

# AI-Based Smart Contracts in the Indonesian Civil Law System: Legal Certainty and Regulatory Challenges

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## Article Info

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## ABSTRACT

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This study analyzes the vagueness of norms governing AI-based smart contracts within the Indonesian civil law system, particularly concerning contractual validity, legal liability, and dispute resolution. The emergence of blockchain and Artificial Intelligence has introduced autonomous and adaptive contractual mechanisms that challenge traditional doctrines under the Civil Code, especially the principle of consensualism and fault-based liability. The primary legal issue lies in whether AI-driven smart contracts satisfy the validity requirements under Article 1320 of the Indonesian Civil Code, how liability should be attributed in automated execution, and how disputes involving code-based contracts should be resolved within existing procedural frameworks. This research employs a normative juridical method using statute, conceptual, and case approaches, analyzing relevant regulations such as the Civil Code, the Electronic Information and Transactions Law, the Personal Data Protection Law, and the Consumer Protection Law. The findings reveal that Indonesian positive law has not adequately accommodated the autonomous and adaptive nature of AI-based smart contracts, resulting in legal uncertainty in interpreting consent, determining liability, and assessing digital evidence. This study proposes a prescriptive legal framework through the recognition of digital consent as valid agreement, the application of strict liability and role-based responsibility, and the development of procedural rules recognizing algorithmic code and blockchain records as legal evidence to ensure legal certainty and protection in digital transactions.

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## 1. INTRODUCTION

The rapid development of blockchain technology and Artificial Intelligence (AI) has fundamentally transformed the structure of legal relations in civil transactions, particularly through the emergence of smart contracts as algorithm-based contractual instruments that execute

obligations automatically without direct human intervention. Unlike conventional electronic contracts, AI-based smart contracts are not merely self-executing but also possess adaptive capabilities, enabling them to analyze data, modify contractual performance, and generate outcomes dynamically based on predefined or evolving conditions. This technological transformation challenges the foundational doctrines of civil law, especially within the Indonesian legal system, which is still largely grounded in classical contract principles under the Civil Code (Kitab Undang-Undang Hukum Perdata).<sup>1</sup>

In global practice, smart contracts have been widely implemented in sectors such as financial technology, supply chain management, and digital asset transactions, primarily due to their efficiency, transparency, and automation. However, the integration of AI into smart contracts introduces a higher degree of complexity, particularly concerning decision-making autonomy and the absence of continuous human consent during execution. In Indonesia, the existing legal framework governing electronic transactions, including Law Number 11 of 2008 as amended by Law Number 19 of 2016 concerning Electronic Information and Transactions, has recognized electronic contracts as legally binding. Nevertheless, these regulations do not explicitly regulate AI-based smart contracts, thereby creating normative uncertainty in their legal recognition and enforcement.<sup>2</sup>

The central legal issue in this study is the vagueness of norms regarding the recognition and implementation of AI-based smart contracts within the Indonesian civil law system. This vagueness is manifested in several critical aspects. First, the legal status of smart contracts as valid agreements under Article 1320 of the Civil Code remains unclear, particularly concerning whether algorithmic execution can fulfill the requirement of consensus between parties. Second, the notion of consent becomes problematic when contractual obligations are executed automatically by AI systems without renewed approval from the contracting parties. Third, there is no clear legal framework regulating liability arising from autonomous decision-making by AI in contractual execution, which raises significant concerns regarding accountability and risk allocation.<sup>3</sup>

This normative ambiguity has direct implications for legal certainty and the protection of contractual parties. In the absence of clear legal standards, parties engaging in AI-based smart contracts may face difficulties in asserting their rights, challenging contractual outcomes, or seeking remedies in the event of disputes. Furthermore, the traditional interpretation of contract law, which emphasizes human intention and explicit agreement, appears insufficient to accommodate the autonomous and adaptive nature of AI-driven contracts. As a result, there is a pressing need for a reinterpretation of civil law principles to ensure their relevance in the digital era.<sup>4</sup>

Previous studies have examined the legality and implementation of smart contracts in Indonesia; however, significant research gaps remain. Baihaiqi, Adillah, and Hasana (2022), in their work “Juridical Overview of the Use of Smart Contracts in Indonesia as a Form of Artificial Intelligence Development,” primarily focus on the general legal recognition of smart contracts without deeply analyzing the normative ambiguity of consensus in AI-driven systems. Berliana, Dewantara, and Widyanti (2025), in “Can Smart Contracts Have a Legality Valid in Indonesia?”, discuss the validity of smart contracts but do not critically address the issue of autonomous execution and its implications for contractual liability. Furthermore, Nugraheni and Rahma (2024), in “Optimizing Legal Protection of Parties in Smart Contracts Within the Indonesian Legal System,” emphasize legal protection mechanisms but do not explore the doctrinal conflict between traditional contract principles and adaptive AI systems. These gaps indicate the absence of a

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<sup>1</sup> Naser Al-Sherman, "Smart Contracts: Methods of Documentation, Applications and Integration with Artificial Intelligence," *The Arab World Geographer* (2025).

<sup>2</sup> Happy Budyana Sari, Emmy Febriani Thalib, and Ni Putu Suci Meinarni, "Implementation of Smart Contracts in Indonesia: An Analysis of Financial Regulation, Taxation, and Consumer Protection," *Notariil Jurnal Kenotariatan* (2024)

<sup>3</sup> Syaif Al Haq and Yunanto Yunanto, "Legal Implications of Using Artificial Intelligence (AI) Technology in Electronic Transactions," *International Journal of Social Science and Human Research* (2024)

<sup>4</sup> Hendri Khuan, "The Urgency of Civil Law Reform in Responding to the Development of Artificial Intelligence in Automatic Contracts," *Jurnal Hukum dan Keadilan* (2025)

comprehensive normative analysis that specifically addresses the vagueness of legal norms in AI-based smart contracts, particularly concerning validity, liability, and dispute resolution.<sup>5</sup>

Based on these considerations, this study aims to analyze the position of AI-based smart contracts within the Indonesian civil law system and to formulate a prescriptive legal framework capable of addressing the existing normative ambiguities. This includes reinterpreting the concept of consent in digital environments, redefining liability structures in automated systems, and proposing legal reforms to enhance certainty and protection in AI-driven contractual relationships.

## 2. METHOD

This research employs a normative juridical method, which focuses on the analysis of legal norms, principles, and doctrines governing AI-based smart contracts within the Indonesian civil law system. The research is prescriptive-analytical in nature, aiming not only to identify normative ambiguities but also to formulate legal arguments and recommendations to resolve them. This approach is particularly relevant in addressing emerging legal issues arising from technological developments, where positive law often lags behind innovation.<sup>6</sup>

The statute approach is used to examine the existing legal framework relevant to smart contracts, including the Civil Code (Kitab Undang-Undang Hukum Perdata), Law Number 11 of 2008 as amended by Law Number 19 of 2016 concerning Electronic Information and Transactions, Law Number 27 of 2022 concerning Personal Data Protection, and Law Number 8 of 1999 concerning Consumer Protection. These legal instruments are analyzed to determine their applicability and limitations in regulating AI-based contractual relationships. The statute approach also enables the identification of normative gaps and inconsistencies within the current legal system.<sup>7</sup>

In addition, the conceptual approach is applied to analyze fundamental legal doctrines relevant to this study, including contract theory, the principle of freedom of contract, the doctrine of consensualism, and the evolving concept of legal technology in the context of smart contracts. This approach allows for a critical evaluation of whether traditional legal concepts remain adequate in addressing the characteristics of AI-driven contracts or require reinterpretation to align with technological developments.<sup>8</sup>

The case approach is utilized to examine the practical implementation of smart contracts, particularly those based on blockchain platforms such as Ethereum, and to assess their relevance within the Indonesian legal context. Although Indonesia has limited jurisprudence specifically addressing AI-based smart contracts, comparative analysis of global practices provides valuable insights into potential legal challenges and solutions. This approach also facilitates the identification of practical issues related to execution, liability, and dispute resolution in real-world applications.<sup>9</sup>

The legal materials used in this research consist of primary and secondary sources. Primary legal materials include statutory regulations governing civil law and electronic transactions, while secondary legal materials consist of scholarly articles, legal journals, and academic literature related to smart contracts, AI, and digital law. These materials are systematically analyzed to

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<sup>5</sup> Muhammad Rizqon Baihaiqi, Siti Ummu Adillah, and Dahniarti Hasana, "Juridical Overview of the Use of Smart Contracts in Indonesia as a Form of Artificial Intelligence Development," *Sultan Agung Notary Law Review* (2022); Dina Berliana, Reka Dewantara, and Yenny Eta Widyanti, "Can Smart Contracts Have a Legality Valid in Indonesia?," *International Journal of Business, Law, and Education* (2025); Ciptorukmi Nugraheni and Adalia Safira Rahma, "Optimizing Legal Protection of Parties in Smart Contracts Within the Indonesian Legal System," *Revista de Gestão Social e Ambiental* (2024).

<sup>6</sup> Soerjono Soekanto, *Pengantar Penelitian Hukum* (Jakarta: UI Press, 2008).

<sup>7</sup> Sigit Irianto, "Validity of Contracts in the Digital Era in Indonesia," *International Journal of Religion* (2024).

<sup>8</sup> Adam Muko, "Kajian Smart Contract Dalam Perspektif Hukum Positif Di Indonesia," *Doktrin: Jurnal Dunia Ilmu Hukum dan Politik* (2024).

<sup>9</sup> Anis Habibah, "Implementasi Blockchain dalam Meningkatkan Kepastian Hukum dan Penyelesaian Sengketa Kontrak di Indonesia," *Jurnal Hukum Mimbar Justitia* (2024).

construct coherent legal arguments and to support the prescriptive recommendations proposed in this study.

### **3. RESULTS AND DISCUSSION**

#### **Vagueness of Norms on the Validity of AI-Based Smart Contracts under Article 1320 of the Indonesian Civil Code**

The validity of agreements within the Indonesian civil law system is fundamentally governed by Article 1320 of the Civil Code, which requires four essential elements: consent of the parties, legal capacity, a certain object, and a lawful cause. While these elements have long served as the doctrinal foundation of contract law, the emergence of AI-based smart contracts exposes a significant vagueness of norms, particularly regarding the element of consent. This issue arises because the traditional understanding of consent is inherently anthropocentric, presupposing direct human intention and explicit agreement, whereas AI-based smart contracts operate through automated and adaptive processes that may not involve continuous human participation.<sup>10</sup>

In conventional contracts, consent is typically manifested through explicit expressions such as signatures or written agreements. However, in AI-based smart contracts, consent is often embedded in digital interactions, including clicks, data inputs, or predefined algorithmic conditions. The normative problem lies in determining whether such forms of digital expression can be equated with legally valid consent, especially when the contract continues to execute and evolve without renewed approval from the parties. This becomes even more problematic in adaptive AI systems, where contractual outcomes may change based on real-time data analysis, thereby potentially deviating from the original intention of the parties.<sup>11</sup>

The Indonesian Electronic Information and Transactions Law recognizes electronic contracts as legally binding, thereby providing a basis for acknowledging digital agreements. Nevertheless, the law does not explicitly regulate AI-based smart contracts, nor does it clarify whether algorithmic execution satisfies the requirement of consensus. This regulatory silence creates a normative ambiguity that may lead to inconsistent legal interpretations, particularly in determining whether a smart contract fulfills the subjective element of agreement under Article 1320.<sup>12</sup>

Furthermore, the principle of consensualism in Indonesian contract law emphasizes that agreements are formed based on the meeting of minds between parties. In AI-based smart contracts, the “meeting of minds” is replaced by pre-programmed logic and automated execution, raising the question of whether such a mechanism can genuinely reflect mutual consent. The concept of “code is law,” often associated with blockchain-based contracts, further complicates this issue by prioritizing technical execution over legal interpretation. As a result, there is a risk that contractual validity becomes dependent on code functionality rather than the actual intention of the parties.<sup>13</sup>

The implications of this normative vagueness are significant. First, there is a potential for contracts to be declared null and void if the element of consent is deemed not to have been properly fulfilled. Second, the absence of clear legal standards creates uncertainty regarding the enforceability of AI-based smart contracts, thereby undermining trust in digital transactions. Third, evidentiary challenges may arise in proving the existence and scope of consent, particularly when contractual terms are encoded in complex algorithms that are not easily understood by non-technical parties.<sup>14</sup>

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<sup>10</sup> Sigit Irianto, "Validity of Contracts in the Digital Era in Indonesia," *International Journal of Religion* (2024).

<sup>11</sup> Fanisa Asyatilah Rusli et al., "Keabsahan Kontrak yang dibuat Melalui Artificial Intelligence (AI) dalam Perspektif Hukum Perdata Indonesia," *Hukum Inovatif* (2026).

<sup>12</sup> Muhammad Rizqon Baihaiqi, Siti Ummu Adillah, and Dahniarti Hasana, "Juridical Overview of the Use of Smart Contracts in Indonesia," *Sultan Agung Notary Law Review* (2022).

<sup>13</sup> S. Sudarto, "Smart Contracts from a Civil Law Perspective: Validity and Implementation in Indonesia," *Jurnal Ilmiah Hukum Dirgantara* (2025).

<sup>14</sup> M. Munawar, "The Legality of Smart Contract in the Perspectives of Indonesian Law and Islamic Law," *Al-Istinbath* (2022).

To address these issues, a progressive legal interpretation is required, one that recognizes digital expressions of consent as valid forms of agreement, provided that they meet certain conditions. Specifically, consent in AI-based smart contracts should be considered valid if it reflects the free will of the parties, is based on informed understanding, and is not obtained through coercion or manipulation. This approach aligns with the fundamental principles of contract law while accommodating the realities of digital transactions.

In addition, it is necessary to develop legal standards that ensure transparency and accountability in AI-based smart contracts. This includes requiring clear disclosure of algorithmic mechanisms, ensuring that parties have the ability to review and understand the terms of the contract, and establishing safeguards against unintended or harmful outcomes. Ultimately, the reinterpretation of Article 1320 must be guided by the objective of maintaining legal certainty while embracing technological innovation.

### **Vagueness of Legal Liability in the Automated Execution of AI-Based Smart Contracts**

The automated execution of AI-based smart contracts introduces a fundamental challenge to the traditional framework of legal liability in Indonesian civil law. Under the Civil Code, liability is generally based on two primary doctrines: breach of contract (*wanprestasi*) and tort (*perbuatan melawan hukum*). Both doctrines presuppose human actions and intentions, which become difficult to identify in the context of AI-driven systems that operate autonomously and adaptively. This creates a significant vagueness of norms regarding who should be held responsible when a smart contract produces harmful or unintended outcomes.<sup>15</sup>

In AI-based smart contracts, execution occurs automatically once predefined conditions are met, without the need for further human intervention. Moreover, advanced AI systems are capable of learning from data and modifying their behavior over time, which may lead to outcomes that were not explicitly anticipated by the parties. In such cases, determining liability becomes highly complex, as it is unclear whether responsibility should be attributed to the developer who designed the algorithm, the user who deployed the contract, or the system itself.<sup>16</sup>

The absence of explicit legal regulation on AI-based liability exacerbates this problem. While the Consumer Protection Law provides a general framework for protecting consumers in digital transactions, it does not specifically address the unique risks associated with AI-driven systems. Similarly, existing provisions on breach of contract and tort are not adequately equipped to handle situations where the harmful act is performed by an autonomous system rather than a human actor. As a result, there is a risk that injured parties may be left without effective legal remedies.<sup>17</sup>

Another critical issue is the difficulty in establishing causation. In traditional legal analysis, liability requires a clear causal link between an act and the resulting harm. However, in AI-based smart contracts, causation may involve multiple layers of decision-making, including algorithmic processing, data inputs, and system interactions. This complexity makes it challenging to identify the precise source of the error or to attribute responsibility to a specific party. Consequently, the application of conventional liability doctrines becomes increasingly uncertain.<sup>18</sup>

The implications of this normative vagueness are far-reaching. First, it creates a legal vacuum in which parties may suffer losses without a clear avenue for compensation. Second, it undermines the principle of legal certainty, as parties cannot predict the legal consequences of engaging in AI-based contractual relationships. Third, it weakens consumer protection, particularly

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<sup>15</sup> Aril Ramadhan, Holyness N. Singadimedja, and Rr. Janti Surjanti, "Tanggung Jawab Penyedia Platform terhadap Pekerja Gig," *Padjadjaran Law Review* (2022).

<sup>16</sup> Nadia Rizki Pratami and Muhammad Fakhry Dzulfiqar, "Analisis Hukum terhadap Peran Artificial Intelligence (AI)," *INFOKOM* (2024).

<sup>17</sup> Anjar Sri Ciptorukmi Nugraheni and Adalia Safira Rahma, "Optimizing Legal Protection of Parties in Smart Contracts," *Revista de Gestão Social e Ambiental* (2024).

<sup>18</sup> Syaif Al Haq and Yunanto Yunanto, "Legal Implications of Using Artificial Intelligence (AI)," *IJSSHR* (2024).

in cases where individuals lack the technical knowledge to understand or challenge the operation of AI systems.<sup>19</sup>

To address these challenges, a prescriptive legal approach is necessary. One potential solution is the adoption of a strict liability regime for high-risk technologies, including AI-based smart contracts. Under this approach, parties involved in the development or deployment of such systems would be held liable for damages regardless of fault, thereby ensuring greater protection for injured parties. Additionally, a role-based liability framework should be established, clearly defining the responsibilities of developers, operators, and users in the lifecycle of AI-based smart contracts.

Furthermore, regulatory standards should be introduced to ensure accountability and risk management in AI systems. These may include requirements for algorithmic transparency, mandatory testing and validation, and the implementation of safeguards to prevent harmful outcomes. By establishing a clear legal framework for liability, it is possible to balance the benefits of technological innovation with the need for legal protection and certainty.

**Table 1. Comparative Legal Liability Framework between Conventional Contracts and AI-Based Smart Contracts**

Aspect	Conventional Contracts	AI-Based Contracts	Smart Normative Problem	Proposed Legal Approach
Execution	Human-controlled	Automated algorithm	by Lack of human intervention	Legal recognition of automated execution
Decision-making	Based on human intent	Adaptive decisions	AI-based Unpredictable outcomes	Algorithmic transparency standards
Liability subject	Clearly identifiable parties	Developer, user, or AI system unclear	Ambiguity of responsible party	Role-based liability framework
Basis of liability	Fault-based (wanprestasi/PMH)	Difficult to prove fault	Weak enforcement of liability	Adoption of strict liability
Causation	Direct and traceable	and Complex and multi-layered	Difficulty proving causation	Presumption of liability in AI systems
Consumer protection	Explicitly regulated	Not AI-specific	Legal protection gaps	Strengthening consumer protection norms

### **Vagueness of Norms in Dispute Resolution and Evidentiary Mechanisms in AI-Based Smart Contracts**

Disputes arising from AI-based smart contracts present unique legal challenges that expose a significant vagueness of norms within the Indonesian civil procedural framework. Unlike conventional contractual disputes, which are typically grounded in written agreements and human interpretation, disputes involving smart contracts are inherently code-based and often operate within decentralized blockchain environments. This fundamental difference raises critical questions regarding the appropriate mechanisms for dispute resolution and the admissibility and interpretation of evidence in such cases.<sup>20</sup>

One of the primary issues lies in the absence of a specific legal framework governing dispute resolution for smart contracts. Indonesian civil procedure law remains largely oriented toward traditional forms of dispute resolution, including litigation and alternative dispute resolution

<sup>19</sup> Happy Budyana Sari et al., "Implementation of Smart Contracts in Indonesia," *Notariil Jurnal Kenotariatan* (2024).

<sup>20</sup> Leonard Parulian, "Eksistensi Perjanjian Elektronik sebagai Alat Bukti dalam Hukum Acara Perdata," *Jurnal Akta Yudisia* (2021).

mechanisms such as mediation and arbitration. While these mechanisms are theoretically applicable to digital disputes, they are not designed to address the technical complexities of AI-based smart contracts, particularly those involving automated execution and algorithmic decision-making. Consequently, there is a normative gap in determining how disputes arising from such contracts should be resolved effectively and fairly.<sup>21</sup>

The cross-border nature of blockchain-based smart contracts further complicates dispute resolution. Smart contracts often involve parties from different jurisdictions, raising issues of applicable law and forum selection. In the absence of clear regulatory provisions, it becomes difficult to determine which legal system governs the contract and which court or tribunal has jurisdiction over disputes. This uncertainty undermines legal certainty and increases the risk of conflicting decisions across jurisdictions.<sup>22</sup>

Another significant aspect of normative vagueness concerns evidentiary mechanisms. Indonesian law, particularly through the Electronic Information and Transactions Law, recognizes electronic documents as valid legal evidence. However, the law does not explicitly address whether algorithmic code, blockchain records, or AI-generated outputs can be treated as equivalent to traditional written agreements. This creates uncertainty regarding the evidentiary value of smart contracts, especially when the contractual terms are embedded in complex code that may not be easily interpreted by judges or legal practitioners.<sup>23</sup>

The problem is further exacerbated by the technical nature of smart contracts. Judges and legal practitioners may lack the necessary expertise to understand and interpret algorithmic code, leading to potential inconsistencies in judicial decisions. Moreover, the principle of freedom of proof in civil procedure may not be sufficient to accommodate the complexities of digital evidence, particularly when it involves cryptographic verification and decentralized data storage. As a result, there is a risk that courts may either misinterpret the evidence or rely excessively on expert testimony, thereby affecting the fairness and efficiency of dispute resolution.<sup>24</sup>

The implications of this normative vagueness are substantial. First, it creates uncertainty regarding the enforceability of smart contracts, as parties may be unsure of how disputes will be resolved or what evidence will be considered valid. Second, it increases the likelihood of inconsistent judicial outcomes, which undermines the predictability of the legal system. Third, it may discourage the adoption of smart contracts in Indonesia due to the perceived risks associated with legal uncertainty.<sup>25</sup>

To address these challenges, a prescriptive legal framework is required. One key approach is the development of a specialized legal tech adjudication framework that integrates technological expertise into the dispute resolution process. This may include the establishment of specialized courts or tribunals with expertise in digital technology, as well as the use of technical experts to assist judges in understanding complex evidence.

In addition, there is a need to explicitly recognize algorithmic code and blockchain records as valid forms of legal evidence, provided that their authenticity and integrity can be verified. This requires the development of standardized procedures for the verification and interpretation of digital evidence, including the use of digital forensics and cryptographic validation techniques. Furthermore, dispute resolution mechanisms such as electronic arbitration (e-arbitration) should be strengthened to provide more efficient and flexible solutions for resolving disputes arising from smart contracts.

Ultimately, the reform of dispute resolution and evidentiary mechanisms must be guided by the principles of legal certainty, fairness, and technological neutrality. By aligning procedural

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<sup>21</sup> Methodius Kossay et al., "Efektivitas Mediasi dalam Penyelesaian Sengketa Perdata di Era Digital," *Perkara: Jurnal Ilmu Hukum dan Politik* (2025).

<sup>22</sup> Diding Jalaludin and Chaerul Shaleh, "Integrasi Kontrak Elektronik dan Arbitrase Elektronik dalam Satu Platform Digital," *Maliyah: Jurnal Hukum Bisnis Islam* (2025).

<sup>23</sup> Dennis Fernando, D. Heniarti, and Chepi Ali Firman Zakaria, "Transformasi Alat Bukti Elektronik Menggunakan Digital Forensik," *Journal Justiciabelen* (2025).

<sup>24</sup> Anis Habibah, "Implementasi Blockchain dalam Meningkatkan Kepastian Hukum," *Jurnal Hukum Mimbar Justitia* (2024).

<sup>25</sup> Mas Agus Priyambodo, "Mekanisme Penyelesaian Sengketa Konstruksi," *IBLAM Law Review* (2021).

law with technological developments, it is possible to ensure that the legal system remains relevant and effective in addressing the challenges posed by AI-based smart contracts

#### **4. CONCLUSION**

AI-based smart contracts within the Indonesian civil law system are characterized by significant vagueness of norms in three fundamental aspects: the validity of agreements, legal liability, and dispute resolution mechanisms. The analysis demonstrates that the existing legal framework, particularly the Civil Code and related statutory regulations, is not adequately equipped to address the autonomous and adaptive nature of AI-driven contractual relationships.

The vagueness of norms regarding the validity of smart contracts is primarily rooted in the uncertainty surrounding the concept of consent, as traditional doctrines of consensualism are challenged by automated and algorithmic execution. Similarly, the absence of clear legal standards for liability creates ambiguity in determining responsibility for damages arising from AI-based contract execution. In the context of dispute resolution, the lack of specific procedural rules for handling code-based disputes and digital evidence further exacerbates legal uncertainty.

These normative ambiguities have significant implications for legal certainty and the protection of contractual parties. Without clear legal standards, parties engaging in AI-based smart contracts face increased risks, including the potential invalidity of agreements, difficulties in enforcing rights, and challenges in resolving disputes. This situation highlights the inadequacy of the current legal framework in accommodating technological advancements.

Therefore, this study emphasizes the necessity of legal reform to address these challenges. Such reform should include the reinterpretation of fundamental contract law principles to recognize digital forms of consent, the establishment of a clear liability framework that incorporates strict liability and role-based responsibility, and the development of procedural rules that accommodate digital evidence and technology-based dispute resolution.

In conclusion, the evolution of smart contracts driven by AI requires a responsive and adaptive legal system. By addressing the existing vagueness of norms, Indonesian civil law can provide greater legal certainty, enhance the protection of contractual parties, and support the sustainable development of digital transactions in the era of technological innovation.

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