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ANALYSIS OF AUTOMATIC EXECUTION IN BLOCKCHAIN-BASED SMART CONTRACTS FROM THE PERSPECTIVE OF THE PRINCIPLE OF FREEDOM OF CONTRACT

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Abstract

The principle of freedom of contract, as regulated in Article 1338 paragraph (1) of the Indonesian Civil Code, affirms that legally formed agreements bind the parties as law. This principle grants contractual autonomy to determine the formation, parties, and content of agreements, provided they do not violate statutory law, public order, or morality. However, such freedom is limited by the principles of good faith, fairness, proportionality, and the protection of weaker parties.The development of blockchain technology has introduced smart contracts as automatically executed electronic agreements based on pre-programmed code. Legally, smart contracts may be considered valid contracts insofar as they fulfill the requirements of Article 1320 of the Indonesian Civil Code and comply with the Law on Electronic Information and Transactions. Digital consent, such as authorization through a digital wallet, constitutes a legitimate expression of agreement.Smart contracts represent a modern manifestation of freedom of contract by enabling automated performance without third-party intervention, reflecting the prior intention of the parties embedded in blockchain-based code. Their application on platforms such as Stellar Lumens (XLM) demonstrates practical implementation in cryptocurrency transactions. Nevertheless, legal challenges remain, including regulatory gaps, transaction anonymity, technological inequality, and potential imbalances in bargaining power. Therefore, adaptive legal regulation is essential to ensure legal certainty, fairness, and effective legal protection.

Keywords: Smart Contract; Blockchain Technology; Freedom of Contract Principle; Cryptocurrency

INTRODUCTION

The rapid development of information technology has driven a significant shift from conventional transactions toward electronic transactions, including the use of blockchain technology and smart contracts, which are increasingly utilized by business actors. Blockchain technology enables transactions to be conducted more efficiently, transparently, and securely, while also reducing transaction costs due to the absence of intermediaries. Structurally, blockchain consists of interconnected blocks arranged in a chain, each containing transaction data that are permanently recorded and difficult to manipulate. Smart contracts are electronic contracts that utilize blockchain technology as their underlying infrastructure. The existence of smart contracts is closely linked to the principle of freedom of contract, provided that they do not conflict with applicable laws and regulations. This principle is in line with Article 1338 paragraph (1) of the Indonesian Civil Code, which stipulates that all legally formed agreements shall bind the parties as law. Through smart contracts, the parties retain full authority over the contractual terms they establish, without third-party intervention in the execution of the contract. Moreover, smart contracts operate on a *self-executing* mechanism, whereby contractual obligations are automatically performed once predetermined conditions are fulfilled, thereby enhancing efficiency and certainty in transactions. In practice, conventional smart contracts are often operated within centralized systems or internal company servers and still require human or third-party involvement for validation and execution. In contrast, blockchain-based smart contracts operate on decentralized networks and are characterized by transparency, immutability, and automated execution. In Indonesia, blockchain-based smart contracts have begun to be implemented in various forms of electronic transactions, particularly in cryptocurrency trading. Despite their advantages, blockchain-based smart contracts raise legal concerns, especially regarding automatic execution. The rigid and immutable nature of such contracts may limit the parties' ability to modify terms or incorporate human discretion in exceptional circumstances, such as *force majeure*. This condition potentially complicates dispute resolution and raises questions regarding the balance between

contractual autonomy and legal protection. Based on these considerations, this study examines the automatic execution of blockchain-based smart contracts from the perspective of the principle of freedom of contract.

Research Questions

1. How is the principle of freedom of contract conceptualized in Indonesian civil law?
2. How can the automatic execution of blockchain-based smart contracts be analyzed from the perspective of the principle of freedom of contract?

LITERATURE REVIEW

Scholarly discussions on smart contracts have largely focused on their technological foundations and potential to transform traditional contractual relationships through automation and decentralization. Early studies conceptualize smart contracts as self-executing digital agreements that operate on blockchain networks, enabling contractual obligations to be performed automatically once predefined conditions are met. These studies emphasize the efficiency, transparency, and cost-reduction advantages of smart contracts compared to conventional contracts, particularly due to the elimination of intermediaries and the immutability of blockchain records. From a legal perspective, several scholars examine the compatibility of smart contracts with traditional contract law principles. Research generally agrees that smart contracts may be recognized as legally valid agreements, provided they fulfill the essential elements of contract formation, including consent, capacity, lawful object, and lawful cause. However, debates arise regarding the manifestation of consent in digital environments, where agreement is expressed through cryptographic actions such as wallet authorization or transaction confirmation. While some scholars argue that such digital consent sufficiently reflects party autonomy, others question whether it fully captures informed and voluntary agreement, especially in complex or standardized smart contract systems.

The principle of freedom of contract has been widely discussed as the normative foundation of contractual autonomy in both conventional and electronic contracts. Existing literature highlights that this principle allows parties to freely determine contractual terms and mechanisms, including the use of automated execution. Nevertheless, critical legal studies underline that contractual freedom is not absolute and must be balanced with principles of good faith, fairness, and the protection of weaker parties. This concern becomes more pronounced in blockchain-based smart contracts, where rigid code execution may limit renegotiation, human discretion, or equitable intervention.Several studies also identify legal challenges related to the automatic and immutable nature of smart contracts, particularly in situations involving unforeseen circumstances such as force majeure or contractual disputes. The inability to easily modify or suspend execution has generated debate on whether smart contracts adequately accommodate equitable doctrines traditionally recognized in contract law. Despite growing academic attention, the existing literature reveals a gap in normative legal analysis concerning the automatic execution of blockchain-based smart contracts within the framework of freedom of contract, particularly in the context of Indonesian civil law. Most studies either emphasize technological aspects or provide general legal assessments without critically examining the tension between contractual autonomy and legal protection. This research seeks to address this gap by analyzing automatic execution mechanisms in blockchain-based smart contracts through the lens of the principle of freedom of contract, thereby contributing a more balanced and contextual legal perspective

METHOD

This study employs normative legal research, also known as doctrinal legal research. Normative legal research focuses on the analysis of legal norms contained in statutory regulations, legal principles, and legal doctrines relevant to the issues examined. Accordingly, this research does not rely on empirical data but emphasizes a juridical analysis of written legal materials governing blockchain-based smart contracts. The approaches adopted in this study include the statutory approach and the conceptual approach. The statutory approach is conducted by examining and interpreting legal provisions regulating contracts and electronic transactions, particularly the Indonesian Civil Code, especially Articles 1320 and 1338, and Law Number 19 of 2016 concerning the Amendment to Law Number 11 of 2008 on Electronic Information and Transactions. This approach is used to assess the legal validity and binding force of smart contracts as electronic contracts. Meanwhile, the conceptual approach is applied to analyze the principle of freedom of contract as a fundamental doctrine in contract law and its relevance to the automatic execution mechanism of blockchain-based smart contracts. The legal materials used in this research consist of primary and secondary legal materials. Primary legal materials include statutory regulations directly related to the object of study. Secondary legal materials comprise legal textbooks, national and international journal articles, academic writings, and scholarly opinions addressing smart contracts, blockchain technology, and the principle of freedom of contract. These

materials are utilized to strengthen the normative analysis and provide a theoretical foundation for the discussion. Legal materials are collected through library research. The collected materials are then analyzed qualitatively using a deductive method, whereby general legal norms and principles are applied to specific legal issues, particularly the automatic execution of blockchain-based smart contracts viewed from the perspective of the principle of freedom of contract.

RESULTS AND DISCUSSION

1. The Principle of Freedom of Contract in Indonesian Civil Law

The principle of freedom of contract constitutes a core doctrine within Indonesian private law and is implicitly affirmed in Article 1338 of the Indonesian Civil Code. This provision establishes that agreements lawfully entered into possess binding force equivalent to statutory law for the parties involved. Consequently, individuals are granted autonomy to decide whether to engage in contractual relations, to select contractual counterparts, and to determine contractual terms, forms, and mechanisms of performance, provided such agreements do not conflict with mandatory law, public order, or moral standards. Indonesia adheres to an open contractual system, allowing parties to formulate agreements beyond those explicitly regulated by legislation. Within this framework, freedom of contract encompasses several dimensions: the liberty to contract or abstain, freedom to choose contractual partners, discretion in determining contractual content and structure, and autonomy in selecting governing legal provisions. These elements collectively support legal certainty and facilitate economic efficiency, particularly in evolving commercial practices.

Nonetheless, the practical application of contractual freedom is increasingly constrained, especially in the context of standard-form agreements. Such contracts frequently reflect unequal bargaining positions, where economically dominant parties unilaterally impose non-negotiable clauses. Although standard contracts remain legally valid under Article 1338 paragraph (1) of the Civil Code, their prevalence challenges the theoretical assumption of equality underlying freedom of contract and may undermine substantive justice. Accordingly, freedom of contract is not absolute. Its exercise is circumscribed by complementary legal principles, including good faith, fairness, proportionality, and balance. Article 1338 paragraph (3) of the Civil Code explicitly mandates the performance of contracts in good faith, serving as a normative safeguard against abusive contractual practices. Moreover, freedom of contract is intrinsically linked to the principle of consensualism, as stipulated in Articles 1320 and 1321 of the Civil Code, which require genuine mutual consent as a prerequisite for contractual validity. In this regard, while freedom of contract remains a foundational principle of Indonesian contract law, its contemporary application—particularly in standardized and digital contractual arrangements—necessitates legal oversight to prevent structural inequality and to ensure equitable outcomes.

2. Automatic Execution of Blockchain-Based Smart Contracts from the Perspective of Freedom of Contract

Smart contracts represent a technologically driven evolution of contractual mechanisms, operating as self-executing electronic agreements embedded within blockchain networks. These contracts consist of programmed code that automatically enforces contractual obligations once predefined conditions are satisfied. Unlike conventional agreements, smart contracts exist in a non-physical, decentralized environment, ensuring transparency, immutability, and procedural efficiency. From a legal standpoint, smart contracts differ conceptually from traditional legal contracts. However, they may acquire legal validity insofar as they comply with statutory requirements governing contracts under Indonesian law. Article 1338 paragraph (1) of the Civil Code provides normative legitimacy for the emergence of innovative contractual forms, including electronic and blockchain-based agreements, by recognizing the autonomy of parties in determining contractual form and substance.

The implementation of smart contracts reflects the principle of freedom of contract by enabling parties to independently design, execute, and enforce agreements without reliance on intermediaries. Automatic execution enhances transactional efficiency and legal certainty, particularly in digital and cross-border contexts. Blockchain platforms such as Ethereum facilitate the deployment of smart contracts through decentralized architectures, thereby reducing risks associated with manipulation, delay, or human error. Nevertheless, the utilization of smart contracts also presents notable legal challenges. The pseudonymous nature of blockchain transactions complicates the verification of identity and legal capacity, while disparities in technological literacy may result in imbalanced contractual relationships. Although digital consent—manifested through actions such as wallet connection and transaction confirmation—can be construed as valid agreement under the principle of consensualism, the irreversible nature of smart contract execution raises concerns regarding fairness and remedial mechanisms.

In the Indonesian legal context, electronic contracts are recognized under Law Number 19 of 2016 concerning Electronic Information and Transactions. However, existing regulatory frameworks remain inadequate to comprehensively address the autonomous, immutable, and self-enforcing characteristics of smart contracts. Similar issues arise in alternative blockchain ecosystems such as Stellar (XLM), where smart contracts enable rapid, low-cost automated transactions through the Stellar Consensus Protocol. Accordingly, this study underscores the urgency of developing a specific and adaptive legal framework governing smart contracts. Such regulation is essential to enhance legal certainty, ensure proportional protection of parties' rights and obligations, and mitigate the risk of contractual injustice arising from automated execution mechanisms.

The implementation of Stellar Lumens (XLM) in digital asset transactions can be observed through trading activities on registered cryptocurrency platforms such as Indodax. In general, the transaction process begins with user registration and identity verification through a *know your customer* (KYC) mechanism. After verification, users may deposit funds, purchase XLM according to their available balance, monitor price movements through market charts, sell the assets, and withdraw funds to their bank accounts. These stages form a legal relationship between users and platform providers and constitute an electronic contractual agreement. XLM Stellar operates on a blockchain network that supports smart contracts as a mechanism for executing transactions. Through the Stellar network, particularly via the Soroban platform, smart contracts function as self-executing electronic agreements embedded in program code. Once predefined conditions are fulfilled, the contract is executed automatically without the involvement of intermediaries. This mechanism grants users the freedom to enter, perform, or terminate digital asset transactions at any time in accordance with applicable terms.

The formation of smart contracts involves several stages, including the formulation of contractual terms in program code using conditional logic, deployment of the code onto the blockchain network, and automatic execution recorded immutably on a distributed ledger. This process replaces conventional written contracts with a transparent, tamper-resistant, and cryptographically secured digital system. From the perspective of Indonesian contract law, smart contracts may satisfy the validity requirements of agreements under Article 1320 of the Indonesian Civil Code, particularly consent expressed digitally, a clearly defined object, and a lawful cause, supported by the provisions of the Electronic Information and Transactions Law. Despite their efficiency and certainty of execution, smart contracts also present legal risks. Rapid technological development is not always accompanied by adequate regulatory frameworks, resulting in legal uncertainty regarding liability, supervision, and dispute resolution in cases of system failure or coding errors. Additional legal risks arise from the limited understanding of smart contract mechanisms by users, as their application in Indonesia remains largely grounded in the principle of freedom of contract and the general framework of the Electronic Information and Transactions Law, without specific regulatory instruments.

Accordingly, blockchain-based smart contracts on platforms such as Ethereum and Stellar Lumens (XLM) are conceptually consistent with the principle of freedom of contract as stipulated in Article 1338 paragraph (1) of the Indonesian Civil Code. They enable parties to freely determine the form, content, and execution of electronic agreements through automated, efficient, and transparent mechanisms. However, such freedom should not be interpreted as absolute. The absence of specific regulation, disparities in technological capability, and the irreversible nature of automated execution may conflict with the principle of good faith and contractual balance under Article 1338 paragraph (3) of the Civil Code. Therefore, while smart contracts expand the application of the principle of freedom of contract in contemporary digital transactions, progressive and adaptive legal regulation is necessary to ensure legal certainty, protect weaker parties, and prevent automated contract execution from generating unjust outcomes.

CONCLUSION

The principle of freedom of contract as stipulated in Article 1338 of the Indonesian Civil Code constitutes a fundamental pillar of Indonesian private law, granting parties the autonomy to enter into agreements concerning their content, form, and conditions. This principle is supported by the doctrine of consensualism as regulated in Articles 1320 and 1321 of the Civil Code, as well as the principle of good faith as emphasized in Article 1338 paragraph (3), provided that such agreements do not contravene the law, public order, or morality. Nevertheless, in modern legal practice—particularly in standard-form contracts drafted by dominant corporations—the principle of freedom of contract often results in an imbalance of bargaining power that disadvantages weaker parties. This condition is reflected in criticisms of onerous clauses, exoneration clauses, and corporate monopolistic practices that undermine the substantive meaning of contractual freedom. Therefore, although the principle of freedom of contract effectively promotes liberal economic activities, its implementation must be balanced with the principles of fairness, equilibrium, and proportionality in order to achieve substantive justice.

In line with technological developments, blockchain-based smart contracts—such as those implemented on Ethereum and Stellar Lumens (XLM) platforms—are consistent with the principle of freedom of contract under Article 1338 of the Indonesian Civil Code. Smart contracts enable the automatic execution of electronic agreements in an efficient, transparent, and intermediary-free manner, while fulfilling the consensual requirements under Article 1320 of the Civil Code and receiving legal recognition through the Indonesian Electronic Information and Transactions Law (UU ITE). However, the absence of specific regulations governing smart contracts gives rise to several legal risks, including legal uncertainty, anonymity of contracting parties, potential coding errors (bugs), and unequal access to technological infrastructure, all of which may further exacerbate the vulnerability of weaker parties. Consequently, while smart contracts expand the scope of contractual freedom in the digital era, they simultaneously necessitate progressive regulatory frameworks to ensure legal certainty, balanced protection, and effective prevention of digital contractual disputes

This study emphasizes the importance of establishing clear and comprehensive regulations governing the use of smart contracts in Indonesia. Considering the significant potential of smart contracts to enhance transactional efficiency and transparency, the government must provide legal certainty for investors and other stakeholders. Specific regulations should address investor protection mechanisms, dispute resolution frameworks, and security standards to minimize potential losses arising from technical vulnerabilities. Furthermore, harmonization with international legal frameworks and the adoption of best practices from other jurisdictions may serve as valuable references to ensure that smart contract regulation in Indonesia is not only responsive to technological advancements but also capable of providing comprehensive legal safeguards. This is particularly crucial given that smart contracts have evolved into a tangible legal phenomenon rather than merely a technological innovation.

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