate and reactivate contract addresses as needed while retaining historical transaction information.⁷

III. APPLICATIONS TO ORGANIZING COMMERCIAL CONTRACTS USING SMART CONTRACTS

(A) Lease Contract

In the realm of real estate transactions, the concept of tokenizing properties introduces innovative possibilities, particularly in facilitating leasing arrangements rather than outright sales.⁸ By converting a property into a tokenized asset, the focus shifts towards establishing leasing agreements supported by smart contracts. Unlike traditional lease contracts, which often rely on cumbersome paperwork and manual processes, smart contracts streamline and automate the entire leasing lifecycle.

A smart contract executed on a blockchain platform can specify detailed terms of the lease agreement. This includes parameters such as the rental fee, payment schedule, duration of the lease, and conditions for renewal or termination. Blockchain technology ensures that these terms are transparent, immutable, and automatically enforced, mitigating potential disputes and enhancing trust between parties.⁹

Integration with IoT (Internet of Things) further augments the functionality of smart contracts

⁶ Yongshun Xu, Heap-Yih Chong & Ming Chi, *A Review of Smart Contracts Applications in Various Industries: A Procurement Perspective*, 2021 *ADVANCES IN CIVIL ENGINEERING* 5530755 (2021), <https://onlinelibrary.wiley.com/doi/abs/10.1155/2021/5530755> (last visited Jun 26, 2024).

⁷ Alex Lipton & Stuart Levi, *An Introduction to Smart Contracts and Their Potential and Inherent Limitations*, *THE HARVARD LAW SCHOOL FORUM ON CORPORATE GOVERNANCE* (May 26, 2018), <https://corpgov.law.harvard.edu/2018/05/26/an-introduction-to-smart-contracts-and-their-potential-and-inherent-limitations/> (last visited Jun 26, 2024).

⁸ Rashikala Weerawarna, Shah J. Miah & Xuefeng Shao, *Emerging Advances of Blockchain Technology in Finance: A Content Analysis*, 27 *PERS UBIQUIT COMPUT* 1495 (2023), <https://doi.org/10.1007/s00779-023-01712-5> (last visited Jun 26, 2024).

⁹ Hamed Taherdoost, *Smart Contracts in Blockchain Technology: A Critical Review*, 14 *INFORMATION* 117 (2023), <https://www.mdpi.com/2078-2489/14/2/117> (last visited Jun 26, 2024).

in real estate leasing. For instance, IoT sensors and devices can automate the collection of rental payments.¹⁰ If a tenant fails to make a scheduled payment, smart IoT-enabled mechanisms can restrict access to the property until the payment is received, thereby ensuring compliance with the terms of the lease agreement.

Moreover, the use of IoT extends beyond payment automation. It can include functionalities such as remote monitoring of property conditions, automated maintenance requests, and enhanced security measures. For example, smart locks controlled via IoT can grant or restrict access to the property based on the status of rental payments, ensuring seamless management of tenant access and security.

The combination of blockchain and IoT technologies not only simplifies and secures the rental process but also offers scalability and efficiency advantages over traditional methods.¹¹ By tokenizing real estate assets and employing smart contracts with IoT integration, property owners and tenants alike benefit from increased transparency, reduced administrative overhead, and enhanced operational control throughout the leasing lifecycle.

(B) Mortgages Contract

Smart contracts (SCs) offer transformative potential in streamlining and securing mortgage-related activities within the real estate industry. By leveraging smart contracts, the processes associated with purchasing property can be accelerated, made more cost-effective, and significantly enhanced in terms of security.

Traditionally, mortgage transactions involve multiple intermediaries, extensive paperwork, and time-consuming verification processes. Smart contracts simplify this complexity by automating many aspects of the transaction, thereby reducing the time required for buyers to finalize their purchases and gain access to their new properties.

One of the key advantages of using smart contracts in mortgage transactions is the ability to digitize and automate payment processes. Instead of relying on manual verification and authorization steps, smart mortgage contracts facilitate instantaneous digital payments once all conditions of the contract are met. This not only expedites the transfer of funds but also ensures that transactions are executed securely and transparently.

Moreover, smart contracts can update property ownership records in real-time on a blockchain

¹⁰ Ahmed G. Gad et al., *Emerging Trends in Blockchain Technology and Applications: A Review and Outlook*, 34 JOURNAL OF KING SAUD UNIVERSITY - COMPUTER AND INFORMATION SCIENCES 6719 (2022), <https://www.sciencedirect.com/science/article/pii/S1319157822000891> (last visited Jun 26, 2024).

¹¹ Daniel Macrinici, Cristian Cartoceanu & Shang Gao, *Smart Contract Applications within Blockchain Technology: A Systematic Mapping Study*, 35 TELEMATICS AND INFORMATICS (2018).

ledger. When a transaction is completed and funds are transferred, the smart contract automatically updates the property rights data to reflect the change in ownership. This eliminates the delays and potential errors associated with manual recording and ensures an accurate and tamper-proof record of ownership.

Security is another critical benefit offered by smart mortgage contracts. Transactions executed through smart contracts are inherently more secure because they rely on cryptographic principles and decentralized verification mechanisms. Each party involved in the transaction must authenticate their identity using cryptographic keys, which significantly reduces the risk of fraud and unauthorized access.¹²

Furthermore, the use of smart contracts minimizes the need for intermediaries and associated costs. By automating most of the transactional processes, smart contracts help in reducing overhead expenses, making mortgage transactions more affordable for both buyers and sellers.

(C) Understanding the Legal Framework of Contracts

Contracts form the backbone of legal relationships, ensuring that agreements between parties are not merely promises but enforceable obligations under the law. When parties enter into a contract, they commit to specific terms and conditions that govern their interactions and outline the consequences of non-compliance.¹³

The legal framework surrounding contracts serves several crucial functions. Firstly, it holds parties accountable for fulfilling their promises. If a party fails to honor their obligations as stipulated in the contract, they can be compelled by law to perform as agreed, compensate the other party for damages incurred, or face other legal consequences.

Smart contracts represent a technological evolution of traditional contracts, operating on blockchain technology to automate and enforce contractual agreements. Once parties agree to the terms of a smart contract and it is deployed on the blockchain, those terms are immutable and automatically executed according to predefined conditions. This immutability ensures that the agreement cannot be altered unilaterally at a later date without mutual consent.

However, the implementation of smart contracts raises unique challenges regarding the accurate translation of human intentions into computer code. Errors in the code or unforeseen circumstances can lead to unintended consequences or disputes between parties. In such cases,

¹² Kajol Wadhvani, *Smart Contracts and Their Role in Blockchain Development*, BLOCKCHAIN TECHNOLOGY, MOBILITY, AI AND IOT DEVELOPMENT COMPANY USA, CANADA (Nov. 29, 2023), <https://www.solulab.com/smart-contracts-in-blockchain-development/> (last visited Jun 26, 2024).

¹³ Macrinici, Cartoceanu, and Gao, *supra* note 11.

legal intervention may be necessary to interpret the true intentions of the parties based on their prior interactions and communications.¹⁴

Moreover, smart contracts have the capability to automate various legal functions beyond simple transactions. They can facilitate the creation of new contracts based on predefined conditions, such as accepting offers or triggering actions like terminating a lease if rent payments are not made on time. This automation streamlines processes and reduces the need for manual oversight, enhancing efficiency and reducing the potential for human error.

a. Is the software a party to the contract?

The role of software in contracts, especially in the context of smart contracts, raises intriguing questions about legal status and enforceability. Typically, software is viewed not as a party to a contract but as a tool or intermediary facilitating communication and execution between actual parties involved in the agreement.

Software, in most cases, operates on behalf of users or entities, helping to transmit information, process transactions, and automate certain contractual obligations.¹⁵ It does not possess legal capacity on its own to enter into contracts independently. However, there is ongoing discussion about whether software could potentially be granted legal status in the future, akin to an autonomous agent capable of entering into agreements.¹⁶

In current practice, software's role in contracts is primarily that of a messenger or facilitator. It aids parties in interacting with each other or with the contract's terms and conditions. This distinction is crucial because it clarifies that while software may be integral to the execution and enforcement of a smart contract, it does not constitute a separate legal entity capable of assuming legal rights and obligations on its own.¹⁷

When parties engage in smart contracts, whether in commercial relationships or otherwise, it is presumed that they intend to create legal relations. This presumption holds true in both traditional contracts and smart contracts, emphasizing that parties expect their agreements to be legally binding and enforceable under the law.

The critical aspect in contract law is the objective intent of the parties involved, demonstrated through their actions rather than their subjective thoughts or feelings. As famously articulated

¹⁴ Panagiotis Vionis & Theodore Kotsilieris, *The Potential of Blockchain Technology and Smart Contracts in the Energy Sector: A Review*, 14 APPLIED SCIENCES 253 (2024), <https://www.mdpi.com/2076-3417/14/1/253> (last visited Jun 26, 2024).

¹⁵ Tina Balke & Torsten Eymann, *The Conclusion of Contracts by Software Agents in the Eyes of the Law*, 2 771 (2008).

¹⁶ *Id.*

¹⁷ Macrinici, Cartofeanu, and Gao, *supra* note 11.

by Judge Learned Hand, contracts are about the objective manifestation of intent through actions and words that establish clear obligations.

Smart contracts, written in code and executed automatically, introduce complexities not typically found in traditional contracts.¹⁸ The code must accurately reflect the parties' intentions; otherwise, unintended consequences may arise. Mistakes in code can lead to contract executions that do not align with the parties' actual agreements, necessitating corrections or revisions through new smart contracts.

Despite these complexities, many experts argue that smart contracts do not fundamentally alter the intention to create legal relations. Even if smart contracts operate under different rules than traditional contract law, as long as their outcomes are consistent with legal principles, they can still be considered legally binding agreements.

IV. CAPACITY TO ENTER INTO A CONTRACT

Contracts must possess legal capacity to be considered valid and enforceable. Blockchain platforms such as Ethereum enable individuals, including minors and those lacking legal capacity, to enter into smart contracts.¹⁹ However, if a party lacks legal capacity, the contract can be challenged and invalidated through legal means. In smart contracts, parties are represented by cryptographic private keys, which complicates the identification of legal capacity, especially in cases where the parties are not human entities.²⁰

One of the risks associated with smart contracts is the potential for parties to engage without knowing each other's identities, increasing the likelihood of inadvertently contracting with a minor. This anonymity in online transactions could render the agreement unenforceable. Implementing effective age verification mechanisms before executing transactions on a blockchain may be necessary but challenging to enforce consistently. Additionally, the enforceability of a contract depends on the jurisdiction in which it is formed and whether it falls under specific exceptions, such as contracts deemed essential for basic needs.

Smart legal contracts introduce two critical properties that traditional contracts lack:

¹⁸ Jeremy Sklaroff, *Smart Contracts and the Cost of Inflexibility*, PRIZE WINNING PAPERS (2018), https://scholarship.law.upenn.edu/prize_papers/9.

¹⁹ Cristina Poncibò & Larry A. DiMatteo, *Smart Contracts: Contractual and Noncontractual Remedies*, in THE CAMBRIDGE HANDBOOK OF SMART CONTRACTS, BLOCKCHAIN TECHNOLOGY AND DIGITAL PLATFORMS 118 (Cristina Poncibò, Larry A. DiMatteo, & Michel Cannarsa eds., 2019), <https://www.cambridge.org/core/books/cambridge-handbook-of-smart-contracts-blockchain-technology-and-digital-platforms/smart-contracts/204763D373B82BD527FB4E98EC98A36B> (last visited Jun 26, 2024).

²⁰ MANUEL JOSÉ FERNÁNDEZ IGLESIAS, INTRODUCTION TO BLOCKCHAIN, SMART CONTRACTS AND DECENTRALIZED APPLICATIONS (2023).

executability and statefulness.²¹ Executability allows a contract to be processed as a set of machine-readable instructions, enabling it to respond dynamically to inputs and produce outputs accordingly. Statefulness enables the contract's conditions to be stored and updated based on the events that occur during its execution. These properties enhance the flexibility and responsiveness of smart contracts, transforming them into dynamic artifacts capable of adapting to changing circumstances in real-time.

V. ADVANTAGES OF SMART CONTRACTS

(A) Elimination Judiciary Intervention

Smart contracts are highly advantageous because they remove the necessity for judicial interpretation of contract legitimacy.²² They eliminate disputes over contract wording and whether both parties genuinely agreed to its terms. A smart contract only activates once all relevant conditions are met and verified, ensuring transparency and preventing deceptive verbal agreements.

Enhanced Security

When employing smart contracts, traditional negotiations and verbal assurances become obsolete. Smart contracts provide a precise and secure record of all terms, leaving no room for miscommunication or questionable business practices. They ensure that all parties receive identical information simultaneously, significantly reducing the likelihood of dishonest transactions or contract discrepancies.

(B) Safe and Clear

Blockchain technology enhances the security of smart contracts significantly. Once a smart contract is set up, it remains immutable unless all parties consent to changes. This transparency builds trust among all participants involved in the contract.

(C) Eliminate All Middlemen

Smart contracts eliminate the need for intermediaries, thereby saving time and money. Verification of the contract can be achieved autonomously without relying on third parties,

²¹ Angelo Borselli, *Smart Contracts in Insurance: A Law and Futurology Perspective*, in INSURTECH: A LEGAL AND REGULATORY VIEW 101 (Pierpaolo Marano & Kyriaki Nousseia eds., 2020), https://doi.org/10.1007/978-3-030-27386-6_5 (last visited Jun 26, 2024).

²² Oscar Borgogno, *Usefulness and Dangers of Smart Contracts in Consumer Transactions*, in THE CAMBRIDGE HANDBOOK OF SMART CONTRACTS, BLOCKCHAIN TECHNOLOGY AND DIGITAL PLATFORMS 288 (Cristina Poncibò, Larry A. DiMatteo, & Michel Cannarsa eds., 2019), <https://www.cambridge.org/core/books/cambridge-handbook-of-smart-contracts-blockchain-technology-and-digital-platforms/usefulness-and-dangers-of-smart-contracts-in-consumer-transactions/EF1E89AE07194C7F4ECF6BF89A36D13D> (last visited Jun 26, 2024).

resulting in cost savings for all involved parties.

(D) Automated Upgrades

Smart contracts have the capability to update themselves autonomously, without human intervention. This not only saves time but also ensures that the contract remains current without additional effort.

VI. LIMITATION OF SMART CONTRACT

As smart contracts gain popularity, there is a potential need for lawyers to familiarize themselves with coding principles to ensure accurate translation of legal terms and procedures into appropriate programming languages.²³ This could be integrated into their ongoing professional development requirements or through collaboration between the legal industry and blockchain experts to establish standards and customizable smart contract templates tailored to client needs. However, there are significant challenges associated with this approach. Training legal professionals in coding is a time-consuming and costly process that can strain firm resources. Moreover, there remains uncertainty about widespread acceptance of blockchain technology across all sectors of business and society.

Smart contracts differ from traditional contracts in that they function more like applications, bridging the gap between agreement development and execution.²⁴ Unlike formal agreements, which rely on voluntary compliance or court enforcement, smart contracts are written in code and executed automatically on a blockchain when predefined conditions are met.

One challenge is the lag in case law adaptation to technological advancements. Courts typically recognize traditional paper documents that manifest parties' intentions, whereas smart contracts exist as program code on a decentralized ledger. This discrepancy highlights a potential barrier in legal recognition, but it should not impede parties from choosing how to formalize contracts and utilize technological solutions, especially in less formal contractual contexts.

VII. SMART CONTRACT AND ISLAMIC LAW

In accordance with Sharia law, a contract involves an *ijab* (declaration) from one party and a *qabul* (acceptance) from another, imposing mutual obligations and legal consequences based on the contract's objectives. Islamic principles emphasize clarity and comprehensiveness in contracts to ensure their legality and enforceability.²⁵

²³ *Id.*

²⁴ Mateja Durovic & Andre Janssen, *The Formation of Smart Contracts and Beyond: Shaking the Fundamentals of Contract Law?* (2018).

²⁵ Mahmoud Fayyad, *Reconstructing Lease-to-Own Contracts: A Contemporary Approach to Islamic Banking*

Smart contracts, however, present challenges in meeting these Islamic legal standards. Unlike traditional contracts, smart contracts often lack the ability to specify real-time conditions comprehensively.²⁶ For instance, in dynamic transactions like purchasing solar energy where prices and volumes fluctuate, smart contracts struggle to accurately capture and execute such variable terms autonomously. This raises questions about how effectively smart contracts can adhere to Sharia law's requirement for contracts to be clear and detailed.

Moreover, the concept of smart contracts must be evaluated against Islamic contract law, which mandates adherence to Sharia principles and safeguards for all parties involved. Islamic contract law prohibits flaws such as deception, coercion, and manipulation. Given that smart contracts operate in a decentralized manner, emphasizing autonomy and pseudonymity, there are concerns that unscrupulous parties could exploit these features to engage in activities contrary to Islamic principles.²⁷

Smart contracts must align with Islamic law requirements, including ensuring transactions are halal (permissible), following procedural sequences prescribed by Sharia law, and maintaining fixed prices throughout the contract duration.²⁸ These criteria are essential to uphold the ethical and legal integrity expected under Islamic contracts.

On the other hand, certain aspects of smart contracts, such as the autonomy and contractual parties involved, may not fully conform to Sharia law. Issues like gharar (excessive uncertainty) arise, especially in transactions involving cryptocurrencies, which are viewed with caution under Islamic finance principles.²⁹

Furthermore, the subject matter of smart contracts can introduce risks incompatible with Sharia principles, such as transactions involving usury, illegal goods, or uncertain assets (gharar substances).³⁰ These elements pose challenges in managing risks and upholding the ethical standards prescribed by Sharia law.

(A) Cases of rejection of smart contracts

a. INDIA

Standards, 9 HELIYON e19319 (2023), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10474404/> (last visited Jun 26, 2024).

²⁶ Nurul Syazwani Mohd Noor, Muhammad Hakimi Mohd Shafiai & Abdul Ghafar Ismail, *The Derivation of Shariah Risk in Islamic Finance: A Theoretical Approach*, 10 JOURNAL OF ISLAMIC ACCOUNTING AND BUSINESS RESEARCH 663 (2019).

²⁷ Dr Jalil & Muhammad Rahman, *Islamic Law of Contract Is Getting Momentum*, 1 INTERNATIONAL JOURNAL OF BUSINESS AND SOCIAL SCIENCE 175 (2010).

²⁸ Norafni Rahim, Mohammed Bakri & Siti Yahaya, *Fintech and Shariah Principles in Smart Contracts* 207 (2019).

²⁹ Lipton and Levi, *supra* note 7.

³⁰ Article Detail, INTERNATIONAL JOURNAL OF ADVANCED RESEARCH, <https://www.journalijar.com/article/> (last visited Jun 26, 2024).

India has responded negatively to the rise of cryptocurrencies despite acknowledging the potential benefits of blockchain technology for financial inclusivity and efficiency.³¹ The Reserve Bank of India (RBI), the country's primary regulatory authority, has consistently expressed caution regarding cryptocurrencies. Concerns over consumer protection, security risks, and potential for financial crimes have prompted government agencies like the Finance Ministry, RBI, and Central Board of Direct Taxes (CBDT) to actively discourage cryptocurrency trading since 2013.³²

In April 2018, the RBI issued a circular directing all financial institutions to cease dealing with virtual currencies entirely. The government's stance on cryptocurrencies remains ambiguous due to ongoing apprehensions about consumer safety, market stability, and concerns regarding illicit activities such as money laundering. Recent reports from reputable media outlets suggest that the government is considering legislation to ban cryptocurrency trading, a move that could significantly impact the cryptocurrency market if implemented.³³

b. UNITED KINGDOM

The "Legal Statement on Crypto assets and Smart Contracts" by the UK Jurisdiction Taskforce clarifies two critical points in legal theory.³⁴ Firstly, it asserts that the use of software alone cannot establish legal obligations between parties beyond what traditional contract law permits. This challenges the notion that automatic outcomes generated by software in smart contracts inherently create legally enforceable duties for parties, especially when property transfer occurs outside of a formal contractual framework. Secondly, the statement argues that if a legal relationship must exist between parties for a smart contract to be valid, there is no reason to treat smart contracts differently in principle from traditional contracts. This position forms the crux of the debate between cyber-purists advocating for a future where "code is law," where software-driven transactions are considered valid and enforceable under legal standards.

(B) Cases of Support of Smart Contracts

Smart contracts are gaining international recognition, exemplified by initiatives such as UNICEF's development of a prototype aimed at improving transparency and accountability in

³¹ Anup Saha, Suborna Barua & Shobod Nath, *Blockchain for Financial Technology: Challenges and Opportunities for India* (2021).

³² RBI governor Shaktikanta Das has two word warning for cryptocurrency investors in India, THE TIMES OF INDIA, Jan. 21, 2024, <https://timesofindia.indiatimes.com/gadgets-news/rbi-governor-shaktikanta-das-warns-indian-cryptocurrency-investors/articleshow/106925220.cms> (last visited Jun 26, 2024).

³³ Mondaq's Comparative Guide to Blockchain (India), AZB, <https://www.azbpartners.com/bank/mondaq-comparative-guide-to-blockchain-india/> (last visited Jun 26, 2024).

³⁴ Sarwat Jahan et al., *Towards Central Bank Digital Currencies in Asia and the Pacific: Results of a Regional Survey* (2022), <https://www.elibrary.imf.org/view/journals/063/2022/009/article-A001-en.xml> (last visited Jun 26, 2024).

partnerships. The UN Economic and Social Council has drafted guidelines emphasizing the use of blockchain technology for trade facilitation. Additionally, the United Nations Commission on International Trade Law (UNCITRAL) has endorsed the adoption of smart contracts. At the national level, several U.S. states including Nevada, Arizona, Wyoming, and Tennessee have passed legislation integrating smart contracts into their legal frameworks.

a. UNITED STATE

Vermont has enacted House Bill 868, which legitimizes blockchain transactions and specifies that digital records can be admitted as evidence in court. Similarly, states like California, New York, Illinois, Virginia, Arizona, Washington, and Ohio have also introduced legislation to regulate blockchain technology, smart contracts, and recognize cryptocurrencies as valid forms of currency. These laws mandate the use of smart contracts and digital records.

Arizona's HB 2417 shares many definitions with Nevada's SB 3985, both focusing on electronic transactions and authorizing the use of blockchain technology. The bill explicitly prohibits local governments from imposing taxes or restrictions on the use of blockchain technology, smart contracts, or related applications. It also integrates blockchain and smart contracts into definitions concerning electronic contracts and records. The legislation affirms that smart contracts can fulfill contractual obligations, and electronic records stored on a blockchain cannot be invalidated solely because of their blockchain storage.

Moreover, the bill clarifies that the use of a blockchain for generating, storing, or verifying smart contracts, records, or signatures does not automatically confer legal effect or enforceability.³⁵ However, it underscores that such usage should not preclude the admissibility of these items as evidence in legal proceedings. Additionally, the legislation outlines specific scenarios where blockchain may not be suitable for disseminating warnings, such as product recalls that affect public health or safety.

b. INDONESIA

According to Bank Indonesia Regulation No. 19/12/PBI/2017, blockchain technology is recognized as legal and is implemented within the financial technology framework, specifically in payment systems.³⁶ The regulation aims to facilitate processes such as authorization, clearing, final settlement, and payment settlements.³⁷

³⁵ Uni Putri & Nikmah Mentari, *The Legal Perspective of Blockchain's Potential Use For Sharia Banking Institutions In Indonesia* HANG TUAH LAW JOURNAL, 6 HANG TUAH LAW JOURNAL 1 (2022).

³⁶ Soehartono & Umi Khaerah Pati, *The Regulation of Cryptocurrency Investation in Indonesia* (2019).

³⁷ Devkant Kala & Dhani Shanker Chaubey, *Cryptocurrency Adoption and Continuance Intention among Indians: Moderating Role of Perceived Government Control*, 25 DIGITAL POLICY, REGULATION AND GOVERNANCE 288

Under Articles 5 to 12 of Law Number 11 of 2008 concerning Information and Electronic Transactions, as amended by Law Number 19 of 2016, electronic information and printouts are considered valid evidence, expanding the scope of legal evidence under Indonesian procedural law.³⁸ Consequently, smart contracts, which are electronic agreements reflecting the principle of contractual freedom, are legally enforceable.

VIII. CONCLUSION

Smart contracts represent a pinnacle of technological advancement and are prominent manifestations of the Fourth Industrial Revolution. The evolution of technology has simplified everyday life by providing electronic tools and methods that have globalized communication and made the world more interconnected. This advancement has significantly benefited the trade sector, enabling transactions such as sales, rentals, and mortgages to be conducted online through the completion of commercial contracts and exchange of goods and services over the internet. Some legal systems and states, like the United States, have embraced smart contracts, while others, such as India and certain parts of the United Kingdom, have expressed skepticism and rejected their foundational premises.

Islamic law presents an interesting perspective on smart contracts, permitting them as long as they adhere to the fundamental principles of a valid contract, including eligibility, offer, acceptance, and mutual consent between parties. Any violation of these terms renders the contract void and unlawful. To effectively harness technology in organizing and executing commercial contracts, it is crucial that the mechanisms used align with the elements of contracts as defined by public laws and Islamic Sharia, ensuring acceptance across legal systems.

The researcher advocates for lawmakers to draft new legislation or revise existing laws to accommodate the demands of modern technological advancements, particularly within the business sector. This adaptation is necessary to streamline processes and leverage the efficiencies offered by technology, ultimately saving time, costs, and resources. Furthermore, the researcher underscores the importance of experts and legal professionals familiarizing themselves with modern technology to navigate and capitalize on its fundamentals effectively.

(2023), <https://doi.org/10.1108/DPRG-09-2022-0108> (last visited Jun 26, 2024).

³⁸ S.Jayalakshmi & Dr.S.malathi, *Challenges Of Cryptocurrencies In Indian Financial Sector*6 (2024).

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2. Alex Lipton & Stuart Levi, *An Introduction to Smart Contracts and Their Potential and Inherent Limitations*, The Harvard Law School Forum on Corporate Governance (May 26, 2018), <https://corpgov.law.harvard.edu/2018/05/26/an-introduction-to-smart-contracts-and-their-potential-and-inherent-limitations/> (last visited Jun 26, 2024).
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