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Digitalization of the Public Procurement System in Indonesia: Challenges and Problems

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Abstract

The Indonesian government carries out goods/services procurement activities in the framework of the welfare of its people. From time to time the procurement of goods/services has developed and, in the current digital era, it has begun to switch to electronic-based procurement. To answer the challenges of these developments, as well as to prevent fraud or violations of the law, a solid system is needed that can accommodate all of this. The blockchain concept can be an alternative to answer this issue because the blockchain system has advantages in terms of security and transparency. The research method used in this article is legal research with a statute and conceptual approach. The purpose of this article is to become a reference regarding the probability of using the blockchain system in the law of procurement of goods and services in Indonesia. The findings of this study are that no country has yet implemented a blockchain system for the procurement of goods/services. Blockchain technology has been implemented by the private sector, namely by Walmart, Nestle, and Unilever who use blockchain technology as the basis of their supply chain management which, with this system, can increase effectiveness and efficiency as well as afford a good level of security. Thus the blockchain system for procuring goods/services in Indonesia can be a method that can be applied to increase efficiency and aspects of transparency to reduce misuse in the procurement of goods/services.

Introduction

The state has several functions, one of which is to improve the welfare of the lives of its citizens; the state is obliged to fulfill the needs of citizens. In this case, this involves such as meeting the needs of both goods, services, and infrastructure to support the lives of its citizens. For this reason, the government carries out goods and

services procurement activities. According to Black's Law Dictionary,[1] procurement of goods and services is defined as government procurement. According to Turpin, it is stated that:

> "A substantial part of this procurement is concentrated upon crucial sectors of industry whose welfare is of national importance, and much government contracting takes place at the forefront of technological advance. It will be realized that the way in which government procurement is carried out can have a significant effect upon growth, competitiveness and efficiency…".[2]

In Indonesia, procurement of goods and services is specifically regulated in Presidential Regulation No.16 of 2018 concerning Government Procurement of Goods/Services as amended by Presidential Regulation No. 12 of 2021 concerning Amendments to Presidential Regulation Number 16 of 2018 concerning Government Procurement of Goods/Services. Procurement of Goods and Services is the activity of procuring Goods/Services by Ministries/Institutions/Regional Apparatus/ financed by the APBN/APBD whose process starts from identifying needs, up to the handover of work results.

Government procurement of goods/services involves many parties ranging from those representing the government, the private sector, to the community.[3] Then, based on Article 4 of Presidential Regulation 12/2021, Public Procurement has eight objectives, namely: 1) produce the right goods/services for money spent, measured in terms of quality, quantity, time, cost, location, and provider; 2) increase the use of domestic products; 3) increase the participation of micro, small and cooperative enterprises; 4) increase the role of national business actors; 5) support the implementation of research and the utilization of goods/services resulting from research; 6) increase the participation of the creative industry; 7) realize economic equality and provide expansion of business opportunities; and 8) improve sustainable procurement.

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[1] HC Black and JR Nolan, *Black's Law Dictionary: Definitions of the Terms and Phrases of American and English Jurisprudence, Ancient and Modern* (West Publishing Company 1990). [696].

[2] Colin Turpin, *Government Contracts* (Penguin Books 1972).[3].

[3] Murniati Harjo Pardi, 'Transparansi Dalam Sistem E-Procurement Alat Kesehatan di Kementerian Kesehatan Republik Indonesia' (Universitas Airlangga 2023).[172].

However, in achieving the goals stated in PR 12/2021, there is an abuse of the rights and obligations of the parties involved in order to benefit personal or group interests, or what is commonly referred to as corruption.[4] Therefore, to reduce the potential for abuse in the procurement of goods/services, by utilizing the development of information technology, an electronic procurement system (e-procurement) is implemented. In Article 1 paragraph 37 of Presidential Regulation No. 70 of 2012 concerning the Second Amendment to Presidential Regulation of the Republic of Indonesia Number 70 of 2012 concerning the Second Amendment to Presidential Regulation 54 of 2010 concerning Government Procurement of Goods/Services, e-procurement is the procurement of goods/services carried out using information technology and electronic transactions in accordance with statutory provisions. In Presidential Regulation No. 16/2018 on Government Goods/Services Procurement, it is stated in Article 1 point 35, that e-purchasing is a procedure for purchasing goods/services through an electronic catalog system. With the transformation from conventional procurement of goods/services to e-procurement systems, it is expected to increase the transparency aspect, which can therefore continue to reduce the potential for corruption in the procurement of goods/services.[5] The advantages of the e-procurement system, among others, are openness because, by using information technology as the basis, the implementation of the Goods/Services Procurement can be more widely monitored. Information technology enables transparent governance and communication between government and the public and the monitoring or overseeing of government performance.[6] For example, the provider, in this case, can participate in monitoring the tender auction process online at any time.[7] The next advantage is

[4] Sabrina Dyah Nayabarani, 'Membangun Transparansi Pengadaan Barang Dan Jasa Melalui Peningkatan Peran Ict Dalam Mereduksi Korupsi' (2018) 47 Jurnal Hukum & Pembangunan.[477].

[5] Badzalina Daroyani Novitaningrum, 'Akuntabilitas Dan Transparansi Pengadaan Barang Dan Jasa Pemerintah Melalui Electronic Procurement (Best Practice Di Pemerintah Kota Surabaya)' (2014) 2 Kebijakan dan Manajemen Publik.[200].

[6] Amir Hamsyah, 'Bureaucratic Reform Based on E-Procurement: Opportunities and Challenges', *1st Doctoral International Conference 2023* (KnE Life Sciences 2023).[32-46].

[7] Achmad Nurmandi and Sunhyuk Kim, 'Making E-Procurement Work in a Decentralized Procurement System: A Comparison of Three Indonesian Cities' (2015) 28 International Journal of Public Sector Management .[198–202].

the reduction of human intervention in the Procurement process, which can be prone to abuse.[8] However, the Goods/Services Procurement system also has its weaknesses. According to Gunasegaram, these include lack of financial support, there are agencies that are still comfortable with the conventional procurement system, lack of support from top management, lack of skills and knowledge about e-procurement, and security assurance of the system.[9] Some crucial factors for the success of e-procurement are system integration and security and authentications,[10] which are absolutely necessary because system integration is related to integration with a large database, which also includes integration with the financial management system of a country which, of course, also involves sensitive data from the government.[11] Thus, the e-procurement system needs to be equipped with a qualified security system.[12] Related to this transformation, to support data integration in e-procurement, blockchain technology can be a solution to be able to integrate all data with high security in the context of transformation toward the e-procurement system. Blockchain technology itself is simply a decentralized ledger used to run all data between parties in the network, which is not controlled by one central authority to record and store all data between users in chronological order.[13]

The application of blockchain technology can be applied in the e-procurement process or system so that the system can be applied efficiently. The e-procurement system uses blockchain as an information identification platform. The decentralization and non-tampering of blockchain make suppliers' information transparent and increase the trustability of decision-making.[14] So that it is necessary to transform

[8] Nurmandi and Kim (n 7).

[9] Hasni Gayathma Gunasekara, Pournima Sridarran and Dilakshan Rajaratnam, 'Effective Use of Blockchain Technology for Facilities Management Procurement Process' (2022) 20 Journal of Facilities Management.[452].

[10] Kishor Vaidya, ASM Sajeev and Guy Callender, 'E-Procurement Initiatives in the Public Sector: A Literature Review of the Critical Success Factors' (2006) 6 Journal of Public Procurement [70, 84].

[11] Nurmandi and Kim (n 6).[203].

[12] Vaidya, Sajeev and Callender (n 10).

[13] OECD, 'The OECD Blockchain Primer'.[4].

[14] S Qin,[*et.,al.*] 'Smart Elderly Care: An Intelligent e-Procurement System for Elderly Supplier Selecting' (2023) 11 Systems <https://doi.org/ 10.3390/systems11050251>.[251].

the procurement of goods/services, which initially only took the conventional form, toward the procurement of goods/services that can utilize information technology, namely electronic procurement of goods/services (e-procurement). This transformation is in order to achieve effectiveness, efficiency, transparency, openness, competition, fairness, and accountability, which are the principles of goods/services procurement.

Based on the background that has been described, this article raises the following issues such as transformation of conventional goods and services procurement towards e-procurement and the probability of using blockchain technology for the development of ep in Indonesia. The type of research used in this article is legal research. Peter Mahmud Marzuki stated that legal research is to find the truth of coherence, namely whether there are legal rules and whether the norms in the form of orders or prohibitions are in accordance with legal principles, and whether a person's actions are in accordance with legal norms (not just in accordance with legal rules) or legal principles.[15] The approaches used in this research are statute approach and conceptual approach.

Transformation of Conventional Goods and Services Procurement to E-Procurement

Government Procurement of Goods/Services, with the development of information and communication technology, is also transforming from conventional to electronic or digital Procurement of Goods/Services. Regarding this matter, it has also been regulated in Presidential Regulation No. 16 of 2018 which is amended by Presidential Regulation No. 12 of 2021. Historically, the regulation of Goods/Services Procurement has undergone many changes and improvements. Starting from Presidential Decree Number 11 of 1973, every year thereafter a new presidential decree was always issued born because the presidential decree regulates the implementation of the state budget, which

[15] Peter Mahmud Marzuki, *Penelitian Hukum* (Revisi, Kencana 2022).[47].

also includes the procurement of goods/services.[16] Only since 2000 has, there been a presidential decree that specifically regulates procurement.[17] This is a consequence of Indonesia's acceptance of the World Trade Organization (WTO) which is marked by ratification through Law No.7 of 1994 concerning Ratification of the Agreement Establishing the World Trade Organization so that there are very fundamental changes in the regulation of public procurement, namely the issue of transparency and rejection of discriminatory treatment reflected in the basic principles in public procurement.[18]

The process of government procurement of goods / services is regulated in Article 18 paragraph (1) of Presidential Regulation No.16 of 2018 and is regulated more specifically in LKPP regulation No.7 of 2018 concerning Guidelines for Planning for Government Procurement of Goods / Services, which can simply be described that the process of procurement of goods / services consists of five points of arrangement from the planning stage before finally reaching the output stage.[19] The process can be illustrated with the following chart:

Figure 1: Chart of Public Procurement Process based on Article 18 paragraph (1) of Presidential Regulation No.18 paragraph (1).[20]

The most fundamental difference that causes the transformation from conventional procurement of goods/services to electronic procurement of goods/services is in terms of transparency and accountability. The context discussed here is about how conventional government procurement of goods/services is vulnerable to abuse or corrupt practices there. Apart from that, the issue of eradicating corruption from

[16] Y.Sogar Simamora, *Hukum Kontrak Prinsip-Prinsip Hukum Kontrak Pengadaan Barang dan Jasa Pemerintah di Indonesia* (LaksBang Pressindo 2017).[98].

[17] Y.Sogar Simamora (n 16).

[18] *ibid.*

[19] Y.Sogar Simamora and others, *Pengantar Hukum Pengadaan Barang dan Jasa* (Airlangga University Press 2021).[22].

[20] Y.Sogar Simamora and others (n 19).

potential arbitrariness of a loose criminal law approach also has the opportunity to be further clarified.[21]

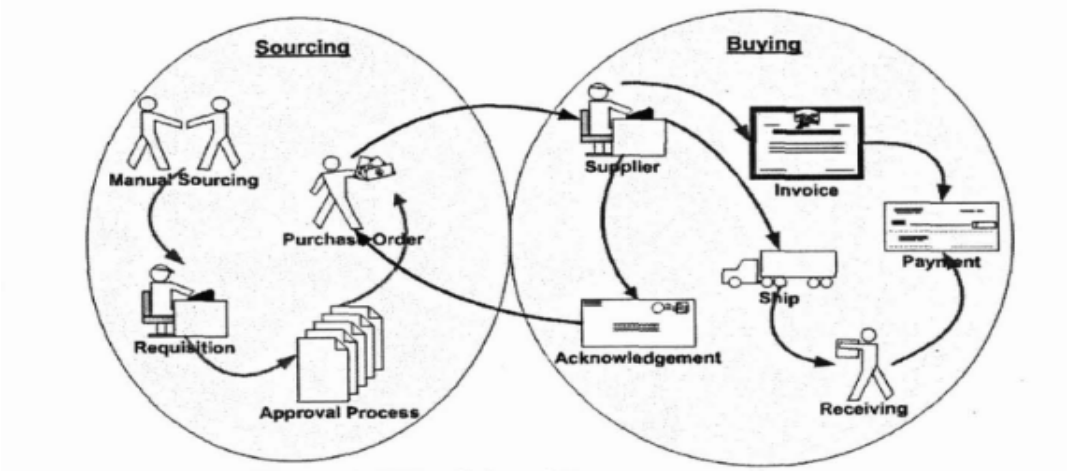

Figure 2: Traditional Procurement.[22]

Transparent means that all provisions and information regarding the procurement of goods/services are clear, can be known and can be accessed widely.[23] While accountable means referring to the accountability of the implementation of goods/services procurement to related parties and to the public.[24] Based on the stages of the procurement of goods/services, in its implementation in conventional government procurement of goods/services is very vulnerable to corrupt practices, which is the most basic weakness in the conventional procurement system. With a conventional system, all stages cannot be monitored or supervised directly by the public because all information about the procurement is limited to the procurement committee and the provider.

Therefore, there is a transformation in the field of goods/services procurement from conventional (non-electronic) to digital-based goods/services procurement. Digital or electronic-based goods/services procurement is called e-procurement. In the regulations governing the Procurement of Goods/Services, the terminology

[21] Richo Andi Wibowo, 'Penyelesaian Sengketa Pada Rancangan Aturan Pengadaan Barang Jasa Publik: Apresiasi, Kritik, Rekomendasi' (2023) 6 Media Iuris.[500].

[22] Munir Majdalawieh and Robert Bateman, 'Tejari and E-Procurement: Moving to Paperless Business Processes' (2008) 10 Journal of Information Technology Case and Application Research.[53].

[23] Y.Sogar Simamora and others (n 17).[12].

[24] *ibid.*[28].

used for electronic purchasing is e-purchasing. In Presidential Regulation No. 16 of 2018 jo. Perpres No. 12 of 2021, e-purchasing is a procedure for purchasing goods/ services through an electronic catalog system. Then further, based on Article 38 of Perpres 16 of 2018 jo. Perpres 12 of 2021, e-purchasing is one of the methods of selecting providers of goods/construction work/other services that have been listed in the electronic catalog (e-catalogue). In Article 50 paragraph (5) of Presidential Regulation No. 16 of 2018 jo. Presidential Regulation No.12 of 2021, it is stipulated that e-purchasing must be carried out for goods and services related to the fulfillment of national and/or strategic needs determined by the minister, head of institution, or head of region.

Government Procurement of Goods/Services using the e-procurement system is regulated in Articles 104 to 112. Basically, the e-procurement system aims to protect the leakage of state money in the Goods/Services Procurement sector due to corruption, collusion, and nepotism.[25] This electronic system is considered lower risk of misuse because, with the electronic system, the basis is to utilize technology as a means of interaction between the two parties involved (the government and the goods/services provider).[26] Furthermore, regarding the norms of e-procurement, we can refer to regulations that specifically regulate electronic catalogs, which can be found in the Regulation of the Government Goods / Services Procurement Policy Agency (Perka LKPP) No. 9 of 2021 concerning Online Stores and Electronic Catalogs in Government Goods/Services Procurement. E-Catalog is an electronic catalog that is part of the technical infrastructure and transaction support services in the e-marketplace in the context of goods/services procurement.[27] In Article 72 paragraph (1) of Presidential Regulation No. 16/2018, electronic catalogs can be in the form of national electronic catalogs, sectoral electronic catalogs, and local electronic catalogs.

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[25] Ariman Sitompul, 'E-Procurement System In The Mechanism Of Procurement Of Goods And Services Electronically' (2022) 1 International Asia of Law and Money Laundering (IAML). [57–59].

[26] Sitompul (n 25).

[27] Y.Sogar Simamora and others (n 19).

In simple terms, electronic procurement of goods/services can be described as follows:

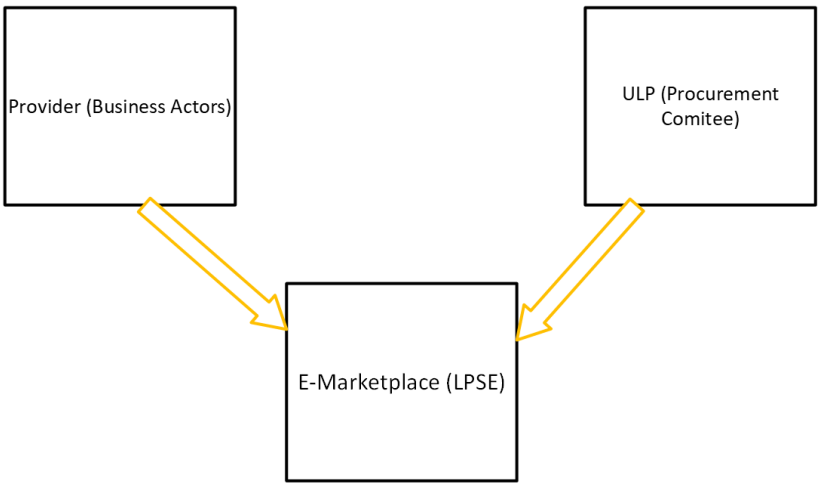

Figure 3: Chart of Procurement of Goods/Services with electronic system

The implementation of e-procurement started since 2006 with the Electronic Procurement Service (LPSE).[28] However, e-procurement in the form of a new government program began in 2008 with the creation of INAPROC as a national e-procurement system in order to procure and deliver goods and services electronically.[29] Based on the chart of the procurement of goods/services with the electronic system, it can be concluded that the LPSE, which acts as an estuary where the Procurement Committee meets with the Provider, plays a very crucial role in terms of simplification and in order to increase the transparency and accountability of the procurement process.

The advantages of the electronic system are firstly in terms of supervision. Because it is open to the public, there is transparency and it can be monitored and tracked in real time. Including the tendering process with the electronic system, which is not done face-to-face, which, in addition to efficiency in terms of time and cost, the potential for collusion and nepotism in tendering is very likely to be suppressed or eliminated.[30] E-procurement, which is supported by qualified

[28] Adie Dwiyanto Nurlukman, 'E-Procurement: Inovasi Penyelenggaraan Pemerintahan Dalam Pengadaan Barang dan Jasa Berbasis e-Government di Indonesia' (2017) 1 Journal of Government and Civil Society [81–82].

[29] Nurmandi and Kim (n 6); Adie Dwiyanto Nurlukman (n 25).[83].

[30] Adie Dwiyanto Nurlukman (n 28).

technology, can cover all files, documents and data related to the procurement of goods/services neatly and safely.[31] So that with its nature that allows direct supervision from the community, the accountability aspect of e-procurement can certainly also be fulfilled. Procurement of goods/services with technology for the basis is not without problems but remains at a good level.[32]

According to Mahadi, principle is defined as beginning, foundation,[33] which means it is the source or origin of something, a rule or basis for one's actions, and a statement that is used as a basis for explaining an event.[34] Meanwhile, according to Henry Campbell, a principle is defined as a fundamental truth, a comprehensive rule that provides a basis or origin for others, fixed rules for action, a truth that is clear by itself and that cannot be proven or contradicted.[35] So, based on these definitions, it can be simply interpreted that principles are the beginning or basis for acting or explaining something, as well as being the basis for something.[36]

Of course, it is necessary to understand the basic principles in conducting public procurement. The legislation in Indonesia that currently regulates the Procurement of Goods / Services is Presidential Regulation No. 16 of 2018 which is amended by Presidential Regulation No. 12 of 2021. In Presidential Regulation No. 16 of 2018 jo. Perpres No.12 of 2021, the principles can be found in Article 6, namely:

a. Efficient;
b. Effective;
c. Transparent;
d. Open;
e. Competitive;
f. Fair; and
g. Accountable.

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[31] Novitaningrum (n 5).

[32] Yardie David Roringkon,[*et.,al.*] 'Juridical Analysis of Conventional or Electronic Procurement of Goods and Services and The Role of Government Supervisory Agency, Legal Brief' (2022) 11 IHSA Institute.

[33] Mahadi, *Falsafah Hukum: Suatu Pengantar* (PT Citra Aditya Bakti 1989); Y.Sogar Simamora and others (n 19).[1726-1736].

[34] Mahadi (n 33); Y.Sogar Simamora and others (n 19).

[35] Black and Nolan (n 1).

[36] Y.Sogar Simamora and others (n 19).

Furthermore, in Presidential Regulation No. 16 of 2018 jo. Perpres 12 of 2021, in Article 7, it is also mentioned about the Ethics of Goods/Services Procurement, namely:

a. carry out duties in an orderly manner, accompanied by a sense of responsibility to achieve the objectives, smoothness, and accuracy of the Goods/Services Procurement objectives;
b. work professionally, independently, and maintain the confidentiality of information that by its nature must be kept confidential to prevent irregularities in the Goods/Services Procurement;
c. not influencing each other directly or indirectly which results in unfair business competition;
d. accept and be responsible for all decisions made in accordance with the written agreement of the parties concerned;
e. avoiding and preventing conflicts of interest of related parties, either directly or indirectly, which result in competition;
f. avoiding and preventing waste and leakage of state finances;
g. avoiding and preventing abuse of authority and/or collusion; and
h. not accepting, not offering, or not promising to give or receive gifts, rewards, commissions, rebates, and anything from or to anyone who is known or reasonably suspected to be related to the Procurement of Goods/Services. unfair business in the Procurement of Goods/Services.

In simple terms, it can be concluded from Article 6 and 7 of PR 16/2018, that there are principles that must be applied by the procurement committee and authorized officials in issuing decisions, provisions, procedures and other actions and that, by applying these principles, it is hoped that an atmosphere conducive to achieving efficiency, participation and fair and open competition among goods / services providers will be created.[37] These principles are also followed by what is called procurement ethics. In this case, procurement ethics are essentially obligations and prohibitions.[38] So that it becomes clear, in terms of procurement of goods/ services, that this is the first guideline or principle underlying the procurement of goods/services.

Specifically, the regulation of goods/services procurement has been recognized in Indonesian legislation since the regulation of goods/services

[37] Y.Sogar Simamora (n 16).
[38] *ibid.*

procurement in Presidential Regulation No. 70 of 2012 concerning the Second Amendment to the Presidential Regulation of the Republic of Indonesia Number 70 of 2012 concerning the Second Amendment to Presidential Regulation 54 of 2010 concerning Government Procurement of Goods/Services. In Article 1 point 37 it is stated that e-procurement is the procurement of goods/services carried out using information technology and electronic transactions in accordance with statutory provisions. The keywords here are procurement of goods/services, information technology and electronic transactions. Because the context of goods/services procurement here is procurement carried out with an information technology platform which leads to the terminology of electronic transactions.

In Article 1 number (35) of Presidential Regulation No. 16/2018 jo. Presidential Regulation No. 12 of 2021, it is stated that electronic purchasing activities are called e-purchasing. Furthermore, Article 38 point (2) states that the purchasing procedure is carried out through an electronic catalog system. Therefore, to understand the norms of e-procurement, it is necessary to refer to regulations that specifically regulate electronic catalogs, which can be found in the Regulation of the Government Goods/Services Procurement Policy Agency (Perka LKPP) No. 9 of 2021 concerning Online Stores and Electronic Catalogs in Government Goods/Services Procurement. In the LKPP Regulation No.9 of 2021, Article 1 states that the principle of the regulation is so that the procurement of goods/services carried out through an electronic system can be fast, easy, transparent and electronically recorded. This principle is in line with the principles of goods/services procurement in Presidential Regulation 16/2018. The importance of public policy is that it facilitates and promotes technological innovation.[39]

[39] Ardhana Januar Mahardhani, 'The Role of Public Policy in Fostering Technological Innovation and Sustainability' (2023) 1 Journal of Contemporary Administration and Management (ADMAN) <https://doi.org/10.61100/adman.v1i2.22>.[47-53].

The Probability of Using Blockchain Technology for the Development of E-Procurement in Indonesia.

Blockchain is a term that first appeared in the context of the digital currency Bitcoin.[40] Blockchain technology is a decentralized ledger of transactions between parties in a network without being controlled by a single central authority.[41] From a data management perspective, blockchain is a distributed database that records a list of transaction records and stores the entire chronological order of evolving transactions by organizing them into a hierarchical blockchain.[42] From a security perspective the blockchain is created and maintained using a peer to peer overlay network and secured through the utilization of smart, decentralized cryptography with crowd computing.[43]

Meanwhile, cryptography, according to Bruce Schneier,[44] is the art or science of keeping messages secure.[45] In simple terms, blockchain technology is a technology that consists of a series of blocks, where each block is connected by cryptography. Each block is interrelated with each other to form a chain.[46] Thus, the security of the chain is essentially multilevel and interrelated. Before entering the blockchain, transactions are subject to verification at the user level within the peer to peer network, without the intervention of a central authority, specialized third party, or trust, but rather by other computers connected to the network that receive the transaction.[47] Therefore, blockchain systems are considered to provide trust and transparency as anyone can check that a particular transaction exists and has not been altered even though there is no central authority involved.[48]

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[40] Farah Diba, 'Implikasi Teknologi Blockchain Pada Proses Pendaftaran Tanah di Indonesia' (SH Oemar Moechtar M.Kn and SH Dr. Intan Inayatun Soeparna M.Hum eds, Fakultas Hukum Unair 2023).

[41] *ibid.*

[42] *ibid.*

[43] Rui Zhang, Rui Xue and Ling Liu, 'Security and Privacy on Blockchain' (2019) 52 ACM Computing Surveys.

[44] Diba (n 40).

[45] Basri Basri, 'Kriptografi Simetris dan Asimetris Dalam Perspektif Keamanan Data dan Kompleksitas Komputasi' (2016) 2 Jurnal Ilmiah Ilmu Komputer.[16].

[46] Diba (n 40).

[47] *ibid*.

[48] Rosa M Garcia-Teruel, 'Legal Challenges and Opportunities of Blockchain Technology in the Real Estate Sector' (2020) 12 Journal of Property, Planning and Environmental Law 129.[3].

According to Kiviat,[49] blockchain technology is revolutionary and beneficial because:

> "The blockchain is an authentication and verification technology, it can enable more efficient title transfers and ownership verification. Because it is programmable, it can enable conditional "smart" contracts. Because it is decentralized, it can perform these functions with minimal trust without using centralized institutions. Because it is borderless and frictionless, it can provide a cheaper, faster infrastructure for exchanging units of value".[50]

The concept of blockchain has several characteristics, namely:[51]

1. Peer to peer, which is a network composed of two or more computers;
2. Decentralization, where the database is maintained and held by all users in the network;
3. Immutable, existing data cannot be changed once given in program execution;
4. Consensus Mechanism, the protocol is essential to ensure that each block is valid and all participants maintain the same version of the ledger;
5. Anonymity, where blockchain users can interact with each other without revealing their identity; and
6. Protocol Efficiency Program, the execution of transactions is carried out in accordance with the blockchain program settings and organized systematically.[52]

When depicted, the blockchain system can be simply described as follows:

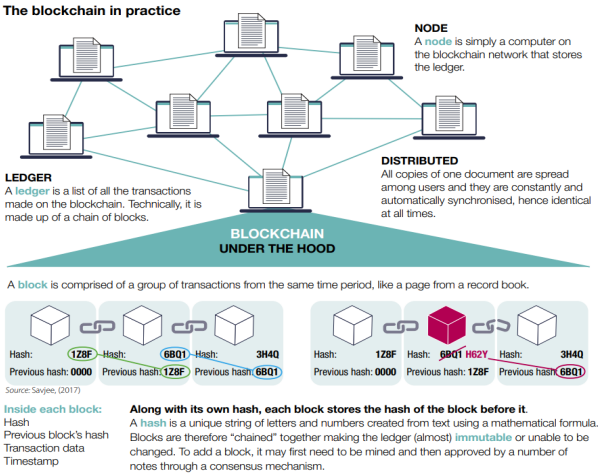

Figure 4: How blockchain works in general.[53]

[49] Malik Khalfan and others, 'Blockchain Technology: Potential Applications for Public Sector E-Procurement and Project Management' (2022) 14 Sustainability (Switzerland).[1–12].

[50] Sope Williams-Elegbe, 'Public Procurement, Corruption and Blockchain Technology in South Africa: A Preliminary Legal Inquiry' (2019) 1 SSRN Electronic Journal.[4].

[51] Diba (n 35).[24].

[52] Funlade T Sunmola and Uje D Apeji, 'Blockchain Characteristics for Sustainable Supply Chain Visibility' [2020] Proceedings of the International Conference on Industrial Engineering and Operations Management 3306.[25].

[53] Diba (n 40).

Based on the schematic image of how the blockchain works, t in these blocks there are hashes, previous hash blocks, data transactions and timekeepers. When making a transaction, each datum will be recorded and executed by a block which will then be grouped according to the transaction, given a time marker and digital signature into a hash.[54] The hash will be connected to the previous hash, recorded, verified and stored with cryptography. And finally the hash will form a chain with the previous hash.[55]

In relation to government procurement, the main issue is transparency, which aims to prevent fraud in activities such as corruption, collusion and nepotism.[56] Transparency is one of the important principles in procurement. So, in line with the transformation of conventional goods/services procurement into e-procurement, the blockchain concept can be a solution to be able to synchronize all e-purchasing carried out by the government and still be in accordance with the principles of transparency and accountability. In this electronic goods/services procurement, blockchain functions to store a ledger or database regarding the procurement of goods/services both from the procurement committee and the provider. This blockchain also functions to automate transactions in this procurement block, namely there is a timestamping process on documents and validation of transactions carried out which must be based on pre-existing data.

In practice, blockchain technology has previously been applied by the private sector, namely by Walmart, Nestle, and Unilever who used blockchain technology as the basis of their supply chain management starting in 2016.[57] It turns out to be able to increase time and energy efficiency in tracking food in their global food supply chain.[58] The global food supply chain also involves many parties, such as

[54] *ibid.*
[55] *ibid.*
[56] Nayabarani (n 4).
[57] Williams-Elegbe (n 50).
[58] Molly Jane Zuckerman, 'Walmart, IBM Blockchain Initiative Aims to Track Global Food Supply Chain' (*Cointelegraph*, 2018).

producers, retailers and consumers.[59] It also involves many processes ranging from production, processing, packaging, distribution, storage, and others. So, due to the long process, there is a risk that the food we consume could have been damaged, contaminated, or even exchanged with other food ingredients.[60] Therefore, Nestle finally developed a system based on blockchain. In this system, Nestle can create accountability and a traceable system[61] so that, in the food supply chain, the quality of food can be maintained until it reaches consumers.

In addition to the food industry, in 2017 the blockchain system was also adopted or utilized in the healthcare industry by Big Pharma, a company engaged in the field of health services.[62] Just like in the food industry, in the context of the healthcare industry, Big Pharma uses the blockchain system in order to track medicines and prevent drug counterfeiting in their supply chain.[63] In regard to the use of blockchain technology in the public sector, and in terms of public procurement in particular, there are still very few countries that have used this system. So far, only Seoul's Yeongdeungpo-gu District in South Korea has successfully used blockchain as the basis for their procurement,[64] followed by Mexico and Canada through Public Services and Procurement Canada (PSPC).[65]

Based on these examples, when linked to the context of public procurement in Indonesia, which in Indonesia has also used e-procurement, the blockchain system can be used to improve the effectiveness and efficiency of these procurement activities. With blockchain, automation can be done, which in this case involves many sectors, and this can be done without any dependence on third parties in running everything. Everything can run automatically just as in the business world

[59] Natsuki Kawaguchi, 'Application of Blockchain to Supply Chain: Flexible Blockchain Technology' (2019) 164 Procedia Computer Science [143].

[60] Mark Jones, 'Nestlé – Why the World's Biggest Food Company Uses Blockchain' (*Techhq*, 2020).

[61] *ibid.*

[62] Williams-Elegbe (n 50).

[63] *ibid.*

[64] Ledger Insight, 'Seoul District Using Blockchain for Public Procurement' (*Ledger Insight*, 2019).

[65] Marinela Mircea, Marian Stoica and Bogdan Ghilic-Micu, 'Analysis of the Impact of Blockchain and Internet of Things (BIoT) on Public Procurement' (2022) 10 IEEE Access 63353.

where it is common to use the Enterprise Resource Planning (ERP) system in running their supply chain system.

Conclusion

Government procurement of goods/services is an implication of the state's duty to improve the welfare of its people. The activity of public procurement of goods/services has developed in the current digital era, also experiencing a transformation from conventional to digital-based procurement of goods/services or e-procurement. This transformation is also an effort to achieve the principles of goods/services procurement, namely transparency and accountability. Because, in its journey, these procurement activities are prone to abuse or to corruption, collusion and nepotism. According to the types of corruption, the equation is an act of confiscation of state assets that will cause the state losses.[66] To prevent fraud from the procurement of goods/services, a solid system is also needed that can accommodate transparency and security in the procurement of goods/services. The advantage of the blockchain system is in terms of transparency because it does not depend only on a single authority but on all parties in the system which in this case, involves all parties from both the government and goods/services providers and others. And the second advantage is its security, which is secured by a cryptographic system that is difficult to break into. Besides that, implementing the blockchain system enables the government to carry out the process of selecting or appointing service providers more transparently. So, to answer the challenges of this digital procurement transformation, a clear legal umbrella is also needed regarding the use of this blockchain system to improve the current regulation of electronic goods/services procurement. The existence of clear regulations will avoid risks to the use of blockchain. Indonesia still needs to increase its capabilities regarding understanding the blockchain system and its management, so that the implementation is used appropriately.

[66] Rustanto, 'Accountability of Budget Users and Proxy Budget users on the Emergence of State Losses in the Procurement of Government Goods/Services' (2022) 37 Yuridika.[601].

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