

Smart Contract Governance: A Comparative Study of ASEAN (Association of Southeast Asian Nations) Countries

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 <https://doi.org/10.25134/unifikasi.v13i01.1731>

ARTICLE INFO	ABSTRACT
Article History Received: December 15, 2025 Revised: January 16, 2026 Accepted: June 25, 2026 Keywords Blockchain; Comparative Law; SDGs; Smart Contract.	The rapid development of blockchain has given rise to smart contracts that challenge traditional legal doctrine, even though the technology is crucial to supporting SDGs (Sustainable Development Goals) 9 and 16. Purpose: This study aims to analyze smart contract governance in Indonesia, Malaysia, and Thailand to support the achievement of the SDGs in the region. Methods: A normative-comparative legal method is used with a socio-legal approach. This study examines the synchronization of regulations and the socio-institutional impacts. Results: The validity of smart contracts in the three countries is interpretative due to the lack of specific regulations. The self-executing and immutable nature triggers doctrinal tensions related to agreements and consumer protection, which are increased by the digital literacy gap. Conclusion: Smart contract governance in Southeast Asia requires an adaptive regulatory strategy that balances innovation and legal certainty. Suggestion: Authorities are expected to develop co-regulation-based regulations, strengthen digital institutions, and initiate regional legal standardization across ASEAN (Association of Southeast Nations). Contributions: The contribution is in the development of a blueprint for regional digital law harmonization that integrates aspects of dogmatic law with legal sociology. This study offers a model for ASEAN legal standardization that bridges technological innovation with social justice and provides indicators of institutional readiness replicated by developing countries in embracing an inclusive and sustainable digital economy.



Introduction

The rapid development of digital technology has significantly changed various aspects of human life, including the way individuals conduct transactions, build commercial relationships, and formalize agreements¹. The digitalization of economic activities has transformed traditional legal concepts, particularly contract law.² The most influential technological breakthrough is blockchain technology, which was known as the basic infrastructure of cryptocurrency systems, but is widely used in the financial, logistics, governance, and digital commerce sectors³. This technological development presents a new mechanism for building trust and verification that operates independently of centralized authorities.

¹ Ferdi Yufriadi, Fadilla Syahriani, and Abdullah A Afifi, "Trade Transformation In The Digital Era : Agency Role , Opportunities And Challenges," *Al-Iman: Journal on Islamic Studies, Civilisation and Learning Societies* 5, no. 1 (2024): 13-23.

² Dmytro Zahorodnii, Olena Nadiienko, and Olena Artemenko, "Civil-Law Regulation of Electronic Contracts: Current Challenges in Marketing and the Digital Economy.," *Legal Horizons* 25 (2025): 35-46.

³ Umar Kayani and Fakhrul Hasan, "Unveiling Cryptocurrency Impact on Financial Markets and Traditional Banking Systems : Lessons for Sustainable Blockchain and Interdisciplinary Collaborations," *Journal of Risk and Financial Management* 17, no. 58 (2024): 1-15.

The most prominent innovation from blockchain technology is the smart contract, a self-executing agreement embedded in digital code and running on a decentralized network. Smart contracts automatically execute obligations when predetermined conditions are met, unlike conventional contracts that depend on written clauses interpreted and enforced by courts. As explained by Aggarwal and Kumar, smart contracts represent an evolution towards Blockchain 2.0, enabling programmatic and automated transactions while minimizing reliance on intermediaries.⁴ The advantages are in efficiency, transparency, immunity to change, and reduced enforcement costs.

Despite the numerous advantages, smart contracts challenge fundamental assumptions in traditional contract law. According to Taherdoost and Zheng et al., smart contracts shift the focus of trust from legal institutions to technological systems.⁵ Code automatically executes predetermined instructions instead of courts interpreting ambiguous clauses. This shift raises a fundamental question as to whether a legal system founded on human intention, interpretation, and flexibility is capable of adequately regulating contracts that operate autonomously and are, by design, irrevocable. The automation of the execution of obligations also complicates the application of the doctrines of mistake, fraud, force majeure, and contract interpretation.

Classical contract law places the principle of consensus (mutual agreement) as the primary element of an agreement's validity. In many jurisdictions, including Indonesia, Malaysia, and Thailand, the validity depends on the existence of the agreement, legal capacity, a legitimate object, and the certainty of the content. According to Irianto, the digital era demands a rethinking of how agreements are expressed and verified⁶. In electronic contracts, consent is often reduced to the act of clicking an "agree" button.⁷ In smart contracts, consent can be embedded indirectly through programming logic or digital wallet authorization.⁸ Sulistyaningrum questions whether mechanistic manifestations of will truly meet civil law standards regarding the voluntariness and understanding of the parties.⁹

In Indonesia, academic debate has focused on the compatibility of smart contracts with Article 1320 of the Indonesian Criminal Code and the Electronic Information and Transactions Law (Law No. 11 of 2008 as amended). The ITE Law recognizes electronic documents and transactions, but does not explicitly regulate smart contracts. Saputri¹⁰ and Wahyuni, Naili, and Ruhtiani cited the lack of specific regulations as a regulatory gap creating uncertainty in practice.¹¹ Indonesian jurisprudence is very limited in addressing blockchain-

⁴ Shubhani Aggarwal and Neeraj Kumar, "Blockchain 2.0: Smart Contracts," in *Advances in Computers*, vol. 121 (2021), <https://doi.org/10.1016/bs.adcom.2020.08.015>

⁵ Hamed Taherdoost, "Smart Contracts in Blockchain Technology: A Critical Review," *Information* 14, no. 117 (2023): 1-19.

⁶ Shubhani Aggarwal and Neeraj Kumar, *Blockchain 2.0: Smart Contracts, The Blockchain Technology for Secure and Smart Applications across Industry Verticals*, 1st ed. (Elsevier Inc., 2020), <https://doi.org/10.1016/bs.adcom.2020.08.015>.

⁷ Sigit Irianto, "Validity of Contracts in the Digital Era in Indonesia," *International Journal of Religion* 19, no. 11 (2024): 5808-17, <https://doi.org/10.1108/IJITLP-07-2019-0046>.

⁸ Rizki Okta Priansa et al., "Contractual Justice in Traditional Market Leasing: An Ijārah - Based Analysis at Pasar Kalangan," *Aplikatif: Journal of Research Trends in Social Sciences and Humanities* 44, no. 3 (2025): 353-65.

⁹ Helena Primadianti Sulistyaningrum, "E-Contract Consensus in Indonesian Contract Law," *Batulis Civil Law Review Volume* 5, no. 2 (2024): 89-98.

¹⁰ Fitri Arianti Saputri, "Regulating the Use of Smart Contract in Indonesia.," *Jurnal Hukum Dan Keadilan* 1, no. 2 (2024): 42-50.

¹¹ Hesti Ayu Wahyuni, Yuris Tri Naili, and Maya Ruhtiani, "Penggunaan Smart Contract Pada Transaksi E-Commerce Dalam Perspektif Hukum Perdata Di Indonesia," *Jurnal Hukum In Concreto* 2, no. 1 (2023): 1-11.

based agreements, leaving businesses and consumers reliant on the general principle of freedom of contract.⁵ Rohaya, Sinulingga, and Mutiara added that Indonesian contract law faced structural tensions when dealing with automated commercial systems outside of traditional textual interpretations.¹²

Malaysia provides a different but comparable legal framework. Smart contracts are analyzed within the context of the Contracts Act 1950, supplemented by the Electronic Commerce Act 2006 and the Digital Signatures Act 1997. These regulations recognize electronic communications and signatures, providing a formal basis for digital agreements. According to Khairi et al., Malaysia does not have a specific law designed to regulate smart contracts.¹³ In this context, the legal enforceability depends on whether code-based agreements can be interpreted as fulfilling the elements of offer, acceptance, consideration, and intention to create legal relations. Khan et al. also reported issues of immutability, privacy risks, and technical errors complicating legal remedies.¹⁴ Even though Malaysia shows relatively higher institutional readiness and digital literacy levels compared to Indonesia, the regulatory development remains cautious and gradual.

This comparative analysis has been enriched by Thailand. The Electronic Transactions Act B.E. 2544 (2001) recognized electronic data messages and signatures based on the principle of functional equivalence, placing electronic contracts on a par with written agreements.¹⁵ This normative recognition provides a basis for interpreting smart contracts within the framework of Thai contract law. However, Thailand has not adopted a specific legal regime that explicitly regulates smart contracts as autonomous instruments. Thai scholars emphasize that automated execution through code must meet classical doctrinal requirements, particularly a valid agreement and object.¹⁶ The development of digital asset regulation since 2018 reports institutional openness to blockchain innovation, but doctrinal ambiguities remain regarding the division of responsibilities, coding defects, and the possibility of judicial intervention in irrevocable automated transactions.¹⁷

Beyond doctrinal issues, the social dimension plays a crucial role in shaping the legitimacy and effectiveness of smart contracts. The law and society approach emphasizes that legal norms cannot be evaluated formally. The implementation in practice is highly dependent on social awareness, institutional capacity, and the level of public trust.¹⁸ The rapid expansion of e-commerce and fintech in Indonesia reports high levels of technology adoption, but digital literacy remains unequal. Users may interact with automated systems without fully understanding the implications of the obligations embedded in the code. This

¹² Nizla Rohaya, Dini Bahraini Sinulingga, and Upik Mutiara, "Challenges of Indonesian Contract Law in the Digital Business Era," *Pagaruyung Law Journal* 7, no. 1 (2023): 1–15.

¹³ Khairil Faizal Khair et al., "Smart Contract in Zakat Collection Transactions Through the Development of Newly-Developed Backend Demo Zakat Blockchain in MAIWP-PPZ," *AZKA International Journal of Zakat and Social Finance* 3, no. 1 (2022): 103–24.

¹⁴ Shafaq Naheed Khan et al., "Blockchain Smart Contracts : Applications , Challenges , and Future Trends," *Peer-to-Peer Networking and Applications* 14 (2021): 2901–25.

¹⁵ Vachira Arromdee and Tunyathon Koonprasert, "Central Bank Digital Currency: Applications for Domestic and Cross-Border Transactions in Thailand," *Journal of Digital Banking* 6, no. 4 (2022): 319–30.

¹⁶ Kajornsak Piyoungkorn, Siriboon Chaisawat, and Chalee Vorakulpipat, "Trusted Electronic Contract for Enabling Peer-to-Peer HPC Resource Sharing," *Applied Sciences* 12, no. 5153 (2022): 1–18.

¹⁷ Anchisa Pinyo and Athikom Bangviwat, "Smart Contracts-Based Demand Response Bidding Mechanism to Enhance the Load Aggregator Model in Thailand," *Energies* 16, no. 3606 (2023): 1–18.

¹⁸ Kevin Werbach and Nicolas Cornell, "Contracts Ex Machina," *Duke Law Journal* 67, no. 2 (2017): 313–82.

mismatch between adoption and understanding has the potential to increase consumer vulnerability and undermine trust in digital contracts.¹⁹

Malasia shows a relatively higher level of digital literacy and stronger institutional support. However, regulatory caution reports an awareness that technological efficiency does not necessarily eliminate legal risks. Thailand presents a hybrid scenario where significant digital economic growth, coupled with proactive regulatory inclusion in regulating digital assets, faces challenges in ensuring broad public understanding of blockchain mechanisms. This variation suggests that effective smart contract governance requires a balance between technological innovation and social preparedness. The issue of consumer protection further increases the urgency of this debate. Hutabalian²⁰ and Pardede²¹ stated that the principle of freedom of contract in the digital environment often masked unequal bargaining power between businesses and consumers. In the context of smart contracts, code rigidity eliminates room for renegotiation or fair adjustments. Automated execution has the potential to reinforce asymmetries. Without explicit regulatory protections, vulnerable parties may bear disproportionate risks due to algorithmic errors or opaque code structures.

Despite the growing academic attention on smart contracts globally, comparative socio-legal analysis in the Southeast Asian region remains limited. Most existing studies focus on doctrinal compatibility within a single jurisdiction, without systematically examining the interaction between different legal frameworks and social conditions in each country.²² Indonesia, Malaysia, and Thailand all depend on general contract law and electronic transaction regulations, but the levels of digital literacy, institutional capacity, and regulatory orientations differ significantly. These differences suggest that smart contract governance cannot be addressed through a uniform legal transplant.²³

Fundamental issues remain unresolved despite the growing adoption of blockchain-based transactions in Southeast Asia. These include the lack of an explicit legal framework governing smart contracts and uncertainty regarding doctrinal validity and practical binding force.¹² Even though Indonesia, Malaysia, and Thailand recognize electronic contracts through general regulations, specific regulatory guidance is not provided in addressing the unique characteristics of self-executing code, automated execution, and algorithmic rigor. This creates tension between traditional contract law principles and evolving technological realities. Differences in digital literacy, institutional capacity, and consumer protection mechanisms raise questions about social readiness to accommodate automated contracts. This lack of clarity at the normative and socio-legal levels has the potential to create uncertainty that can undermine trust, fairness, and cross-border digital transactions in the ASEAN (Association of Southeast Nations) region. Therefore, this study conducts a comparative analysis based on legal and societal approaches to smart contracts in Indonesia, Malaysia, and Thailand. By examining the normative legal framework alongside social preparedness and institutional dynamics, this study aims to identify regulatory gaps,

¹⁹ Max Raskin, "The Law and Legality of Smart Contracts," *1 Georgetown Law Technology Review* 304 (2017): 205–7.

²⁰ Sahala Parlindungan Siahaan, Hulman Panjaitan, and Hendri Jayadi, "Perlindungan Konsumen Pada Transaksi E-Commerce Dalam Perspektif Azas Kebebasan Berkontrak," *Jurnal Hukum* 9, no. 2 (2023): 291–312.

²¹ Yustina Dhian Novita and Budi Santoso, "Urgensi Pembaharuan Regulasi Perlindungan Konsumen Di Era Bisnis Digital," *Jurnal Pembangunan Hukum Indonesia* 3, no. 1 (2021): 46–58.

²² David Chuen Kuo Lee, Li Guo, and Yu Wang, "Cryptocurrency: A New Investment Opportunity?," *Journal of Alternative Investments* 20, no. 3 (2018): 16–40.

²³ Dirk A Zetsche et al., "The ICO Gold Rush: It's a Scam, It's a Bubble, It's a Super Challenge for Regulators," *Harvard International Law Journal* / 60, no. 2 (2019): 268–315.

contextual differences, and possible directions for adaptive legal reform. A comprehensive understanding of the interaction between technological systems and social realities is essential to ensuring that the implementation of smart contracts advances not only efficiency and innovation but also fairness, legal certainty, and social protection in ASEAN's evolving digital economy.

Research Methods

This normative-comparative legal study uses a socio-legal approach to analyze regulatory synchronization and socio-institutional impacts in Indonesia, Malaysia, and Thailand. Primary legal sources such as the Information Technology Act (ITE Law) (Indonesia), the Contract Act 1950 (Malaysia), and the Electronic Transactions Act (Thailand) are analyzed qualitatively and comparatively, with secondary legal materials related to digital literacy and technological infrastructure.

Results and Discussion

1. *Normative Accommodation of Smart Contracts in Three Jurisdictions: Doctrinal Flexibility and Regulatory Ambiguity*

Indonesia has not recognized smart contracts as a separate legal category. The validity must be derived indirectly from Article 1320 of the Criminal Code and the Electronic Information and Transactions Law (UU ITE).²⁴ Formally, electronic agreements are recognized as valid provided the concept meets the essential elements of agreement, legal capacity, a valid legal basis, and a specific object. From a doctrinal perspective, smart contracts can fulfill these elements. Agreements can be concluded through digital authentication or blockchain-based authorization. Capacity remains subject to general civil law provisions, while the object's legality depends on the substance of the transaction. However, the automatic and irreversible nature of smart contracts creates tensions with Indonesian contract law principles, which allow for interpretation, amendment, or cancellation by a court in the event of error, fraud, or duress. Indonesian law does not provide clear guidelines regarding liability for coding errors or malfunctions in automated systems. There is uncertainty as to whether liability is with the programmer, the platform operator, or the contracting parties when a smart contract is executed incorrectly due to a programming error. This doctrinal ambiguity poses risks for businesses and consumers, particularly in fintech and e-commerce environments with high transaction volumes that depend on automation.

Malaysia has a more structured legislative basis for electronic transactions through the Contracts Act 1950, the Electronic Commerce Act 2006, and the Digital Signatures Act 1997.²⁵ These regulations recognize electronic communications and signatures, providing a formal basis for digital contracts. However, this country has not enacted specific regulations explicitly governing smart contracts. The enforceability of smart contracts depends on whether code-based transactions meet the elements of a traditional contract, including offer, acceptance, consideration, and the intention to create legal relations. Courts will interpret

²⁴ Hery Dwi Utomo and Bulelani Thukuse, "Electronic Contracts (E-Contracts) and Validity in Indonesian Civil Law : Analysis of Article 1320 of The Civil Code and The ITE Law," *Jembatan Hukum: Kajian ilmu Hukum, Sosial dan Administrasi Negara* 2, no. 4 (2025): 82–93.

²⁵ Mohd Asmadi Mohd Angsor et al., "Blockchain, Smart Contracts, and Digital Signatures: Legal and Managerial Challenges for Business in Malaysia," *Selangor Business Review* 10, no. 1 (2025): 181–198.

smart contracts based on established legal doctrine, rather than technological definition. A unique issue in Malaysia relates to equitable legal remedies. Malaysian contract law allows for contract rescission, damages, and other remedies under certain circumstances. The immutable nature of blockchain presents challenges in the practical application of the remedies. Even though a court orders the rescission of a contract, reversing transactions on the blockchain may be technically impossible. This creates a gap between legal rulings and technological implementation, raising questions about the effectiveness of judicial intervention. Malaysia's regulatory caution reflects an awareness of this complexity. The country shows stronger institutional preparedness and a relatively higher level of digital literacy than Indonesia. However, the lack of regulations specifically targeting smart contracts leaves uncertainty regarding algorithmic accountability and consumer protection.

Thailand Electronic Transactions Act B.E. 2544 (2001) establishes the principle of functional equivalence, which recognizes electronic data messages and electronic signatures as legally valid. These provisions provide a strong normative basis for the formation of electronic contracts.²⁶ Smart contracts are not explicitly regulated under Thai law. The recognition depends on interpretation within the framework of general principles of contract law under the Civil and Commercial Codes. Similar doctrinal issues arise, particularly regarding the formation of the agreement, the parties' intent, and the allocation of liability for unintentional performance. Thailand's regulatory developments in digital asset governance suggest institutional openness to blockchain innovation. This regulatory progress has not directly addressed the private law issues associated with automated contracts. The Thai legal system remains doctrinally conservative, prioritizing established legal categories over redefining contractual construction to accommodate algorithm-based automation.

Comparative results indicate that legal legitimacy is not sufficient to ensure effective implementation. Social preparedness, particularly digital literacy, institutional capacity, and consumer awareness, plays a crucial role. In Indonesia, rapid digitalization has expanded the fintech and e-commerce ecosystems. However, gaps in digital literacy can limit users' understanding of code-based obligations. Consumers may agree to automated agreements without fully understanding the terms, increasing the vulnerability to unfair or opaque algorithmic practices. Malaysia shows relatively higher levels of digital literacy and regulatory sophistication, providing a stronger foundation for understanding technological risks. The relatively cautious regulatory stance reflects an awareness that smart contracts introduce new legal uncertainties requiring a measured and adaptive policy response. Thailand falls somewhere in the middle since the country has accepted digital transformation and various blockchain-based initiatives, even though public understanding of smart contract mechanisms remains limited. Institutional openness does not always guarantee widespread social understanding. In all three jurisdictions, consumer protection is reported as a common issue. The rigid nature of code-based execution reduces flexibility for renegotiation and potentially reinforces imbalances in bargaining power. Traditional legal doctrines designed to protect the weaker party may lose effectiveness in an automated environment unless supported by explicit regulatory safeguards.

This analysis identifies three key patterns. First, none of the three jurisdictions has enacted specific legislation regarding smart contracts. All three continue to depend on

²⁶ Juthamas Thirawat, "E-Commerce in Asean: An Emerging Economic Superpower and the Case for Harmonizing Consumer Protection Laws," *South Carolina Journal of International Law and Business* 18, no. 2 (2022): 39-87.

general contract and electronic transactions law to accommodate blockchain-based agreements. Second, the doctrinal tension between human-centered legal interpretation and code-based determinism is consistently developed across jurisdictions. Smart contracts prioritize automation and immunity from change, while traditional contract law emphasizes flexibility and judicial oversight. Third, socio-legal conditions show significant variation. Indonesia faces a literacy gap during rapid technology adoption. Malaysia shows stronger institutional readiness but a cautious regulatory approach. Thailand reports openness to technology combined with doctrinal conservatism. These differences suggest that harmonization of regulations in the ASEAN region requires contextual sensitivity, not just the transplantation of uniform laws.

Table 1. Comparison of Smart Contract Governance in Indonesia, Malaysia, and Thailand

Aspect	Indonesia	Malaysia	Thailand
Smart Contract Specific Regulations	None	None	None
Legal Basis	Civil Code + ITE Law	Contracts Act 1950 + ECA 2006	Electronic Transactions Act 2001
Recognition of Electronic Contracts	Yes	Yes	Yes
Doctrinal Tensions	High (issues of agreement and interpretation)	Moderate (challenges in enforcing legal remedies)	Moderate-High (consent and accountability issues)
Judicial Flexibility vs. Immutability	Limited due to blockchain irreversibility	Recovery efforts are technically difficult	Conservative reliance on classical doctrine
Digital Literacy Level	Uneven	Relatively higher	Developing/transitional
Regulatory Orientation	Adaptive but reactive	Careful and structured	Technologically open but doctrinally conservative
Consumer Protection Risks	High	Moderate	Moderate

Table 1 summarizes the structural similarities and contextual differences between Indonesia, Malaysia, and Thailand in regulating smart contracts. The three countries recognize electronic contracts, but none have a specific legal framework explicitly governing the concept. This lack of explicit regulation indicates that smart contract accommodation in Southeast Asia remains interpretative, rather than codified.

From a doctrinal perspective, tensions between traditional contract law and automated execution vary in intensity. Indonesia reports a relatively higher level of tension due to reliance on classical civil law principles that emphasize human will and flexibility of interpretation. The rigid and self-executing nature of smart contracts increases the difficulty of harmonizing the frameworks, particularly regarding agreements and the possibility of judicial modification. Malaysia faces moderate tensions due to more advanced electronic transaction laws, but major challenges arise in enforcing legal remedies due to the immutable nature of blockchain. Thailand falls in the middle since the Electronic Transactions Law provides strong formal recognition of electronic agreements, even though the interpretation remains conservative and depends on general contract law. The differences in digital literacy levels and regulatory orientations are also reported. In Indonesia, rapid technology adoption, particularly in the fintech and e-commerce sectors, has not been accompanied by widespread digital literacy, increasing potential consumer vulnerability in an automated environment. Malaysia, with higher levels of literacy and institutional readiness, tends to take a more cautious regulatory approach, prioritizing stability over rapid experimentation. Thailand

reports openness to technological innovation, particularly in digital asset regulation, but the approach to private contract law remains conservative.

Another key result relates to consumer protection risks. In all three jurisdictions, the rigid nature of code-based agreements can limit renegotiation and judicial discretion, potentially reinforcing power imbalances. However, the level of risk varies depending on social preparedness and institutional enforcement capacity. Indonesia appears to face the highest level of vulnerability due to rapid technological expansion coupled with a literacy gap. Malaysia and Thailand are relatively better able to mitigate risks through stronger institutional oversight. Even though a normative foundation for electronic contracts exists in all three countries, smart contract governance remains structurally incomplete. The similarities reflect regional reliance on general contract law, while the differences report the diverse socio-legal conditions that influence implementation. This reinforces the argument that regulatory development in ASEAN must balance harmonization efforts with sensitivity to national contexts. Therefore, innovation can be supported without compromising legal certainty and consumer protection.

2. Smart Contract Governance in Indonesia, Malaysia, and Thailand to Support the Achievement of the Sustainable Development Goals (SDGs)

Comparative results show a structural inconsistency between smart contract logic and conventional contract law assumptions. Traditional contract law doctrine in Indonesia, Malaysia, and Thailand is built on human-centered concepts, namely intent, voluntariness, flexibility of interpretation, and judicial oversight. In contrast, smart contracts operate based on code determinism. After implementation on the blockchain, contract terms are automatically executed when conditions are met, often without the possibility of suspension, renegotiation, or contextual interpretation. This difference fundamentally alters how legal systems understand agreements, breaches, damages, and liability. The main implication arises from the principle of consent. In conventional contracts, consent is formed through a shared understanding of the terms and an intention to be legally bound. In practice, courts can interpret the negotiation process, context, and behavior of the parties to determine the occurrence of valid consent. Smart contracts complicate the process because the "agreement" is translated into code that non-technical parties may not be able to read or understand. Even though a user signs with a digital key or clicks on an agreement, the question remains whether the actions reflect a meaningful understanding of the consequences of the code.

This issue is particularly relevant in Indonesia, where rapid digital adoption is not accompanied by widespread digital literacy. The agreements have the potential to become formalistic rather than substantive when consumers are unable to interpret or verify the logic embedded in smart contracts. Malaysia, with the higher levels of literacy and institutional preparedness, may be able to mitigate, but not eliminate, this problem since digitally literate users do not understand the technical scripts of smart contracts. Thailand presents a similar challenge, where the principle of functional equivalence recognizes the legal validity of electronic agreements but does not resolve whether the automated execution of code genuinely embodies the classical legal concept of mutual consent. Therefore, all three jurisdictions face the same doctrinal question, namely, should smart contracts be treated as a means to implement a separate agreement, or an agreement?

The second tension relates to contractual flexibility. Traditional contract law systems assume that agreements can be adjusted to accommodate unforeseen circumstances through the doctrines of tort, misrepresentation, frustration, force majeure, or equitable adjustment. Smart contracts are designed to execute predetermined outcomes without consideration for human re-evaluation. This rigidity becomes problematic when the code produces unintended consequences due to design errors, ambiguous logic, or unforeseen external events during implementation. This raises an important socio-legal question, namely, who bears the burden of technological rigidity? In practice, consumers and weaker parties often face greater risks because of limited bargaining power and technical capacity to identify errors before execution. Traditional legal doctrine could theoretically provide a legal remedy when smart contract is automatically executed under incorrect conditions, but the practical application is limited because blockchain transactions are difficult to reverse. Therefore, the gap is doctrinal and operational since legal norms may promise flexibility, unlike technological systems.

The third core issue is the allocation of responsibility. Smart contracts introduce multiple actors into relationships traditionally understood as bilateral. In addition to buyers and sellers, the concept includes developers who write the code, platforms that implement the contracts, and "oracle" providers who supply external data to the blockchain. Responsibility cannot be clearly classified within predefined legal categories when execution errors occur. For example, when a smart contract triggers a payment based on erroneous oracle data, the dispute includes the parties and the data provider. Similarly, when a bug in the code results in an unintentional transfer of assets, the question arises, was this a breach of contract by one of the parties, the developer's professional negligence, or product liability inherent in the platform? In Indonesia, the regulatory vacuum makes the allocation of liability more uncertain, as smart contracts are not explicitly regulated. The Malaysian legal framework may provide a clearer path through the doctrine of negligence or misrepresentation, but the enforcement remains uncertain, especially where the parties are decentralized or cross-border. In Thailand, doctrinal conservatism also leaves the issue to a common interpretation of contract law, which may struggle to address distributed liability in a blockchain environment.

Smart contract disputes cannot be treated solely as "contractual disputes" in the classical sense. These disputes are hybrid in nature, including aspects of contractual agreements, technological design, and institutional governance. Therefore, future regulation must consider multi-actor accountability. The most common challenges relate to legal remedies. In conventional disputes, courts can order damages, restitution, rescission, or a cease-and-desist order. However, smart contracts can be executed automatically and irrevocably. Even though a court finds the execution unlawful or unfair, reversing blockchain transactions may be technically impossible or prohibitively expensive. This creates a gap in legal remedies, where rights may be legally recognized but technologically ineffective.

Malaysia clearly reports the gap since the legal system recognizes equity-based remedies, but the immutability of blockchain complicates the implementation. Indonesia faces similar challenges, increased by limited institutional experience with blockchain mechanisms. Thailand, with the principle of functional equivalence, supports the recognition of electronic contracts but has not provided a concrete solution for implementing remedies once transactions are permanently recorded on the blockchain. Therefore, smart contract dispute resolution may shift from attempting to "undo" transactions to "compensating". This

increases the urgency of consumer protection and risk allocation mechanisms, such as mandatory disclosure, code audits, and dispute resolution procedures.

The socio-legal dimension becomes particularly evident in the consumer context. Smart contracts have the potential to increase imbalances because the party controlling the code design essentially determines the entire contractual relationship. Consumers are often unable to negotiate or understand the applicable technical clauses. Unlike traditional consumer contracts, where courts can interpret ambiguous clauses adversely to the drafter or apply a reasonableness standard, smart contracts execute automatically and potentially bypass such interpretative protections. In Indonesia, where consumer vulnerability is increased by the literacy gap and rapid growth of fintech, consumer protection risks are more acute. Malaysia, with a higher literacy rate, may be able to mitigate these risks, but cannot eliminate the context, especially when complex blockchain products are marketed to general users. Thailand also shows increasing consumer exposure to automated agreements, while the legal framework remains generic. Across jurisdictions, this suggests that smart contract governance requires private law recognition and integration of consumer protection laws, particularly regarding transparency, fairness, and redress for harm caused by automation. These comparative results also have regional implications. Smart contracts are inherently cross-border since parties can be located in different jurisdictions, code is implemented globally, and transactions occur on decentralized networks without territorial boundaries. This creates uncertainty regarding applicable law, dispute resolution forums, and the enforcement of court decisions. Cross-border disputes become increasingly difficult to resolve consistently when countries depend on general contract law without specific rules for smart contracts. In the ASEAN context, two challenges are reported, namely regulatory fragmentation and gaps in social preparedness. Harmonization requires shared underlying principles, such as recognition standards, accountability mechanisms, consumer protection, and cross-border dispute resolution cooperation. Otherwise, legal uncertainty could undermine trust and affect the growth of blockchain-based commerce in Southeast Asia.

The governance challenge is not simply about whether smart contracts are legally “valid.” A deeper issue is the capacity of the existing legal systems to provide meaningful accountability, enforceable remedies, and fair protections in an automated environment. Indonesia, Malaysia, and Thailand all depend on general contract and electronic transaction law. This reliance leaves gaps in terms of agreements, responsibilities, remedies, and consumer protection. The socio-legal differences between the three countries emphasize that regulatory responses must be contextual, balancing innovation with fairness, legal certainty, and institutional capacity. The connection between smart contract technology and the Sustainable Development Goals (SDGs) is in the role of a driver of transparent, efficient, and inclusive digital transformation. The implementation of code-based digital contracts directly contributes to the achievement of SDG 9 (Industry, Innovation, and Infrastructure) by providing a modern transaction infrastructure that reduces operational costs and eliminates reliance on traditional intermediaries²⁷. This innovation opens up opportunities for businesses, including small and medium enterprises (SMEs) in ASEAN, to connect directly to the global supply chain securely and reliably. Furthermore, smart contracts support the realization of SDG 16 (Peace, Justice, and Strong Institutions) through self-executing and

²⁷ Agung Rizky et al., “Optimizing Blockchain Digital Signature Security in Driving Innovation and Sustainable Infrastructure,” *Blockchain Frontier Technology* 4, no. 2 (2025): 183–192.

immutable nature²⁸. These technological characteristics significantly reduce human discretion, which often fuels corruption, while strengthening institutional accountability. Access to contractual justice and consumer protection can be better assured in the regional digital economy ecosystem with a transparent and consistent system based on computer code.

Conclusion

In conclusion, Indonesia, Malaysia, and Thailand formally recognize electronic contracts through applicable general regulations, but none of the countries has a specific regulatory framework explicitly governing smart contracts. Therefore, the validity and binding force of smart contracts remain interpretative, rather than explicitly regulated by law. Even though traditional contract law principles are theoretically flexible to accommodate automated agreements, the self-executing and immutable nature of blockchain-based contracts creates structural tensions regarding agreements, the allocation of responsibilities, and the effectiveness of legal remedies. In this context, the absence of clear doctrinal guidance has the potential to create legal uncertainty that can undermine consumer protection and cross-border digital transactions in the ASEAN region. From a socio-legal perspective, differences in digital literacy levels, institutional readiness, and regulatory orientation significantly influence smart contract adoption across the three jurisdictions. Indonesia's rapid digital growth reports vulnerabilities related to the literacy gap, Malaysia's regulatory caution reflects an awareness of technological risks, and Thailand shows an openness to innovation combined with doctrinal conservatism. These results emphasize that smart contract governance requires formal legal recognition and adaptive regulatory strategies sensitive to national contexts to balance innovation with fairness, accountability, and legal certainty in the evolving digital economy.

Suggestion

The results proposed three key recommendations as follows. 1) Interpretative Legal Guidelines: Indonesia, Malaysia, and Thailand need to issue specific legal guidelines regarding the formation of agreements, allocation of liability for coding errors, and enforcement of legal remedies in immutable blockchain systems. 2) Strengthening Consumer Protection and Infrastructure: Regulators should require transparency of code logic to address information asymmetries, implement regulatory sandboxes, and provide technology-based dispute resolution mechanisms (such as online dispute resolution). 3) ASEAN Regional Harmonization: Given the cross-border nature of technology, regional dialogue is needed to develop common standards for smart contract governance. This step is crucial in reducing regulatory fragmentation and increasing the inclusive integration of ASEAN's digital economy.

Acknowledgement

The authors would like to thank the Faculty of Law, Universitas Kuningan, ASEAN Study Center, Universitas Kuningan, School of Law, Universiti Utara Malaysia, Malaysia and

²⁸ Hossein Hosseinalibeiki and Majid Heidari, "A Conceptual Hybrid Model Based on Ethereum for Implementing Sustainable Development Goals," *European Journal of Sustainable Development srch* 8, no. 4 (2024): 1-14, <https://doi.org/10.29333/ejosdr/15434>.

the Rajamangala University of Technology Krungthep, Thailand for their support so that this joint research can be published in scientific journals.

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How to Cite :

Anugrah, Dikha, Fariza binti Romli, and Sineenat Suasungnern. "Smart Contract Governance: A Comparative Study of ASEAN (Association of Southeast Asian Nations) Countries". *Unifikasi: Jurnal Ilmu Hukum* 13, no. 01 (June 30, 2026): 56-68.