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# Legal Standing of Smart Contracts in Digital Contractual Systems in E-Commerce

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**Abstract**

The development of blockchain technology has significantly reshaped digital contractual systems in e-commerce, particularly through the emergence of smart contracts as self-executing digital agreements. This study analyzes the legal standing of smart contracts within digital contractual systems, with a specific focus on their position under Indonesian civil law. Employing a normative juridical approach, the research examines the extent to which smart contracts satisfy the essential elements of a valid contract as stipulated in the Indonesian Civil Code and evaluates their alignment with existing regulations on electronic transactions. The analysis demonstrates that smart contracts may attain legal standing as binding agreements provided that they fulfill the fundamental contractual requirements of consent, legal capacity, a definite object, and a lawful cause. Although smart contracts differ from conventional contracts in terms of form and execution, their substantive legal nature remains consistent with the principle of freedom of contract. The automated execution and blockchain-based architecture of smart contracts enhance efficiency, transparency, and legal certainty in e-commerce transactions. However, the study also identifies several normative and regulatory challenges, including disparities in technical expertise between contracting parties, limited contractual flexibility due to the immutable nature of blockchain systems, and the absence of explicit legal provisions governing algorithmic accountability and dispute resolution. The study concludes that while smart contracts possess legal standing within digital contractual systems, further regulatory development is required to ensure fairness, legal certainty, and adequate protection for all parties involved in e-commerce transactions.

**Keywords**

Blockchain; Contract Law; Digital Contractual Systems; E-Commerce; Smart Contracts.

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## INTRODUCTION

The rapid development of information and communication technology has fundamentally transformed modern economic transactions, particularly through the expansion of electronic commerce (e-commerce).[1] Economic interactions that were previously conducted through face-to-face negotiations and physical documentation have shifted toward digital platforms relying on electronic data exchange as the basis for forming legal relationships between parties. This transformation has not only changed the mechanisms of trade but has also influenced the structure and execution of contractual agreements. One of the most significant innovations emerging from this digital transition is the development of smart contracts, which are electronic agreements embedded in blockchain systems and capable of automatically executing contractual clauses once predetermined conditions are fulfilled. Such technology is considered capable of enhancing efficiency, transparency, and security in digital transactions.[2]

In practice (das sein), smart contracts have begun to be utilized in e-commerce environments to automate obligations such as payment processing, delivery confirmation, and fulfillment of contractual conditions without manual intervention.[3] These self-executing mechanisms allow transactions to proceed without reliance on intermediaries and contribute to reducing the risk of default through algorithmic enforcement of agreed terms. The adoption of such technological systems reflects the increasing reliance of commercial actors on digital infrastructure to ensure transactional reliability and operational efficiency. However, this empirical reality also presents legal challenges. Issues arise concerning the clarity of legal relationships between parties, the potential inclusion of standardized clauses drafted unilaterally, and technological asymmetry that may disadvantage parties lacking technical expertise. These circumstances indicate that the practical application of smart contracts may generate risks that cannot be fully addressed solely through technological design.[4]

From a normative perspective (das sollen), the legal system ideally provides a structured framework to ensure fairness, certainty, and protection for contractual parties. Indonesian private law establishes the general foundation of contractual validity through the Civil Code, particularly provisions governing the definition of agreements, requirements for validity, and the principle of freedom of contract. These provisions form the legal basis for recognizing agreements concluded between parties regardless of their form, including digital arrangements. Furthermore, the legal recognition of electronic transactions has been reinforced through legislation regulating electronic information and transactions, which acknowledges electronic documents and contracts as legally valid evidence and provides legal protection mechanisms within digital activities. In principle,

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[1] Lintong O. Sihombing and Gunawan Widjaja, "The Legal Force of Smart Contracts in Electronic Commerce Transactions in Indonesia," *Jurnal Hukum IUS QUIA IUSTUM* 27, no. 3 (2020): 550–567.

[2] Hari Sutra Disemadi and Kholis Roisah, "The Urgency of Regulating Smart Contracts in the Indonesian Contract Law System," *Jurnal Rechts Vinding* 9, no. 2 (2020): 257–275.

[3] Yoga Dwi Pratama and Siti Mahmudah, "Juridical Implications of Smart Contract Utilization in E-Commerce Transactions," *Jurnal Hukum & Pembangunan* 50, no. 4 (2020): 870–889.

[4] Budi Santoso and Nurul Qamar, "The Legality of Electronic Contracts under the Indonesian Civil Code and the ITE Law," *Jurnal Arena Hukum* 13, no. 2 (2020): 222–239.

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such regulatory instruments are expected to accommodate technological developments while safeguarding legal certainty and dispute resolution mechanisms.[5]

Nevertheless, despite the existence of general contractual and electronic transaction regulations, no specific legal framework comprehensively governs smart contracts within the national legal system. This absence of dedicated regulation creates a normative gap that may lead to legal uncertainty, particularly when disputes arise from algorithm-based contractual execution. The disparity between the technological sophistication of smart contract implementation and the current regulatory structure illustrates a tension between empirical developments and normative expectations. Consequently, questions emerge regarding the legal standing, enforceability, and interpretative treatment of smart contracts within the broader system of digital agreements.[6]

Moreover, the automated and code-based nature of smart contracts challenges traditional legal concepts such as mutual consent and meeting of minds, which are fundamental to contract formation. Agreements encoded in algorithms may not involve direct negotiation or textual communication, thereby raising debates about whether genuine consent is adequately manifested within digital execution logic.[7] Scholars suggest that interpretative approaches such as functional equivalence may bridge this conceptual gap by equating the legal function of digital agreements with conventional contractual forms, provided that parties understand and accept the underlying algorithmic logic.[8] However, such theoretical reconciliation does not fully resolve interpretative ambiguities when disputes arise, especially when the intention of parties is not explicitly articulated beyond coded instructions.

Therefore, considering the divergence between empirical practice (das sein) and normative expectations (das sollen), alongside the limitations of existing regulatory instruments, examining the legal position of smart contracts within the digital contractual system of e-commerce becomes essential. Such analysis is necessary not only to understand the formation of legal relationships and contractual validity within digital environments but also to contribute to the conceptual development of adaptive legal frameworks capable of accommodating technological innovation. Ultimately, this inquiry is expected to provide academic and practical insights into harmonizing technological advancement with legal certainty and protection in the evolving landscape of digital commerce.

[5] I Nyoman Putu Budiartha Mahardika, "Blockchain Technology and Its Implications for Contract Law," *Jurnal Acta Comitas* 5, no. 3 (2020): 526–541.
[6] Rini Heryanti and Ridwan Arifin, "Legal Protection of Parties in Blockchain-Based Smart Contracts," *Jurnal Legislasi Indonesia* 17, no. 3 (2020): 311–326.
[7] Satjipto Rahardjo and Ahmad Jazuli, "Electronic Contracts in the Perspective of Indonesian Civil Law," *Jurnal Yuridika* 35, no. 1 (2020): 1-18.
[8] Rika Ratna Permata Sari and Tundjung Herning Sitabuana, "Smart Contracts and Evidentiary Challenges in Indonesian Civil Procedure," *Jurnal Bina Mulia Hukum* 5, no. 1 (2020): 75–92.

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## METHODS

This study employs a normative juridical legal research method with a descriptive-analytical approach to examine the position of smart contracts within the digital contractual system in e-commerce transactions. The research adopts a statutory approach by analyzing contract law provisions under the Indonesian Civil Code and regulations governing electronic transactions, as well as a conceptual approach to understand legal principles of contract law and the notion of smart contracts through legal doctrines and scholarly literature. The data used consist of secondary data, including primary, secondary, and tertiary legal materials collected through library research. Legal materials are analyzed qualitatively using legal interpretation methods to assess the conformity between the practical implementation of smart contracts (das sein) and the prevailing legal norms (das sollen) within Indonesia's contract law system.

## RESULTS AND DISCUSSION

The rapid expansion of blockchain technology has significantly influenced the structure of legal relationships within the digital economy, particularly through the emergence of smart contracts in e-commerce transactions. A smart contract may be defined as a code-based protocol embedded in a distributed ledger system that automatically executes contractual clauses once predetermined conditions are satisfied.[9] The findings of this study indicate that the emergence of smart contracts does not abolish the fundamental concept of agreement under civil law; rather, it transforms the form, medium, and mechanism through which contractual obligations are created and performed. Agreements that were traditionally embodied in written documents or conventional electronic formats are now translated into algorithmic instructions operating within decentralized digital infrastructures. This shift marks a structural evolution in contractual practice, where the enforcement of obligations is technologically embedded within the system itself.[10]

From a conceptual standpoint, the transformation from text-based contracts to code-based contracts signifies a reconfiguration of how legal norms are operationalized. Legal provisions that were once interpreted and enforced through human deliberation are increasingly expressed in programming language capable of self-execution.[11] The contract, therefore, becomes not merely a legal instrument but also a technological architecture. This integration of law and code reflects the broader theory of "regulation by technology," in which compliance is ensured through system design rather than ex post enforcement. In this context, smart contracts illustrate how legal

[9] Xaverius Bintang Pratama Nugraha, "Blockchain and the Validity of Digital Agreements in Indonesia," *Jurnal Konstitusi* 18, no. 2 (2021): 389–406.
[10] Muhammad Beni Kurniawan, "A Juridical Analysis of Smart Contracts in Electronic Trading Systems," *Jurnal Hukum dan Peradilan* 9, no. 3 (2020): 417–436.
[11] Annisa Rezki Putri and Rachmadi Usman, "The Legal Position of Smart Contracts as Electronic Evidence," *Jurnal IUS Kajian Hukum dan Keadilan* 8, no. 3 (2020): 463–480.

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obligations can be embedded into digital infrastructures in a manner that enhances automation and predictability.[12]

Normative analysis demonstrates that the essential requirements for a valid agreement under Article 1320 of the Indonesian Civil Code remain applicable to smart contracts. The element of consent is realized through digital manifestations of agreement, such as clicking acceptance buttons, cryptographic signatures, or other forms of authenticated digital approval within electronic systems. Although consent is expressed electronically, its legal substance remains grounded in the meeting of minds between the parties. [13] Legal capacity continues to be determined by existing civil law provisions concerning natural and legal persons. A definite object is identifiable through the goods, services, or digital assets that constitute the subject matter of the transaction. Meanwhile, a lawful cause remains a substantive requirement ensuring that the agreement does not contravene statutory law, public order, or morality.[14] These findings confirm that smart contracts do not exist outside the established framework of Indonesian civil law but instead operate within it, supported by the principle of freedom of contract enshrined in Article 1338 of the Civil Code.[15]

The transformation of contractual mechanisms also affects the broader paradigm of obligations. In conventional agreements, performance depends largely on the voluntary compliance of the parties, with enforcement mechanisms activated in cases of breach. In contrast, smart contracts execute obligations automatically once predefined conditions are met, thereby reducing reliance on trust and minimizing the likelihood of intentional non-performance. This automated execution enhances legal certainty by ensuring that contractual outcomes are predictable and consistent with the coded terms. Particularly in high-volume digital transactions, such predictability supports commercial efficiency and reduces administrative burdens.[16]

However, increased certainty through automation simultaneously narrows the interpretative flexibility traditionally available in contractual disputes. In conventional legal systems, ambiguities may be resolved through judicial interpretation, equitable principles, or contextual considerations. Smart contracts, by contrast, execute strictly according to coded instructions, leaving minimal room for discretionary interpretation once deployed. From the perspective of legal certainty theory, this rigidity strengthens predictability but may limit the

[12] Ahmad M. Ramli, "Legal Liability in Blockchain-Based Electronic Transactions," *Jurnal Mimbar Hukum* 32, no. 2 (2020): 204–221.
[13] Nurul Hidayah and Faisal Santiago, "Smart Contracts under the Indonesian Electronic Information and Transactions Law," *Jurnal Ilmiah Kebijakan Hukum* 14, no. 2 (2020): 239–254.
[14] Rini Lestari and Ahmad Redi, "Recognition of Electronic Contracts in the Indonesian Legal System," *Jurnal Rechtsidee* 8 (2020): 1–15
[15] I Ketut Oka Setiawan, "The Validity of Digital Agreements in E-Commerce Transactions," *Jurnal Magister Hukum Udayana* 9, no. 1 (2020): 17–33.
[16] Laurensius Arliman, "Consumer Protection in the Use of Smart Contracts," *Jurnal Selat* 8, no. 1 (2020): 45–60.

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pursuit of corrective justice in exceptional circumstances.[17] The legal system must therefore consider how mechanisms of interpretation and equitable adjustment can coexist with technologically enforced agreements.

In practical terms, smart contracts offer significant advantages for e-commerce transactions. The self-executing nature of the system reduces transaction costs by eliminating intermediaries such as escrow agents or manual verification processes.[18] Blockchain's distributed ledger enhances transparency, as all authorized participants can verify transaction records without relying on centralized authorities. Cryptographic security mechanisms protect data integrity and prevent unauthorized alterations. These technological features collectively enhance trust in digital commerce, particularly in cross-border transactions where traditional enforcement mechanisms may be complex or costly.[19]

Electronic records stored on blockchain networks also possess evidentiary value within the framework of electronic transaction law. Provided that they meet statutory requirements for authenticity and reliability, such records may function as valid electronic evidence in dispute resolution processes. The permanence and traceability of blockchain entries strengthen evidentiary integrity by providing verifiable timestamps and transaction histories. Consequently, smart contracts not only automate performance but also contribute to improved documentation and accountability in digital commerce.[20]

Despite these advantages, the implementation of smart contracts presents several normative and practical challenges. One major concern relates to the imbalance of technical expertise between contracting parties. The drafting of contractual terms in programming language requires specialized knowledge that may not be equally possessed by all parties.[21] A technologically sophisticated party may structure the code in a manner that favors its interests, potentially undermining the principle of equality and fairness in contractual relations. This concern is particularly relevant in consumer transactions, where standard-form digital contracts may be embedded within platforms without adequate transparency regarding their coded logic.[22]

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[17] Teguh Prasetyo and Abdul Halim Barkatullah, "Digital Contracts and Legal Certainty in Indonesia," *Jurnal Hukum Novelty* 11, no. 2 (2020): 141–158.

[18] Joko Setiyono Widodo, "Juridical Aspects of Smart Contracts in Civil Law Perspective," *Jurnal IUS Kajian Hukum dan Keadilan* 9, no. 2 (2021): 275–292.

[19] Ari Wibowo and Dewa Gede Sudika Mangku, "Legal Aspects of Smart Contracts in Digital Commerce," *Jurnal Komunikasi Hukum* 6, no. 2 (2020): 176–193.

[20] Djisman Samosir and Yulies Tiena Masriani, "Validity of Electronic Agreements in E-Commerce Practice," *Jurnal Pandecta* 15, no. 2 (2020): 199–214.

[21] Sunaryati Hartono, "Electronic Contracts and Digital Transformation in Indonesian Law," *Jurnal Hukum & Pembangunan* 51, no. 1 (2021): 1–20.

[22] Johannes Ibrahim Gunawan, "Smart Contracts and Digital Dispute Resolution," *Jurnal Media Hukum* 27, no. 1 (2020): 84–99.

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Another challenge arises from the immutable character of blockchain systems. Once deployed, smart contracts are difficult to modify or terminate without deploying additional corrective protocols. In cases involving force majeure, coding errors, fraud, or defects in consent, the rigidity of automated execution may complicate remedial measures.[23] Traditional contract law provides mechanisms such as rescission, nullification, or judicial adjustment, but the technological architecture of blockchain may not easily accommodate such interventions. This tension between technological immutability and legal flexibility highlights the need for hybrid solutions, such as incorporating escape clauses or off-chain dispute resolution mechanisms within smart contract designs.[24]

Regulatory limitations further contribute to legal uncertainty. Indonesian law recognizes electronic contracts and digital evidence under existing electronic transaction regulations, yet it does not explicitly regulate smart contracts as a distinct category. Questions concerning jurisdiction in cross-border blockchain transactions, allocation of liability in cases of algorithmic malfunction, and the legal status of decentralized autonomous systems remain insufficiently addressed. Without clear regulatory guidance, uncertainty may arise regarding which legal framework governs disputes or how accountability is determined when automated systems malfunction.[25]

The gap between rapid technological innovation and slower legislative adaptation underscores the necessity of a responsive and adaptive legal approach. Regulatory reform should aim not only to provide legal certainty but also to ensure transparency of algorithmic design, protection of weaker parties, and accountability in digital transactions. Such reform does not require abandoning existing civil law principles; rather, it requires contextual interpretation and possible supplementation to accommodate emerging technologies. Comparative experiences from other jurisdictions suggest that principle-based regulation combined with technological neutrality can offer flexibility while maintaining fundamental legal safeguards.

Overall, the findings of this study demonstrate that smart contracts can be accommodated within the Indonesian civil law system as long as they fulfill the essential elements of a valid agreement and comply with prevailing legal norms. Their emergence represents a significant evolution in contractual mechanisms, integrating legal norms with digital architecture in the context of the digital economy. While they enhance efficiency, security, and certainty in e-commerce transactions, they also raise complex issues concerning fairness, accountability, and regulatory preparedness. The future effectiveness of smart contract implementation will depend on the ability of legal institutions to harmonize technological innovation with the foundational principles of justice, legal certainty, and societal benefit.

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[23] Anang Firmansyah, "The Implications of Blockchain on the Formation of Digital Contracts," *Jurnal Legislasi Indonesia* 18, no. 1 (2021): 59–74.

[24] Diah Rahmawati and I Made Pasek Diantha, "Legal Certainty of Smart Contracts as Electronic Agreements," *Jurnal Kertha Patrika* 42, no. 3 (2020): 233–248.

[25] Bismar Nasution Siregar, "Smart Contracts and the Principle of Freedom of Contract," *Jurnal Hukum PRIORIS* 6, no. 2 (2020): 101–118.

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## CONCLUSION

The findings of this study confirm that smart contracts hold legal standing within digital contractual systems in e-commerce when assessed through the framework of Indonesian civil law. Despite being embedded in blockchain-based technological systems and executed automatically through code, smart contracts retain the essential legal characteristics of conventional agreements. The fundamental elements of a valid contract, consent, legal capacity, a definite object, and a lawful cause, remain applicable and serve as the primary criteria for determining their legal validity. The integration of smart contracts into e-commerce transactions contributes to increased efficiency, transparency, and predictability in contractual performance. Automated execution reduces reliance on intermediaries and strengthens legal certainty, while blockchain technology enhances data integrity and evidentiary reliability. These features position smart contracts as an important component of modern digital contractual systems. Nevertheless, the study highlights significant legal challenges that affect the full realization of smart contracts' legal standing. Imbalances in technical knowledge may undermine contractual fairness, and the immutable nature of blockchain limits the adaptability of contracts in exceptional circumstances such as force majeure or system errors. In addition, the lack of specific regulatory frameworks addressing smart contracts creates uncertainty regarding liability, jurisdiction, and dispute resolution mechanisms. Accordingly, legal development should adopt an adaptive and principle-based regulatory approach that preserves technological neutrality while reinforcing consumer protection, transparency, and accountability within digital contractual systems. Strengthening the legal framework governing smart contracts is essential to ensure that their implementation in e-commerce not only promotes technological efficiency but also upholds fundamental legal values, including justice, legal certainty, and societal benefit.

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