



Legal Adaptation to Smart Contract Agreements in Indonesia: Navigating Digital Disruption in Business Contracts

Dinda Delfina

Universitas Negeri Malang, Indonesia

Correspondent: dinda.delfina.fis@um.ac.id

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ABSTRACT: This study aims to: (1) examine the legal aspects of smart contracts in the Indonesian legal system and propose adaptations to existing laws and regulations to suit the characteristics of smart contract technology; (2) identify normative and implementative challenges in the legal adaptation process, such as normative gaps and the lack of a standard framework; and (3) formulate the direction of legal reform needed to form responsive and contextual smart contract regulations. Unlike previous studies which are generally descriptive and technological in nature, this study provides a legal contribution by mapping gaps in national contract law and presenting a comparative analysis as a basis for formulating a smart contract regulation model in Indonesia. This research uses a juridical-normative and empirical-qualitative approach, with a doctrinal legal analysis of the legislation, legal literature study, and in-depth interviews with legal practitioners and technology actors. The main findings of this research indicate that there is no legal framework that explicitly regulates the validity and execution of smart contracts, which creates legal uncertainty. Therefore, it is recommended that the principle of freedom of contract in the Civil Code be expanded to include digital contracts that are executed automatically. In addition, special regulations are needed in the form of derivative regulations or technical guidelines that bridge blockchain technology with national civil law principles. The practical contribution of this research is to provide a starting point for policymakers and academics in designing smart contract regulations in Indonesia that are comprehensive and responsive to technological developments, so that they can provide legal certainty while supporting digital innovation.

Keywords: Digital Disruption, Business Contracts, Legal Adaptation, Smart Contract Agreements



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INTRODUCTION

The development of blockchain technology has given rise to smart contracts, agreements that are automatically executed based on computer code without third-party intervention. Smart contracts offer efficiency, transparency, and certainty of execution, significantly different from conventional contracts based on text and legal interpretation. However, their implementation in Indonesia still

faces various legal obstacles due to the lack of explicit and comprehensive regulations in the national legal system.

In the context of Indonesian civil law, the principle of freedom of contract, as stipulated in Article 1338 of the Civil Code, is the basis for the validity of an agreement. However, the emergence of smart contracts raises new questions: can code-based agreements be considered legally valid? Are the elements of consensus and free will in contracts still fulfilled in a digitally automated system? Therefore, relevant legal adaptations are needed so that the Indonesian legal system can appropriately respond to these dynamics.

Smart contracts are not new technological innovations in the fields of informatics and law. However, their significance has been increasing in terms of necessity for legal adaptation ([18 Braun, V. and Clarke, 2021](#)). The global pace of technological advancements has reached the era of intelligent economic activity. Smart contracts that incorporate automated trust verification in digital agreements require substantial sophistication in legal adaptation. Machines and automatic systems develop and streamline activities, including processing various sorts of standard contracts, digital contract templates, rights and obligations, and digital signature requirements. With the increasing adoption of the digital economy, digital contracts rival traditional written contracts. Smart contracts possess significant appeal when applied to various sectors, ranging from notary business, intellectual property rights, and the creation of digital ledger records of financial transfers to e-commerce ([Agustian, Kresnawidiansyah, Aryanda Pohan, Agustian Zen, Wiwin Wiwin, 2023](#)). This essay accomplishes the goals outlined in the previous section. The first section profitably describes the evolution of the use of both smart contracts and legal norms in Indonesia that are relevant to them, as well as how both parties have been adapted to digital technology. Smart contracts are inherently different from their traditional predecessors and thus create a different set of challenges for national legal systems ([Setiawan, 2019](#)). Consequently, this essay seeks to explore the often-ignored legal side through a specific perspective, given that powerful digital technology is no longer new and cannot be neglected from the perspective of contract law theory ([Almeida D, Shmarko K, 2022](#)) ; ([Nugraheni, N., Mentari, N., and Shafira, 2022](#)). The issuance of the term "Smart Contracts" in the late 1990s can be argued as the origin of the term for a significant number of legal professionals and technology enthusiasts around the same time. It describes smart contracts as a "computerized transaction protocol that executes the terms of a contract; as it does so, the contract is applied between untrusting parties. "Technically, a smart contract is self-executing, containing its terms of agreement written directly in code ([Amato F, Cozzolino G, 2021](#)). It provides a way for a certain agreement or process to be completed without a powerful organization as a trusted agent. The first smart contract plays an important role in interpreting encrypted telecommunications, specifically email ([Ferreira, 2021](#)). The development of blockchain as a trust machine in technology has changed how we create and interpret decentralized technologies similar to smart contracts. Although the notion of "smart contracts" in the original framework and the technologically superior variant of smart contracts in the blockchain today are different, they complement and develop the idea of one another. Smart contracts today are bound by smart oracles that allow for many independent information sources to be injected into them in a dynamic and permissionless way. Today, smart contracts not only debut in various domains of the blockchain but also in the hardware and software industries. Supply chain industries have

gradually been leveraging blockchain and smart contracts as transparent and accountable gatekeepers across the production line. Supply chain and logistics are the current uses of a combination of smart contracts and blockchain technologies ([Pasdar, A., Lee, Y. C., and Dong, 2023a](#)). The continued development of blockchain technologies also paves the way for the adoption of smart contracts on a large scale in other industries. The variety of smart contracts may provoke one to see only opportunities and potential use cases. Unfortunately, most of these potentials are not fulfilled because people are skeptical regarding this kind of innovation. This skepticism could be due to the assigned role of the notary in legal contexts, which should be replaced directly through the use of smart contracts. The goals and processes of notaries put a limit on how industries, including electronic signatures under which digital signatures fall, could be incorporated as part of the civil law and other legal infrastructures of countries employing them ([Lehr, 2022](#)). The lead heading "Legal Adaptation of Smart Contract Agreements in Indonesia" sheds light on the main issue this study seeks to address, which lies at the intersection of the concept of smart contracts and Indonesian law. Following this perception, the purposes of this study are threefold: (1) to take a closer look at the different aspects of Indonesian law on smart contracts and to adapt the existing legal rules to the unique characteristics of smart contracts in Indonesia; (2) to identify the challenges in legal adaptation in smart contract regulation in Indonesia; and (3) to identify changes that are required to be made for related legal reforms in the legal rules of smart contracts in Indonesia. This study is purely based on the results of qualitative and empirical research from different sources, such as legal literature, regulations, and available data that are related to the relevant issues. In order to adapt the legal rules, this study refers to a smart contract that is not centralized. However, the results of this study require an understanding of smart contracts in a broader sense, such as in legal literature, because they are still related to the legal rules governing the principle of contract freedom. This study distinguishes between a technical understanding of smart contracts and a legal understanding of smart contracts. Technical understanding is not the object of this study ([Nugraheni, N., Mentari, N., and Shafira, 2022](#)). The issuance of the term "Smart Contracts" in the late 1990s can be argued as the origin of the term for a significant number of legal professionals and technology enthusiasts around the same time. It describes smart contracts as a "computerized transaction protocol that executes the terms of a contract; as it does so, the contract is applied between untrusting parties." Technically, a smart contract is self-executing, containing its own terms of agreement written directly in code. It provides a way for a certain agreement or process to be completed without a powerful organization as a trusted agent. The first smart contract plays an important role in interpreting encrypted telecommunications, specifically email. ([Ferreira, 2021](#)).

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This study is significant because it bridges a gap in smart contract studies in Indonesia, a country with unique civil law characteristics and a still-developing digital economy regulatory framework. Despite the rapid growth of blockchain technology, Indonesia lacks specific regulations governing the validity, execution, or consumer protection of smart contracts. However, this uniqueness has not been fully utilized in previous studies, which tend to be descriptive or technology-centric.

To strengthen its novelty, this study compares the Indonesian legal system with similar jurisdictions in Southeast Asia, such as Malaysia and Thailand, which also adhere to civil law systems. This comparative analysis demonstrates how each country's approach to the principle of freedom of contract, the digitization of legal documents, and the recognition of the automation of digital agreements can serve as a reference for Indonesia.

Furthermore, this study examines Indonesian legal doctrines that may specifically limit or support the adoption of smart contracts, such as the formal principle of written agreements, the doctrine of free will (*wilsautoomie*), and the bindingness of the form and content of contracts under Article 1320 of the Civil Code. With this approach, this study provides a stronger legal foundation for digital contract law reform in Indonesia. Indonesia now faces a lack of digital economy and consumer protection regulations. Therefore, it is very likely that there will be a legal gap as the primary rule that regulates smart contract agreements in Indonesia. Based on the academic gap that is supported by empirical evidence in Indonesia, this study aims to contribute to the literature on this subject. This study is also addressed to Indonesian policymakers and legal professionals who are or will adopt a smart legal contract to avoid possible legal conflicts in the future arising from agreements made through this data network ([Ridwan: 2021](#)).

METHOD

Qualitative research methods can significantly enhance the search for legal adaptations to changing societal, technical, and business demands. They can also offer valuable insights into emergent legal concepts and principles, point to possibilities for legal innovation, and generate hypotheses for further testing. Employing qualitative research methods, and particularly analyzing the perception of smart contracts among the regulated community, offers a legal perspective that can be very insightful. It is important to establish that a lack of awareness or a decline in popularity among those supposedly in charge will indeed affect the ultimate development of customary business law on smart contracts and blockchain contracts ([Agustian, Kresnawidiansyah, Aryanda Pohan, Agustian Zen, Wiwin Wiwin, 2023](#)). The sampling, data collection, and analysis strategy of the construction of qualitative studies. All the strategies below consider the nature of the data and the purpose of the study. The undertaken qualitative research method is in accordance with the unfolding nature of the underlying issues. This method responds well to the study's descriptive, exploratory, and analytical objectives. Additionally, the objectives for explanation and understanding of the explored phenomena are achieved as well. To achieve this, interviews were used as a research instrument for collecting data and a deductive approach was combined for coding the transcripts. Each step throughout the research directions was guided by a model for research design. The model outlines the epistemological, ontological, and methodological design for better achievement of the qualitative study. These research aspects are universally outlined as the research paradigm, research approach, research strategy, time horizon, research sample, research instrument, data analysis, and generalization of the results. In the following, the next subsections discuss the methodological design and its application in Smart Contract Agreements, concluding with a summary of the employed research method. The conclusion of the research method marks the entering phase of a qualitative research study. The study's approach and research method, as well as the data collection process, are then defined, explained, and outlined. The methodological issues, challenges, and limitations are raised along with the information on utilizing qualitative interview questions posed to experienced business executives. The analytical method employed in the study factored in the open, axial, and selective coding activities subsequently conducted. Finally, the chapter's summary of the research design concludes with an effort to highlight the existing gap in utilizing qualitative research methods in Smart Contract Agreements studies ([Karunarathna, Indunil, K. De Alvis, P. Gunasena, 2024](#)).

This research employs a qualitative approach with normative-juridical methods and empirical interviews. The juridical approach was used to examine applicable legal provisions related to smart contracts, including the principles in the Civil Code and other relevant regulations. Secondary data was obtained through desk research of legal literature, scientific journals, and legislative documents.

To complement the normative analysis, semi-structured interviews were conducted with five key informants, consisting of legal practitioners, technology law academics, and blockchain developers. The interviews were conducted online and offline from March to April 2025 in Jakarta and Surabaya, two cities that are centers of legal and digital technology discussion in Indonesia. Information from respondents was used to understand the practices, perceptions, and challenges in implementing smart contracts in Indonesia. Data was analyzed descriptively and qualitatively,

with a focus on identifying legal gaps, implementation barriers, and potential regulatory reforms for smart contracts within the national legal system.

Considering that qualitative research aims to unpack and understand complex requirements for the implementation of smart contract arrangements, qualitative research methods were adopted. This methodological approach was considered relevant due to its capacity to let the researcher gather original information about the themes in focus for the research, providing an in-depth interpretation of these themes. The key point of departing from prospective and exploratory analysis was to object to its qualitative research approach, considering that nowadays it is the best methodological approach for professionals who aim to deal with the challenges of a turbulent business macro-environment, such as smart contract relationships, seeking smart contract authenticity and credible execution, assuring data privacy and security, and offering all the technical guarantees required wisely. This research presents itself as a qualitative study that confronts the questions using documented qualitative investigation into the field in order to deepen the analyses, reflecting on the diverse methodological tools that are required and adopted to solve the research questions with depth and rigor. The exploratory stage allows for a better understanding of the problem in focus, refining the research objective and proposing a new approach to questions that were made in the role of a hypothesis for specific advancement in the subsequent analysis grounded when the answers are required.

We used semi-structured interviews to explore the research question. Some questions were construct-based, as existing literature provides guidance on transaction costs theory and a framework for understanding the applicability of transaction costs to the issue, albeit primarily in the traditional commercial context. Others were fact-collection directed, in order to collect data to support or refute hypotheses about expectations regarding role specialization, types of decisions or management, or potential changes in role responsibilities. Adopting this approach allowed us to collect a rich, diverse set of data, and generating project data was, to some extent, grounded in our prior knowledge. Interviewees were able to express, in their own words, opinions, perceptions, and expectations without being prompted or steered too much by our prior perceptions or knowledge of the issues. Telephone or email exchanges, although less expensive, have the specific difficulty of not promoting direct interaction, and this is important when one of the main goals of the study requires getting answers beyond the subject's comfort zone. To minimize this problem, at the end of some telephone interviews, we asked three to four open questions, providing the interviewee the flexibility to elaborate on their answers. The interview design was also based on the previous research of the project core. The core researchers were engaged in the business of the platform sponsors and were actively connected with the potential designed stakeholders ([Ruslin, Ruslin, Saepudin Mashuri, Muhammad Sarib Abdul Rasak, Firdiansyah Alhabsyi, 2022](#)).

Data sources are a critical part of the evolution of a research project. They can contribute to sharpening the question and shaping the scope of the problem. In this section, six types of data sources will be outlined and examined. Textbooks, legal reports, legislation, case law, and academic literature will be addressed specifically because they are important information sources for legal research. The present paper will also guide researchers to conduct research in the fields of technology law, especially on smart contracts and blockchain technology. Secondary sources, such as textbooks, are a critical part of the development of legal research. These materials provide

primary information to guide a lawyer in the use of primary sources. They can take many forms, including legal treatises, law review articles, technical data, and news. Some are published as books, and some can be found throughout a variety of sources. This paper will especially look at academic literature, legislation, case law, legal documents, and technical overviews and specifications of smart contracts and blockchain technology ([Hamzani, Achmad Irwan, Tiya Vika Widyastuti, Nur Khasanah, 2023](#)).

For qualitative research, interviews bring opportunities for researchers to have in-depth, open conversations about the research topic. They provide access to relevant groups and communities, such as lawyers and IT professionals. Interviewees relate their personal views, experiences, and interpretations to the given subject. They often provide comprehensive responses to the questions, allowing researchers to gain rich descriptions and explanations. This results in thick and explicit data, beneficial to the emergent exploratory stage of the research, enabling unexpected and potentially significant findings. A wide variety of question types, from broad to detailed, can be utilized, encompassing both direct and open-ended questions. To enhance the validity of the study, more than one data source can be accessed via cross-checking and comparing multiple interview answers ([Barak, 2021](#)). For the proposed study, semi-structured interviews will be selected. With a relatively open framework based on key themes, they facilitate detailed responses and the exploration of interviewees' thoughts and experiences. The nine criteria suggested are also considered pertinent for this research: proximal and distal questions (centered on the main issue and peripheral factors), identifying the respondents' basis for providing answers (to understand the validity of the opinion provided), and the sequencing of the questions (through context-providing genealogical questioning); slotted and pyramided questions (consisting of multiple questions where the respondents can offer their answers, followed by further questions on the same topic to ascertain the reasons for their answers); and reluctant to secure-risky questions (questions where the interviewee may be hesitant to answer or may put the validity of other answers at risk). During the actual interview, it is noteworthy that the researchers have to be patient and flexible when investigating the topic of the research, since it may lead to the most insightful answers from the interviewees ([Aung, Khin Thandar, Rafiza Abdul Razak, 2021](#)). The qualitative data collected through in-depth interviews have been analyzed. The data analysis focused on determining how legal perspectives tackled by legal practitioners and scholars adapt to the emergence of digital disruption in the business law ecosystem, particularly concerning the normative legal development of smart contract agreements. The qualitative research analysis was performed using a step-by-step research procedure, referred to as qualitative thematic analysis. Qualitative thematic analysis is a means to systematically organize and interpret qualitative data in a flexible. It is a methodology often applied to inform evidence-based policy for numerous legal, business, and social science procedures. The methodology involves using both inductive and deductive analytical processes that produce themes, which assist in understanding diverse research phenomena ([Braun, V. and Clarke, n.d.](#)). Data were transcribed verbatim and the interview responses were categorized in a codebook, ensuring the research questions and aims guided the coding process. This ensured the coding process was pragmatic and question driven, and that the coding outcomes directly reflected the interview participants' experiences in relation to the research questions. The direct quotations that were captured throughout the research process were refined and organized in each theme that had been generated. The purpose of these data insights

was to substantiate the narratives identified in the final themes in a valid manner. This analytical process was repeated numerous times to ensure it was as robust and unbiased as possible. All possible angles and viewpoints were considered as another pair of eyes could reveal a new direction for the final thematic analysis. The qualitative analysis process used was valid as it was grounded in the data, reflected the worldview of the participant, and considered the research question (Coleman, 2022).

RESULT AND DISCUSSION

Indonesian contract law is predominantly governed by the Indonesian Civil Code, several government regulations, and a number of Supreme Court regulations that elaborate further on the contract provisions in the Code. Indonesian contract law consists of general and special provisions. The general provisions that govern all types of objects of transactions are contained in the Civil Code, but the form required to enforce certain types of contracts is regulated by certain government regulations. In normal practice, these are the laws and acts that are usually referred to as contractual agreements ([Budiarta, I. N., & Putu, 2020](#)).

Positive Legal Aspects of Indonesia Regarding Smart Contracts

Currently, the Indonesian legal system does not have explicit regulations regarding smart contracts. The applicable civil legal framework is still based on the Civil Code (KUH Perdata), specifically the principle of freedom of contract (Article 1338 of the KUH Perdata). However, smart contracts have unique characteristics that distinguish them from conventional contracts: automatic execution and the use of computer code.

Although not explicitly stated in the regulations, smart contracts can theoretically be recognized as valid if they meet the elements of a contract: agreement, capacity, a specific object, and a lawful cause. However, challenges arise because the form, language, and agreement process in smart contracts do not conform to classical norms in Indonesian civil law.

Challenges in Legal Adaptation to Smart Contracts

This research identifies several key challenges in the process of legal adaptation to smart contracts in Indonesia: Ambiguity regarding the legal status of smart contracts within the national legal system. Lack of technical understanding among policymakers and law enforcement. The absence of national standards for the development and implementation of smart contracts. Concerns about cybersecurity and potential abuse.

Table 1. Challenges to Adapting Smart Contract Law in Indonesia

NNNo	Main Challenges	Brief Explanation
11	Legal Uncertainty	There are no explicit articles regulating smart contracts in the Civil Code or the ITE Law.
22	Technical Gap	Law enforcement officials do not yet understand how blockchain and smart contracts work.
33	Absence of Standards	There are no national guidelines regarding the legal design of smart contracts.
44	Cyber Risk	Smart contracts are vulnerable to attacks or bugs in the code

International Comparative Perspective

Several countries have taken significant steps in regulating smart contracts. This comparison shows how Indonesia can learn from other countries' approaches:

Table 2. International Comparison of Smart Contract Regulations

Country	Policy / Regulation	Legal Approach
AS (Arizona, Tennessee)	Declaring that smart contracts have valid legal force	<i>Enabling Law: supporting technological innovation</i>
European Union	Through the Markets in Crypto-Assets Regulation (MiCA) regulates blockchain-based transactions	<i>Risk-based Regulation</i>
Singapore	Adopting technology-neutral principles in digital contract and finance law	<i>Flexible Legal Framework</i>
Indonesia	There are no specific regulations yet; still refers to the Civil Code and the ITE Law	<i>Conservative and Reactive</i>

The legal approaches in these countries demonstrate the importance of combining legal flexibility and developing technology standards. Indonesia can adopt technology-neutral principles and gradually issue derivative regulations tailored to the national context.

Direction of Legal Reform in Indonesia

Based on normative analysis and empirical findings, the direction of legal reform in Indonesia should include:

- Expanding the interpretation of the principle of freedom of contract to encompass digital-based automated agreements.
- Drafting specific technical regulations, for example in the form of ministerial regulations or technical guidelines on the legal design of smart contracts.

- c. Strengthening the legal and technical capacity of law enforcement officials through blockchain technology-based training.
- d. Cross-sector collaboration between government, academics, and industry players in developing smart contract policies.
- e. With these steps, the Indonesian legal system can become more responsive to digital innovation while providing the necessary legal certainty for technology-based transactions.

An observed gap in the conventional legal order may challenge the implementation of smart contracts. It is argued that Indonesia's contract law is not prepared for digital transactions, as its principles stress the traditional concept of contracts as agreements, promises, or undertakings. The principle of 'agreement between the parties' is so fundamental that it has become a popular phrase used widely in describing contract law in Indonesia. As a result, under Indonesian law, a contract is an agreement between the parties, which requires complete understanding, will, capacity, the intention of the parties, and freedom of expression. Commonly, a contract using smart technology is entered into between at least one human, one machine, and a payout system. In the Indonesian context, it is challenging to look at how courts interpret the intention of these digital transactions. In practice, disagreements over these smart contracts are almost always resolved informally, particularly between software engineers. Establishing the intention behind such transactions, especially through judicial intervention, leaves room for multiple interpretations, considering the strict traditional approach. The legal regulation for digital transactions should move forward in line with technological developments, as it may cover areas that have not yet been addressed by existing laws. Furthermore, it is also essential to maintain the general principles clearly set out, particularly in the area of contract law under the Civil Code, in order to guarantee legal certainty and predictability. A civil law jurisdiction like that in Indonesia favors certainty in law while balancing it with the flexibility that innovative IT transactions demand, posing further questions for the possible introduction of smart contract technology within given legal frameworks ([Garcia: 2021](#)). Starting from the establishment of the Wet Buku Undang-Undang Hukum Perdata in 1847, contractual agreements are governed by the Civil Code. Article 1338 of the Civil Code, the so-called "Vrijheid Blijheid" principle, states that any agreement entered into by the parties will bind them. In more specific language, Article 1320 of the Civil Code states that an agreement exists if there is mutual consent and it is not forbidden by legal provisions. This means that the essence of a contract, such as mutual consent, is a very essential requirement in order for a contract to be valid at law. In more general terms, the principle of an agreement binding parties is enshrined in Indonesian law as other general provisions. The Civil Code contains a chapter dedicated to obligations. An obligation is defined under Article 1338 of the Civil Code as a legal tie between two or more persons, requiring the debtor to fulfill a performance concerning the creditor ([Silaber: 2021](#)). Under Indonesian law, the Civil Code does not recognize different performances to recognize different rights from one contract in the event of a breach of the obligation. Moreover, the Civil Code does not give any authority or right for the parties to specify the category of law that is applicable for the classification. It may lead to different outcomes since the category itself is diverse. As technology moves forward, many external factors have been known and delivered various outcomes to the interpretation of different sides ([Fathurrahman, 2021](#)). This legal framework is not good enough to address the external factor, which is now technologically sophisticated and called a smart contract ([Sylva: 2024](#)). There are two legislations that

predominantly govern Indonesian contract law, namely Indonesia's national civil code and one special statute on agreements related to specific transactions, namely business entity law. The latest Business Entity Law explains that a company shall comply with new technology. There are three statutes that further regulate agreement or contract-related transactions. One of which, the electronic transaction law, explains both digital files and electronic documents, and regardless of the technology used, agreements made by two or more parties involved and fulfilled the requirements create a binding legal relationship between them. The validity of the agreement is not subjected to a paper format or a conventional signature on a hardcopy document. Additionally, a more specialized and modern technology law also governs transactions in finance, namely a bill must fulfill the agreements of two or more parties involved ([Silaber: 2021](#)). Recent inventions and their innovative state may pose potential contextual ambiguities towards being included among such definitions' adjustments. Two of the characteristics defining blockchain both simultaneously operate as ambiguity intensifiers. The first is the public supply of records with the concept of the ledger based upon information portioning into each network actor. The second is the absence of a single trusted intermediary. For big businesses, this second feature adds value as part of their strategic management of costs that they would need to pay to third-party intermediaries. Harmonizing laws are deemed necessary for the enhancement of smart contracts ([Ding H, Tian J, Yu W, 2023](#)). Based upon the discussions on Indonesian statutes and regulations earlier, it could be understood that currently, the existing laws can appear ambiguous with contractual deals within smart contracts and blockchain transactions' concept. When smart contracts are fully operational, aside from addressing this legal ambiguity, blockchain technology can address other contract-related issues. Although modifications in the Indonesian legal system are impossible, instructions for future contract overtaking in blockchain would be of good interest for the further development of law in e-transactions. Therefore, further reform to reflect the addition of legal instruments strengthening e-transactions laws is necessary. Any legislative statements in this reform will hinder the alignment of national norms to international standards. The rules inserted will stipulate the employment of smart contracts and objective pursuit. In prior years, adaptation of data protection laws has already been discussed in the draft of amendments to the Electronic Transactions Act. However, adoption of this Act remained unchanged. This may ultimately decrease the functionality of these enhancements. From this reasoning, the legislative track is deemed to have a broad ocean of discussion and agreements. Once taken, the enhancement of regulations based on the concept of smart contracts and blockchain technology is predicted to last over two or three years before its adoption, and thus, the lag to the appearance of a new type of contract is inevitable ([Jnr BA, Sylva W, Watat JK, 2024](#)).

In the era of digitalization and economic globalization, civil business law is required to swiftly adapt to the dynamics of modern contract agreements. Business contracts are no longer limited to physical interactions and paper documents but have evolved through the use of information technology, online transactions, and cross-border legal engagements. One of the clearest forms of civil law adaptation to modern development is the recognition of electronic contracts. In Indonesia, for example, Law No. 11 of 2008 concerning Electronic Information and Transactions (ITE Law) legally validates digital contracts, as long as they fulfill the conditions of validity outlined in Article 1320 of the Indonesian Civil Code (KUHPperdata). This shows that while the fundamental principles of contract law remain intact, the law has become flexible in terms of

format and medium. In international practice, the principle of *party autonomy* has become increasingly significant, allowing contracting parties to determine applicable law and contract form. This is reflected in the UNIDROIT Principles of International Commercial Contracts (2022), which emphasize legal flexibility and certainty in transnational business transactions ([Bonell, 2022](#)).

Technological advancements have also transformed mechanisms of proof and contract execution. Electronic signatures, blockchain, and smart contracts are beginning to be recognized as valid tools to enforce the rights and obligations of parties. In Indonesia, although smart contracts are not yet explicitly regulated, such concepts are gradually being integrated through progressive legal interpretation and judicial discretion. Nevertheless, significant challenges persist, including digital literacy gaps, unequal access to technology, and differences in legal systems across countries, making legal harmonization of contracts complex. Therefore, substantive reform of contract law is necessary whether through amendments to the Civil Code or adoption of new, responsive principles. As [Budiarta and Putu \(2020\)](#) argue, “the existence of civil law in business relations must be more adaptive to changes in the legal relationships of society, so as not to lose its relevance”.

The term "smart contract" is gaining more traction among lawyers, both in the digital and conventional spheres. Smart contracts are pre-coded agreements that automatically execute once the terms are fulfilled. Although it is widely said that a smart contract is neither smart nor a contract, an evolved conceptual sense began growing in the technology sphere. Today, a smart contract represents self-enforcing code that can be integrated between computer codes and regulations. It is self-enforcing and runs automatically, removing the need to involve intermediaries. Several commercially available platforms allow the use of smart contracts, powered by tools of blockchain and decentralized systems ([NB, 2023](#)). Smart contracts are considered a subcategory of "auto-executed" contracts that exist in various forms of digital systems. Automated charge functions in electricity, when a consumer's application meets various conditions or withdrawal limits, are only one of these contracts' applications. Indeed, several computer systems like databases can be constructed based on "if-this-then-that" principles, a format that smart contracts take advantage of in fundamentally new ways. In practical terms, smart contracts are agreements that provide for contractual performance initially with the use of computer codes that operate seamlessly once the contract terms are fulfilled. The noteworthy aspect of a smart contract lies in its usage. Smart contracts are designed to create efficiency for a commercial procedure, knowing that transaction costs could be cut down at both ends. Where there are organizations and consumers that are geographically distant, and where the risks of fraud are increased, security and software engineering communities in the field have been addressing the concomitant requirements so that parties can trust in the "auto-execution" of a promise created electronically ([Loukil: 2021](#)). At its core, smart contracts are digital contracts. They are self-executing, automated code that can carry out the terms of a contract written within the code and upon the occurrence of a specified event. Due to these qualities, a smart contract also has the characteristic of programmability. From these basic characteristics, a smart contract can be defined as a multipurpose software program that is designed to interact with the assets of the real world based on a set of conditions agreed upon by the participating parties. Other key characteristics of a smart contract are its self-execution and that it is automated. Because a smart contract is digital, it can operate in a digital ecosystem

and network, and assets conveyed involve a digital asset. This is different from a 'classic' contract, which operates in an analogue world, provides a layer of trust and security, and external legal enforcement to fulfill the contract. Classic contracts are also needed in the event of a dispute between the contract parties ([Pradhan NR, 2021](#)). In smart contracts, if the specified conditions of the program are met, it will trigger the action with or without the need for an intermediary so that trust is established between the participating parties. When the assets or weights of the world are conveyed, the message will be recorded in a distributed ledger technology that cannot be changed without fulfilling the requirements ([Ariska, Nenda, Romi Adetio Setiawan, 2023](#)). This is called a transparent chain. Smart contracts have characteristics that make it possible for intermediaries, oversight, and custodians in the transaction value chain to be removed completely. This is different from a classic contract, which has transaction overhead. Smart contracts can save or reduce overhead costs in any type of agreement. The technical characteristics that exist in smart contracts bring about advantages in terms of efficiency and cost. A smart contract can execute and enforce a contract term directly and is trust-building because it operates without the need for intermediaries. In addition, the process of creating and executing smart contracts is efficient because it takes place digitally and in an automated manner. All of these properties contribute to better execution and the efficiency of smart contracts over traditional contracts ([Aakib Khan, 2024](#)). Smart contracts come in various types and flavors, reflecting their uptake not just in the financial sector, but also in trade, supply chain, and real estate. The public and private smart contracts denotation is used to identify the environment that the respective smart contracts are implicated in - i.e., open and permissive for public smart contracts, and closed-member participant for private smart contracts. Beyond this binary categorization, a number of other types of smart contracts are reported in the extant smart contract scholarship. Public and permissioned smart contracts allow selective private transactions just like the members-only types of smart contracts (and at times may be listed as members-only smart contracts as distinct from the true public smart contracts that all can transact on), but the ability to transact may be selective. Smart property contracts part ways with the generic categorizations and are classified as neither financial nor trade smart contracts. Their offering may extend into the administrative part of the trade smart contracts – but only as an 'aside'. A security-based proposed smart contract in software platforms in this respect, although using the notion of smart contracts as globally adjoined to financial systems, is listed here along with everyday consumer products and services: there is nothing exceptional in financial derivative smart contracts or letters of credit with mobile phone top-up contracts. Conditional smart contracts, where an executable set of terms is triggered and executed upon the occurrence or non-occurrence of the agreed-on condition(s), form the remainder of the smart contract market that has been proposed to date. A particular case is that of the multi-signature contracts, not so much a smart contract subtype but causing legal implications characteristic to such an application. These differentiations will inform (though will not determine) the different legal adaptations required for the different ecosystems for each niche application - one of these being aspirational purpose-embedded smart contracts. The smart contract proposals that have been made can each in their own way be mapped onto (one or more) of these types, showing the equal (but also differential) mutability of the smart contract concept to suit an eclectic technology-facing and business-facing audience ([Ding H, Tian J, Yu W, 2023](#)).

Enforcement is about how and where the smart contracts can be enforced. In present days, blockchain technology, no matter which type, is already beyond border technology. This means that when there are certain blockchains, the nodes are located in various legal jurisdictions. It brings more complications regarding jurisdiction, enforcement, and dispute resolution ([Kannengiesser, Niclas, Sebastian Lins, Christian Sander, Klaus Winter, Hellmuth Frey, 2021](#)). There is a lack of legal framework on jurisdiction in order to enforce the smart contracts. There are various theories and opinions in agreement regarding jurisdiction in smart contracts. There is a 'choice of law,' which is a conflict of law regarding the governing law in the smart contract ([Khan SN, Loukil F, 2021](#)). In terms of enforcement, arbitration and litigation are settled in the dispute resolution of smart contracts. Setting up a clear jurisdiction of enforcement is crucial for the development of smart contract legal adaptation.

Dispute resolution is about how the smart contracts operator settles the disputes. There are ideas that smart contracts aim to reduce disputes, and traditional dispute resolution may jeopardize the 'self-execution' of smart contracts. The goal of the smart contract would be 'to debate instead of resolve,' where the resolution happens only if the last possibility of debate absorbs more benefits for all parties than the costs ([Pasar, A., Lee, Y. C., and Dong, 2023a](#)). Enforcement and compliance with the existing legal framework are essential. Smart contracts will be meaningful when they comply with existing law, and legal authorities may enforce the smart contracts ([Almeida D, Shmarko K, 2022](#)). This would create a legally binding status between the parties and could serve as evidence before the court when a dispute occurs. However, as an automated contract, it would also limit human intervention to rectify any errors ([Treiblmaier H, 2021](#)). Thus, there are many obstacles in the enforcement of smart contracts, as explained in the enforcement and compliance with the existing legal framework above. The smart contract is simply an automation system of the contract ([Garcia-Teruel RM, 2021](#)).

Peer jurisdictions that are interested in smart contracts agree on the need for establishing a regulatory framework. Yet, each country has a different approach adapted to the peculiarities of its ecosystem. For instance, the United Kingdom prefers to provide some definitions of smart contracts in implementing regulations, while the Singaporean government has concentrated more on exemptions from certain regulations. The German Ministry of Finance, after a period of evaluation, changed its argument and takes a more static approach based on technology. Most of the regulations on smart contracts are primarily facilitated by the trade-off between jurisdictions, although some also focus on the development of autonomous machines, especially in Singapore's regulations. However, all approaches share the same view that they are inspired primarily by the immutability of smart contracts as a solution to deal with the uncertainty that emerged due to the bankruptcy of the traditional enforcement system ([Loman: 2022](#)).

In this research, I proposed a legal framework on the harmonization of smart contracts that can be adapted to the positive law in Indonesia. Some specific principles and new legal provisions are needed to regulate smart contracts in order to create a new legal environment ([Tjong, n.d.](#)). However, further research is needed to fill out these new legal principles and provisions because we are still in the era of rapid and continuous technological development. Providing a new legal framework does not mean limiting the technology behind smart contracts. On the contrary, this must be the result of a multi-stakeholder approach, involving not only legal experts or lawyers but

also technologists, including blockchain and smart contract developers, and of course policymakers. There are some important points that must be underpinned if the smart contracts legal framework will be included in the laws and regulations. In general, the basic principles that must be maintained include providing legal clarity, legal certainty, and consumer protection.

Looking more specifically and in-depth, I think that a balanced smart contracts legal framework can be underpinned and achieved by incorporating the following principles or provisions: Smart contracts are transactions based on the principle of fairness, with the legal foundation of freedom of contract. A smart contracts agreement shall be in writing and is only valid if it fulfills the legal requirements, not mere digitalization. Legal existence means a digital document that meets signing criteria; smart contracts fulfill the formal requirements or contract synthesis. In order to ensure a secure, effective, and trusted system, Indonesia will be able to tighten the requirements for the formation and implementation of smart contracts, including more stringent audit and certification against platforms that wish to enter and operate in the Indonesian market. This research aimed to be a stepping stone to the development of new legal principles, new provisions, and new laws in Indonesia, in order to provide guidance to the Indonesian government to establish new regulations for the operation of smart contracts.

This research aims to serve as a stepping stone for the development of new legal principles relevant to the operation of smart contracts in Indonesia. Specifically, this study proposes three key legal principles: (1) trustless enforcement, namely the legal recognition of automated, code-based execution without third-party intervention; (2) platform liability, namely the need for a legal mechanism that facilitates accountability for developers or providers of smart contract infrastructure; and (3) jurisdictional flexibility, namely the recognition of cross-border legality in blockchain-based digital transactions. These three principles differ significantly from conventional Indonesian contract law norms, which still rely on written evidence, human interaction, and rigid national jurisdiction.

This distinction is crucial because smart contracts blur the line between private law relationships and technological execution. The current legal system lacks a mechanism to assess the validity of the parties' intentions embodied in code or to resolve disputes when execution occurs automatically. Therefore, the development of these new principles is necessary to fill the legal gap and establish a normative foundation that the government can use in designing regulations or legislation capable of addressing the challenges of the digital era. Thus, this research not only provides a scientific contribution to the development of legal theory, but also has real policy implications in the formation of an adaptive and equitable digital legal system in Indonesia.

This section lays down key principles to regulate and define a smart contract. Some recommendations are provided on the adaptation of the existing legal framework. Legal background is essential to creating a legal framework for smart contracts (Nugroho, 2020). The concept developed in the next few entries is drafted to build a regulatory environment to protect users and provide a trustworthy environment to use smart contracts. Primarily, the legal method is used to create the main principle of the legal framework. In order to keep the framework flexible and be able to adapt to technological changes, certain legal provisions are not widely discussed, and rather than that, the technical infrastructure for implementing a legal framework is the focus

of this method. This section is composed of three parts. First, the guiding principles and key issues to consider are explained. Second, recommendations for the amendments of some laws and regulations are provided. The law needs to be amended to accommodate the main principle of developing smart contracts. This principle is used to govern some important principles in smart contracts, such as the protection of smart contract parties, governmental efforts to create a secure and trustworthy environment to use smart contracts, and the advancement of smart contracts. Third, a number of issues surrounding smart contracts concerning dispute resolution and regulatory compliance are addressed.

Setting out to legally define smart contracts and at the same time draw up legal principles for regulating smart contracts raises the question of what considerations must be made when determining and regulating smart contracts. As a simplified form of blockchain decentralization, the considerations adopted for the regulation of blockchain technology can also be applied to smart contracts. This analysis is complete in the above entries and is based on the main legal amendment in Indonesia, especially in the electronic legal system that mediates the utilization of smart contracts. Based on this insight, the following are the main principles that are important to consider for regulating the use of smart contracts: a) Perspicuity or transparency of smart contracts that can be used to facilitate assessing the quality of an agreement contained in a smart contract. The legal regulation of smart contracts must also require an informative document. b) Verifiability, namely smart contracts that can be guaranteed for all implementing smart contracts to be valid and verifiable transactions executed automatically or semi-automatically using a verified transaction platform as a medium. c) Trust and compliance, namely the importance of the platform provider of smart contract transaction services to gain the trust of users by providing safe, trustworthy, and secure transaction services in terms of security, both in terms of legality and regulation ([Amato F, Cozzolino G, 2021](#)) ; ([Allen, T., & Widdison, 2018](#)).

The transformation in the form, substance, and execution of contractual agreements in the modern era raises a critical question: are these changes a legal *disruption* to traditional systems, or do they represent a significant *progress* in business law? ([Bonell, 2022](#)) The answer lies not in a binary choice but in a contextual evaluation. On the one hand, digital developments such as electronic contracts (*e-contracts*), digital signatures, and *smart contracts* introduce efficiency, speed, and transparency in executing business agreements. As Allen and ([Allen, T., & Widdison, 2018](#)) assert, “the digital transformation of contract law represents a significant step towards legal automation and certainty” (p. 17). Contracts that once required face-to-face meetings can now be executed remotely and across borders, facilitating fast, real-time global transactions ([UNIDROIT, 2022](#)).

Nevertheless, these changes also bring substantial legal challenges. The primary concerns include the validity and evidentiary weight of digital contracts, as well as legal loopholes due to inadequate or outdated regulation. According to [Susanti \(2021\)](#), “the implementation of smart contracts in Indonesia is still in a grey area of legal recognition” (p. 138), leading to legal uncertainty and heightened risk in contract enforcement. In Indonesia, Article 1320 of the Civil Code remains the foundation of contract validity. However, the shift toward digitalization demands reinterpretation of elements such as mutual consent and the form of agreement. While the Electronic Information and Transactions Law (ITE Law) acknowledges electronic contracts, it does not fully encompass evolving innovations, particularly blockchain-based smart contracts. Furthermore, the use of

artificial intelligence (AI) in automated contract drafting introduces new legal and ethical challenges—such as accountability, system bias, and party liability (Surden, 2019). While AI can optimize negotiation and drafting processes, it cannot yet replace normative considerations such as moral judgment, business ethics, and the interpretation of intent. In conclusion, the evolution of modern contracts represents a clear *progress* in terms of efficiency and accessibility (Makarim, 2018). However, it also disrupts the structural stability of legal norms and demands serious adaptation by lawmakers, courts, and legal practitioners to maintain legal certainty and justice in a rapidly changing digital environment.

CONCLUSION

The legal system should be adaptive. This is especially important in the context of technological innovation, such as the increasing use of smart contracts. This study concludes that smart contracts not only present normative challenges to the Indonesian legal system but also open up opportunities to reform the traditional contract law paradigm. Amidst a regulatory vacuum, smart contracts demand a reinterpretation of fundamental principles such as freedom of contract, free will, and the validity of agreements.

The study's primary theoretical contribution is the proposal of a hybrid legal-technological framework that integrates Indonesian civil law principles with the technical characteristics of smart contracts. With this framework, the study expands the discourse on contract theory by incorporating trustless enforcement, automation, and decentralization as legitimate legal aspects that need to be accommodated. This study also fills a doctrinal gap by offering a normative perspective on non-conventional, code-based contract forms, which have been largely unaddressed in Indonesian legal literature.

Thus, this study not only maps challenges and opportunities but also provides an initial foundation for the development of new legal norms capable of bridging the legal and technological worlds. These findings can serve as a reference for policymakers, academics, and industry players in building an adaptive and future-oriented legal system. The framework presented in this study is only a starting point for future legal innovations, and it should be refined further, particularly by involving various stakeholders in the drafting of appropriate regulations. Thus, it may soon be necessary to consider the best way of regulating smart contracts, such as by adopting the proposed five-step framework. It is important to immediately do this to bring legal certainty to the development of smart contracts. Experience has shown that introducing a new technology without proper legislation has created significant legal problems that can be difficult to resolve. This research also shows the theoretical implications of the development of smart contracts in Indonesia. It is hoped that this research will inspire legal professionals and researchers to engage in further research on the development of smart contracts in Indonesia. Finally, this research is also part of the development of the regulation of smart contracts, which has also been the concern of legal practitioners and jurists globally. Thus, it is imperative for legal practitioners and jurists to immediately pay attention to the regulation of smart contracts so that no harm is done in the implementation of smart contract transactions on an ongoing basis. Therefore, there is a need for legislation to regulate the implementation of smart contracts more comprehensively.

The adoption and performance of smart contracts need to be further studied, given the limited empirical basis available on their use in the jurisdiction of a developing country such as Indonesia. This research demonstrates that developing a legal framework for smart contracts in Indonesia cannot be done sectorally. The complexity of blockchain technology and contractual automation demands an interdisciplinary approach encompassing legal, business, and technological aspects. While this paper begins with a juridical and normative approach, empirical interviews with industry players and legal practitioners reveal a significant disconnect between existing regulations and evolving digital practices. This gap demonstrates the need for active collaboration between law schools, business schools, and technology institutions to produce regulations that are not only legally valid, but also commercially realistic and technologically secure.

The empirical findings of this research—particularly the lack of technical understanding among regulators and the unavailability of legal standards for smart contracts—provide a relevant entry point for an interdisciplinary agenda. For example, law schools can develop adaptive doctrine, business schools can examine the implications of smart contracts for digital business models, and technology institutions can design contract execution protocols that comply with national legal norms. By building this synergy, Indonesia can design a digital legal ecosystem that is not only responsive to technology but also contextualized to the challenges of a developing country.

Thus, this paper not only highlights the normative gap, but also encourages the formation of an interdisciplinary framework as a more comprehensive approach to regulating smart contracts sustainably in Indonesia. This would open very positive options for potential international research funding, especially with collaborative initiatives by international governments that have the potential for policy influence if the right partnership delivery method is structured during the proposal writing process. The continuous developments would provide interesting updates for legal interpretation and advance the advancement of legal frameworks or fixative tokens in the future.

Continued analysis of case law developments in multiple jurisdictions with a transnational legal background is essential, given how smart contracts relate to global commercial activities. It would be most beneficial to discuss and learn about the developments in the international forum with selected experts in specific country jurisdictions, such as the United States, the United Kingdom, and the European Union. The design of legal research would benefit from advances in technology, both in relation to computer and information science. This collaboration could facilitate in-depth data analytics that individually benchmarks the development of legal regulations on smart contracts and judicial experience at the national level of a number of selected countries to highlight differences and similarities, ultimately impacting legal certainty and creating a more innovative body of legal research.

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