Juridical Overview of the Use of Smart Contracts in Indonesia as a Form of Artificial Intelligence Development

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Abstract. *Apart from the problems in terms of data security in the midst of blockchain-based business development in Indonesia, it turns out that another problem in smart contracts is that the use of Smart Contracts in Indonesia is actually still a discourse among legal experts regarding the validity of smart contracts. The aims of this research are: a) To find out and analyzeimplementation of the use of smart contracts in Indonesia; b) To know and analyzeobstacles in implementing smart contracts in Indonesia and their solutions; c) To know and analyzelegal remedies that can be taken in the event of a dispute between the parties in the smart contract; d) To find out examples of deeds inthe use of smart contracts in Indonesia as a form of artificial intelligence development." Researchers used normative research specifications with secondary data sources. Stages to find the target, then used the approach through legislation (statute approach). The results were juridical review of the use of smart contracts in Indonesia based on Article 1320 of the Civil Code.Article 1338 of the Civil Code explains that "all agreements made legally valid as law for those who make them". One of the uses of smart contracts on Ethereum. Thereuem's smart contract has the name ERC20.Article 3 Regulation of the Commodity Futures Trading Supervisory Agency Number 5 of 2019 concerning Technical Provisions for the Implementation of the Physical Market of Crypto Assets on the Futures Exchange, Bitcoin which can be traded on the Futures Exchange.Barriers to implementing Smart Contracts in Indonesia and their solutionsimplementing ISO-based Information Security Management or the simplest following the National Institute of Standards and Technology (NIST) framework. ISO 27001:2013 is the latest ISO 27000 series released in 2013. ISO*

27001:2013.Article 30 Paragraph (3) in conjunction with Article 40 Paragraph (3) of Act No. 1 of 2008 concerning Information and Electronic Transactions.

Keywords: Contract; Rule; Settlement; Smart; Technology.

1. Introduction

Information technology is currently developing very rapidly and sophisticated which also has an impact on human life. The impact is giving birth to an information society or the so-called information society. According to Rogers, information society is a condition where information systems have become an important element of society in everyday life. One of the impacts of the existence of information technology is the ease of access to communication which then eases mobility and human work.[1]The ease of mobility and human work caused by the development of information technology is because the development of information technology has reached the development of the internet or the internet era which then gave rise to internet-based telecommunications facilities. Data released by we are social as written by Kompas shows that internet users in Indonesia in early 2021 reached 202.6 million people, an increase of 15.5 percent from 2020.[2]

In addition to the ease of communication between humans, another impact that has arisen due to the development of information technology is the development of artificial intelligence or more popularly known as Artificial Intelligence (AI). Artificial Intelligence (AI) is a machine technology connected to the internet that is made similar to how the human mind works.[3]This Artificial Intelligence (AI) technology then penetrates into various lines of human life in various aspects, one of which is the economy, namely a digital-based payment system known as Blockchain.[4] Blockchain is a form of Distributed Ledger Technology (DLT) whose contents are information and data. Along with its development, Blockchain has developed into the creation and implementation of agreements made by the blockchain users, known as smart contracts.

Smart Contract namely an agreement made by the parties using programming code which is then stored in the Blockchain. After the contract is made, the next step in terms of completion of achievements for each party will run automatically according to the procedures made in the contract.[5] Smart

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[1]Asril Sitompul. (2004). *Hukum Internet (Pengenal Mengenai Masalah Hukum di Cyberspace)*. PT.Citra Aditya Bakti. p. 6.

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[3]Dahria, M. (2008). Artificial Intelligence (AI). *Jurnal Saintikom*, *5*(2), p. 185

[4]Kuner, Et.al, (2018). Blockchain versus data protecti. *International Data Privacy Law Journal*, *8*(2), 103–104. https://doi.org/https://doi.org/10.1093/idpl/ipy009. p. 103-104.

[5]Szabo, N. (1996). Smart contracts: building blocks for digital markets. *EXTROPY: The Journal of Transhumanist Thought*, *16* (18), p. 3.

contracts were first conceived in 1994 by Nick Szabo with the following objectives:[6]

The general objectives of smart contract design are to satisfy common contractual conditions (such as payment terms, liens, confidentiality, and even enforcement), minimize exceptions both malicious and accidental, and minimize the need for trusted intermediaries. Related economic goals include lowering fraud loss, arbitration and enforcement costs, and other transaction costs"

What this means is that the general goal of smart contract design is to meet common contractual terms (such as payment terms, liens, confidentiality, and even enforcement), minimize both malicious and accidental exceptions, and minimize the need for a trusted intermediary. Related economic goals include reducing losses from fraud, arbitration and enforcement fees, and other transaction costs.

*Smart contracts*Unlike normal contracts that are conventionally designed by the parties which are then signed by the parties which are then enforced by law, smart contracts use cryptographic codes to establish the relationship between the parties.In simple terms smart contracts are written in code and run themselves as complex if-then statements i.esmart contracts as algorithms are automatically executed when certain predefined conditions are met. Smart contracts then eliminate the need for third parties which meansparticipants who enter into the agreement can transact directly with each other. [7]

Nick Szabo explained that smart contracts are artificial intelligence technology aimed at facilitating and executing digital contracts. Although different in form, the purpose of a smart contract is the same as a conventional contract, namely as a document that binds an agreement or between the parties involved. Although the objectives are the same, there are differences in that conventional agreements are designed and signed directly by humans or the parties directly, in contrast to Smart Contracts that are designed, written and executed in an electronic system or computer code which eliminates the need for a third party in a transaction. So the validity of Smart Contracts that are run on Blockchain technology is still being questioned.[8]

*Smart contracts*digital in nature with standard clauses that can be executed by themselves. This means that smart contract agreements must still have legal protection for the parties, especially now that smart contracts are used a lot in the economic sector such as financial agreements, property, insurance, venture capital, logistics to crowdfunding spread across various countries with various

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[6]Ibid, p. 3.

[7]Firdaus, D. H. (2020). Aplikasi Smart Contract dalam E-Commerce Prespektif Hukum Perjanjian. *Jurnal Qolamuna*, *6*(1), 39. http://repository.uin-malang.ac.id/6445/1/6712.pdf. p. 39.

[8]Muhammad, D. (2019). Karakteristik Perjanjian Jual Beli Dengan Smart Contract dalam E-Commerce. *Jurist-Diction*, *2*(5), 1659. https://doi.org/http://dx.doi.org/10.20473/jd.v2i5.15223. p. 1659.

platforms such as Bitcoin, Ethereum, Counterparty, Stellar, Lisk, Cardano, Neo, Rootstock, and spread across various countries. Currently, smart contracts are only used for these transaction activities and allow them to continue to develop in various public affairs such as health affairs and even e-voting in line with technological developments.[9]

*Smart contracts*as a human artificial intelligence or Artificial Intelligence appears as a consequence of technological developments that are considered to have advantages when compared to conventional contracts, one of which is the security of the contract (mentioned in more detail). However, the cases that occurred were two cases of hacking on Smart Contracts that caused money losses, namely the DAO (Decentralized Autonomous Organization) case and the Parity Wallet case, implying that even though smart contracts use technology, it is not possible to cause problems.[10] The emergence of the case in Singapore provides guidelines so that legal certainty in smart contracts becomes very important, because it is feared that without obtaining legal certainty guarantees for Blockchain Smart Contracts, it can lead to failure to comply with the engagement agreed by the parties in the agreement in the form of a smart contract.

In the midst of the sophistication of smart contract-based technology as an advantage of artificial intelligence technology, there are potential problems, namely codification, security, performance and privacy.[11]The sophistication of the smart contract system in this case is then faced with cyber crimes that target internet users, especially in the fact that in Indonesia, where there is often hacking of personal user data in cyberspace, as recently happened, 15 million personal data of Tokopedia users was leaked and sold on dark sites and also as much as 13 million Bukalapak data was also leaked.[12]Despite the high number of cybercrimes, the use of smart contracts in Indonesia continues to experience an upward trend marked by the emergence of many artificial intelligence platforms or Artificial Intelligence blockchain with the use of smart contracts starting from agriculture with the emergence of the HARA application as a provider of agricultural data, then the emergence of PAL Insurance in the insurance sector. , and Blokchain logistics in Batam as a logistics company and Batam cosmetic blockchain as a cosmetic company that uses the smart contract system.[13]

Apart from the problems in terms of data security in the midst of blockchain-based business development in Indonesia, it turns out that another problem in

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[9]Rosadi, S. D. (2020). Pengaturan Smart Contract di berbagai Negara. *Buletin Hukum Kebanksentralan*, *17*(1), 96. https://doi.org/http://www.bi.go.id. p. 96.
[10] Ibid.
[11]Junis, F. (2019). *A Revisit on Blockchain-based Smart Contract Technology*. Universitas Gadjah Mada.p. 1-3.
[12]Burhan, F. A. (2021). *Data Pengguna Bocor, E-commerce Disarankan Adaptasi Blockchain*. Www.Katadata.Co.Id. www.katadata.co.id
[13]Basari, M. T. (2021). *BP Batam Hadirkan Teknologi Smart Contract Untuk Tingkatkan Daya Saing*. Www.Bisnis.Com. www.bisnis.com

smart contracts is that the use of Smart Contracts in Indonesia is actually still a discourse among legal experts regarding the validity of smart contracts from the legal side of agreements that apply in Indonesia and regarding legal protection the second party in the event of a dispute considering that the smart contract contains computer program code as a substitute for the third party.

2. Research Methods

This research used normative research specifications with secondary data sources. Normative or doctrinal legal research as well as literature places law as building a system of norms regarding the rules of legislation, legal principles, court decisions, agreements and doctrines from experts.[14] The data analysis used by the researcher consists of the stages that the secondary data obtained will be analyzed descriptively-qualitatively. The purpose of qualitative descriptive is the analysis of data from research on legal materials, which are sorted and processed and then arranged systematically and described to obtain a clear and complete picture of the object in this research.[15]

3. Results and Discussion

3.1.   Implementation of the Use of Smart Contracts in Indonesia

Some examples of legal protections provided for smart contracts are Bitcoin being legalized by the Ministry of Trade through the Commodity Futures Trading Regulatory Agency (CoFTRA). Bitcoin, or digital currency in general, is a type of commodity that can be traded on the Futures Exchange. This is stipulated in Article 1 of the Regulation of the Commodity Futures Trading Supervisory Agency Number 3 of 2019 concerning Commodities That Can Be Subjected to Futures Contracts, Sharia Derivative Contracts, and/or Other Derivative Contracts Traded on the Futures Exchange.

The results of the research regarding the juridical review of the use of smart contracts in Indonesia based on Article 3 of the Regulation of the Commodity Futures Trading Regulatory Agency Number 5 of 2019 concerning Technical Provisions for the Implementation of the Physical Market for Crypto Assets on the Futures Exchange, Bitcoins that can be traded on the Futures Exchange must: a) Based on distributed ledger technology ; b) In the form of utility crypto assets or asset-backed crypto assets; c) Market capitalization value (market cap) is ranked within the top 500 (five hundred) major Crypto Assets market capitalization (coinmarketcap) for utility Crypto Assets; d) Entering in transactions on the world's largest Crypto Asset exchange; e) Has economic benefits; and ; f) The risk assessment has been carried out.

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[14]Ibid.
[15]Ibid.

ExplanationArticle 34 letter aBank Indonesia Regulation Number 18/40/PBI/2016/2016 concerning Implementation of Payment Transaction ProcessingWhat is meant by virtual currency is digital money issued by parties other than monetary authorities obtained by mining, purchasing, or transferring gifts, including Bitcoin, BlackCoin, Dash, Dogecoin, Litecoin, Namecoin, Nxt, Peercoin, Primecoin, Ripple, and Ven. Not included in the definition of virtual currency is electronic money.

The results of the research on the juridical review of the use of smart contracts in Indonesia in CoFTRA Regulation No. 3 of 2019 concerning Commodities that Can Be Subjected to Futures Contracts, Sharia Derivative Contracts and/or Other Derivative Contracts Traded on Futures Exchanges, is the legal basis for determining crypto assets as one of the commodities that can be subject to futures contracts, and/or other derivative contracts which are traded on the Futures Exchange, by adding 'commodities in the field of digital assets in the form of crypto assets'. Furthermore, CoFTRA Regulation No. 4 of 2019 concerning Technical Provisions for the Implementation of the Digital Gold Physical Market on the Futures Exchange will be the operational basis for the implementation of the digital gold physical market on the futures exchange. This regulation regulates gold physical market institutions with more specific requirements (specifically) related to institutions. This regulation also regulates the technical requirements of gold that can be stored in a gold repository which includes quality and purity standards.

This regulation also regulates the settlement of civil disputes as regulated in CoFTRA Regulation No. 2 of 2019 concerning the Implementation of the Physical Commodity Market on the Futures Exchange. The CoFTRA Regulation No. 5 of 2019 concerning Technical Provisions for the Implementation of the Physical Crypto Asset Market on the Futures Exchange is the operational basis for the implementation of the physical market for crypto assets on the futures exchange.

This regulation regulates more specific requirements related to crypto asset trading, including capital requirements for futures exchanges, futures clearing houses, and physical traders of crypto assets; as well as the system and/or online trading facilities used which must meet several technical requirements such as ISO 27001 (Information Security Management System) certification.

The results of the research regarding the juridical review of the use of smart contracts in Indonesia in terms of legislation and the Civil Code as a valid agreement must be in accordance with Article 1313 of the Civil Code, namely that an agreement is an act by which one or more people bind themselves to one or more other people.

The results of the research regarding the juridical review of the use of smart contracts in Indonesia, the legal requirements for a main agreement in smart contact to determine the validity of the agreement must be based on Article 1320 of the Civil Code;

- Agree with those who bind themselves.

Agree according to Subekti is "the two subjects who enter into an agreement must agree, agree, or agree on the main things of the agreement being made, what is desired by one party is also desired by the other party".

- The ability to make an engagement.

The meaning of skill according to Subekti is "the ability to make agreements according to the law, basically every person who is an adult or of middle age and healthy in mind is capable according to law".

- A certain thing.

Subekti is explained as what has been agreed upon, the rights and obligations of both parties if a dispute arises

- A lawful reason.

A lawful cause in other words is the content of the agreement. The judge can test whether the purpose of the agreement can be implemented and whether the contents of the agreement do not conflict with the law, public order, and morality as regulated in Articles 1335, 1336, and 1337 of the Civil Code. 104 Article 1335 in conjunction with Article 1337 of the Civil Code states that "a cause is declared prohibited if it is contrary to the law on morality and public order".[16]A cause is declared contrary to the law if the cause in the agreement is contrary to the applicable law. Public order means contrary to the public interest, state security, unrest in society and also unrest in administrative matters.

Article 18 paragraph (1) of Act No. 11 of 2008 concerning Electronic Information and Transactions (hereinafter referred to as the ITE Law) which has been amended by Act No. 19 of 2016 concerning Amendments to Act No. 11 of 2008 concerning Electronic Information and Transactions. With the recognition of this electronic contract, the electronic contract in Indonesia is considered a valid and binding contract for the parties. Article 18 of the ITE Law has described the procedures for using the electronic agreement/contract, namely:

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[16]Raharjo, H. (2009). *Hukum Perjanjian di Indonesia*. PT Buku Kita.p. 57

- Electronic Transactions set forth in Electronic Contracts are binding on the parties;
- The parties have the authority to choose the law that applies to international Electronic Transactions they make;
- If the parties do not make a choice of law in international Electronic Transactions, the applicable law is based on the principles of International Civil Law;
- The parties have the authority to establish court forums, arbitration, or other alternative dispute resolution institutions that are authorized to handle disputes that may arise from international Electronic Transactions they make;
- If the parties do not make the choice of forum as referred to in paragraph (4), the determination of the authority of a court, arbitration, or other alternative dispute resolution institution authorized to handle disputes that may arise from the transaction, is based on the principles of International Civil Law.

- Barriers to the Implementation of Smart Contracts in Indonesia and their Solutions

*Smart Contract*created by Ethereum running on a decentralized blockchain made reorganizing the global financial system as open and innovative as the internet today. But perhaps the biggest obstacle to actually reaching this world is the technical limitations of how DeFi smart contracts should be written today. Developers feel the need to make it even better.

Ethereum has no inherent concept of a "token", so Token A and Token B are really just separate ERC-20 smart contract pairs each with a small internal balance. They never actually send tokens, only send messages to various smart contract methods. Traders don't actually keep tokens in their accounts, as one might think; they only have the balance listed in the smart contract associated with their private key. This means that the transfer of tokens A and B takes the form of a message sent to the smart contract by the Uniswap contract, as it does everything for the user. And since reserve pools A and B on Uniswap are just entries in the balance sheet of another smart contract.

Every institution must realize that the implementation of Information and Communication Technology (ICT) governance has become a need and demand in every fintech service provider agency, considering the increasingly important role of ICT in efforts to improve service quality as one of the realizations of good governance. Corporate Governance (GCG). In the implementation of ICT governance for fintech services, the information security factor is a very important aspect to consider, considering that the performance of ICT governance will be disrupted if information experiences security problems involving confidentiality, integrity, and availability.

The unlawful act in the smart contract agreement based on Article 1365 of the Civil Code states that: "Every act that violates the law and brings harm to others, requires the person who caused the loss because of his mistake to replace the loss". Based on Article 1267 of the Civil Code, the creditor is given the right to choose whether to demand the fulfillment or cancellation of the agreement with reimbursement of costs, losses and interest. Article 1267 of the Civil Code states that: "The party to whom the engagement is not fulfilled, may choose; compel the other party to fulfill the agreement, if it can still be done, or demand the cancellation of the agreement, with reimbursement of costs, losses and interest."

Based on this, Article 1267 of the Civil Code is only intended for reciprocal agreements and therefore creditors in reciprocal agreements can demand: 1). Pure fulfillment of the agreement 2). Fulfillment of the agreement by way of compensation 3). Cancellation only; or 4). Cancellation with compensation. The provisions regarding compensation in the smart contract agreement are based on article 1246 of the Civil Code, which consists of three types, namely: costs, losses and interest. Costs are all expenses for expenses that have actually been incurred by the creditor, while interest is all losses in the form of loss of profits that have been imagined or that have been calculated previously.

Several provisions in Act No. 11 of 2008 concerning Electronic Information and Transactions mandate further regulations in Government Regulations, namely regulations regarding Reliability Certification Agencies, Electronic Signatures, Electronic Certification Operators, Electronic System Operators, Electronic Transaction Organizers, Electronic Agent Operators, and management of Domain Names has been regulated in Government Regulation Number 82 Year 2Ol2 concerning the Operation of Electronic Systems and Transactions. However, Government Regulation Number 82 Year 2Ol2 concerning the Implementation of Electronic Systems and Transactions needs to be adapted to technological developments and community needs.

The stipulation of this Government Regulation is also intended to further regulate several provisions in Act No. 19 of 2O16 concerning Amendments to Act No. 1 1 of 2008 concerning Information and Electronic Transactions which were established to guarantee the recognition and respect for the rights and freedoms of others and to fulfill just demands in accordance with considerations of security and public order in a democratic society. Some of the provisions that require further regulation are:

- the obligation for each Electronic System Operator to delete irrelevant Electronic Information and/or Electronic Documents under its control at the request of the relevant Person based on a court order; and
- the role of the Government in facilitating the use of Information Technology and Electronic Transactions, protecting the public interest from all kinds of disturbances as a result of the misuse of Electronic

Information and Electronic Transactions that disrupt public order, and preventing the dissemination and use of Electronic Information and/or Electronic Documents containing prohibited contents in accordance with the provisions of the legislation.

The contents of this Government Regulation include:

- Category of Electronic System Operator;
- Obligations of the Electronic System Operator;
- Deletion and/or closure of Access to irrelevant Electronic Information and/or Electronic Documents;
- Placement of Electronic Systems and Electronic Data;
- Supervision of Electronic System operation;
- Operation of Electronic Agents;
- Electronic Transaction Operation;
- Implementation of Electronic Certification;
- Domain Name management;
- The role of the Government in the operation of Electronic Systems and Transactions; and K. Administrative sanctions.

Article 30 Paragraph (3) Jo Article 40 Paragraph (3) Act No. 1 Year 2008 concerning Information and Electronic Transactions explains that "everyone intentionally and without rights or against the law accesses a computer or electronic system in any way by violating, breaking through, exceeds or breaches the security system, shall be punished with imprisonment for a maximum of 8 years or a fine of a maximum of IDR 800,000,000 (eight hundred million rupiah)". Article 32 Paragraph (2) Jo Article 48 Paragraph (2) Act No. 1 Year 2008 concerning Electronic Information and Transactions explains that "every person intentionally and without rights or against the law in any way transfers or transfers electronic information or electronic documents to the electronic system of another person who is not entitled to it, shall be punished with imprisonment for a maximum of 9 years or a fine of a maximum of IDR 3,000,000,000 (three billion rupiah)".

- Legal Remedies That Can Be Taken If There Is A Dispute Between The Parties In The Smart Contract

The results of research conducted by researchers on legal remedies that can be taken in the event of a dispute between the parties in a smart contract include: Settlement of disputes out of court (non-litigation) is an attempt to bargain or compromise to obtain a mutually beneficial solution. The presence of a neutral third party is not to decide the dispute but the parties themselves who make the final decision. Psettlement of civil disputes out of court (non-litigation) has been

regulated in the Indonesian legal system in the Arbitration Law. Article 6 of the Arbitration Law states that:

- Disputes or civil differences of opinion can be resolved by the parties through alternative dispute resolutions based on good faith by setting aside litigation in the district court.
- Settlement of disputes or differences of opinion through alternative dispute resolution as referred to in paragraph (1) shall be resolved in a direct meeting by the parties within a maximum period of 14 (fourteen) days and the results shall be stated in a written agreement.
- In the event that the dispute or difference of opinion as referred to in paragraph (2) cannot be resolved, then upon the written agreement of the parties, the dispute or difference of opinion is resolved through one or more expert advisors or through a mediator.
- If the parties within a period of 14 (fourteen) days with the help of one or more expert advisors or through a mediator fail to reach an agreement, then the parties may contact an arbitration institution or alternative dispute resolution institution to appoint a mediator.
- After the appointment of a mediator by the arbitration institution or alternative dispute resolution institution, within 7 (seven) days the mediation business must be able to start.
- Efforts to resolve disputes or differences of opinion through a mediator as referred to in paragraph (5) by upholding confidentiality within a maximum period of (30) days must reach an agreement in written form signed by all parties concerned.
- The agreement to settle disputes or differences of opinion in writing is final and binding on the parties to be implemented in good faith and must be registered in the district court within a maximum period of 30 (thirty) days from the signing.
- The dispute resolution agreement or difference of opinion as referred to in paragraph 7 (seven) must be completed within 30 (thirty) days of registration.
- If the reconciliation effort as referred to in paragraph (1) to paragraph (6) is not reached, then the parties based on a written agreement may propose a settlement effort through an arbitration institution or ad hoc arbitration."

Article 76 paragraph (1) The Minister is authorized to conduct guidance and supervision of PMSE. In carrying out the guidance and supervision as referred to in paragraph (1), the Minister may coordinate with ministers, heads of non-ministerial government institutions, and heads of relevant authorities, as well as regional governments.

- Examples of Deeds in Using Smart Contracts in Indonesia as a Form of Artificial Intelligence Development

*Smart contracts*is an automatic contract where the terms of the transaction agreement between the buyer and seller are directly entered into the code line. This code will be stored in every node on the entire blockchain network.Programmers actually create smart contracts with simple rules that use words like if, when, and then. The difference is, the words are directly written in the form of coding on blockchain technology. Next, the blockchain network will determine whether the conditions in the smart contract have been met and verified before the contract runs. After the transaction is executed, the blockchain system will automatically update itself. Data is sent directly to each node. So, transactions can no longer be changed or hacked. A smart contract will involve more than one provision. There are many conditions that must be met before a contract can be concluded with satisfactory service to the users.

4. Conclusion

A juridical review of the use of smart contracts in Indonesia, the legal requirements for a main agreement in Smart Contact to find out the validity of the agreement must be based on Article 1320 of the Civil Code; a) Agree on those who bind themselves; b) The ability to make an engagement; c) A certain matter; d) A lawful cause.Article 1338 of the Civil Code explains that "all agreements made legally valid as law for those who make them". One of the uses of smart contracts on Ethereum. Thereuem's smart contract has the name ERC20. Article 3 Regulation of the Commodity Futures Trading Supervisory Agency Number 5 of 2019 concerning Technical Provisions for the Implementation of the Physical Market for Crypto Assets on the Futures Exchange. Elucidation of Article 34 letter aBank Indonesia Regulation Number 18/40/PBI/2016/2016 concerning Implementation of Payment Transaction Processing, What is meant by virtual currency is digital money issued by parties other than monetary authorities obtained by mining, purchasing, or transferring gifts, including Bitcoin, BlackCoin, Dash, Dogecoin, Litecoin, Namecoin, Nxt, Peercoin, Primecoin, Ripple, and Ven. Not included in the definition of virtual currency is electronic money.

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