Integritas: Jurnal Antikorupsi
Vol 9, No. 1, 2023, pp. 93-108

https://jurnal.kpk.go.id/index.php/integritas

Anti-corruption system 4.0: The adoption of blockchain technology in the public sector

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Abstract: Countries are using various sophisticated information technologies to help provide quality and transparent services. This research aims to explore the potential and models of using blockchain technology in overcoming corruption problems in Indonesia. Proper utilisation of blockchain technology can increase accountability and reduce loopholes in corrupt practices. Blockchain is a distributed database with records (ledgers) shared by all network participants. Smart contract as a form of blockchain can help make the process more transparent and trackable. Since blockchain is a relatively new technology, very few studies have been done to explain its potential in the public sector, particularly with regards to issues of corruption. This study develops a model for the application of blockchain technology and conducts an in-depth analysis of its possibilities using a qualitative method and an exploratory approach. In-depth interviews, designed to get a big picture view of the blockchain development model in the public sector were conducted with several sources, namely the Director General of Asset Tracing KPK (Indonesian Anti-Corruption Commission), KPK Public Prosecutors, the KPK IT department, WIr Group, Financial and Development Oversight Agency (BPKP), and blockchain practitioners. The research was conducted between August and December 2022. The study's findings demonstrate how promising it is to use blockchain technology to lessen corruption. Distributed ledgers give governments new ways to improve transparency. The model that can be applied is 'permissioned blockchain' because it has a private nature. Blockchain application requires top management support, organisational readiness, and organisational support. To deepen understanding, further experimental research is needed to test the model.
Keywords: Blockchain Governance; Anti-corruption system; Smart contract; Distributed Ledgers; Information Technology

How to Cite: Azmi, I. F., & Nugroho, A. A. (2023). Anti-corruption system 4.0: The adoption of blockchain technology in the public sector. *Integritas : Jurnal Antikorupsi*, *9*(1), 93-108. https://doi.org/10.32697/integritas.v9i1.985

Introduction

The technological era has given rise to various advanced technologies that have facilitated the implementation of various tasks and jobs, such as artificial intelligence, the 'Internet of Things', machine learning, three-dimensional printing, big data and blockchain technology. These technologies have tremendous potential to advance organisational and individual productivity within a work system. The emergence of new technologies has made it possible to change the pattern of government work from manual and traditional to modern, simple, fast and efficient.

Changing times have created increasingly diverse problems for government agencies. The technological era poses a challenge to government, as mentioned by Shava and Hofisi (2017) in that in this era, people are increasingly demanding the provision of better public services from the government. The government needs to consider utilising new technologies that enable citizens to express their opinions through social networks (Facebook, WhatsApp, Twitter) and other online platforms which are very important in facilitating e-participation, thus increasing government social accountability. The idea is that a knowledge society that will be more informed about the socio-economic and political processes that affect them in this technological era. Thus, the community will be more motivated to participate in their own development processes, even reaching out to communities that have been marginalised previously (Nath, 2003). Sofyani et al. (2020) states that the demands of the community for the government to provide faster and more

accurate services are increasing in the era of disruption during Industrial Revolution stage 4.0. This challenge can be anticipated by utilising government information technology as a tool for improving the performance of a public organisations (Ali & Green, 2005).

Corruption is a public problem that is under scrutiny because of the high number, diversity, and number of countries that have experienced corruption scandals (Elliott, 2017). This shows the complexity of this phenomenon and its relevance as a global issue. Corruption, or the committal of wrongdoing by bribery or other unlawful or improper means, is a global problem (Heeks, 1998). Amundsen in Saputra (2019) separates public sector corruption into several types, namely bribery, extortion, embezzlement, and fraud. Corruption has harmful impacts on society, for example the draining of valuable economic resources, especially investment funds, into unproductive uses and reducing the possibility of achieving government goals. Corruption also draws upon other valuable resources, such as the working time of public sector employees, leading to unproductivity, resentment and frustration among staff, and reducing organisational efficiency. Because of its hidden and unaccountable nature, corruption is fundamentally undemocratic and undermines democratic processes and institutions (Heeks, 1998).

During the last three decades, corruption has become a special topic that has been studied extensively in the social sciences. In the realm of economic studies, corruption has been studied since 1975, initiated by the Rose-Ackermann paper (Rose-Ackermann, 1975). Various disciplines within the social sciences have examined a large number of topics related to corruption, for example the history of corruption, its influence on political factions and parties, its functional role in the political system and its relationship to democracy, civil society, and development (Torsello & Venard, 2016). Several studies have also examined solutions to the problem of corruption in government organisations (du Plessis & Breed, 2013; Klaveren, 2017; Mahmood, 2005).

According to Artidjo Alkostar (Muliyawan, 2021), Indonesia is being faced with increasing corruption, especially in politics. Corruption is seen as hampering aspects of national development, including economic, social, political and cultural aspects of the nation. Several surveys and research papers have been conducted to measure the level of corruption in the Indonesian public sector. *Measurements by the Transparency International Institute*, revealed that Indonesia's Corruption Perceptions Index places it 96th out of 180 countries (Transparency International, 2022). The Corruption Perceptions Index (CPI) is a global corruption ranking that is most widely used in the world. This index measures how corrupt each country's public sector organisations are according to experts and business actors. The corruption perception index in Indonesia in 2021 was 38 (on a scale of 0 = very corrupt, and 100 = very clean).

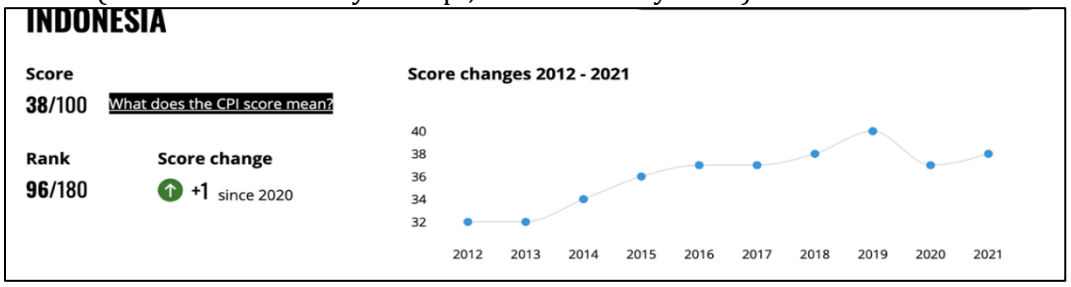

Figure 1. Indonesia's Corruption Perception Index According to Transparency International (*2021 Corruption Perceptions Index - Explore The... - Transparency.Org*, n.d.)

Meanwhile, in the 2021 Global Corruption Index, Indonesia ranked 101 out of a total of 196 countries, with a score of 46.75 (0 indicates a very low level of corruption risk and 100 indicates a very high level of corruption risk) (Global Risk Profile, 2021) . The Central Bureau of Statistics measures the Anti-Corruption Behaviour Index, which assesses the level of permissiveness of society towards anti-corruption behaviour (Badan Pusat Statistik, 2020). This index covers three main phenomena of corruption: bribery, extortion, and nepotism. Indonesia's Anti-Corruption Behaviour Index (IPAK) scores have intervals on a scale of 0 (worst) to five (best). According to Central Bureau of Statistics (BPS), in 2021 Indonesia's IPAK score was 3.88; higher than in 2020 (3.84). The above results are also supported by the number of criminal acts of corruption, which are increasing from year to year.

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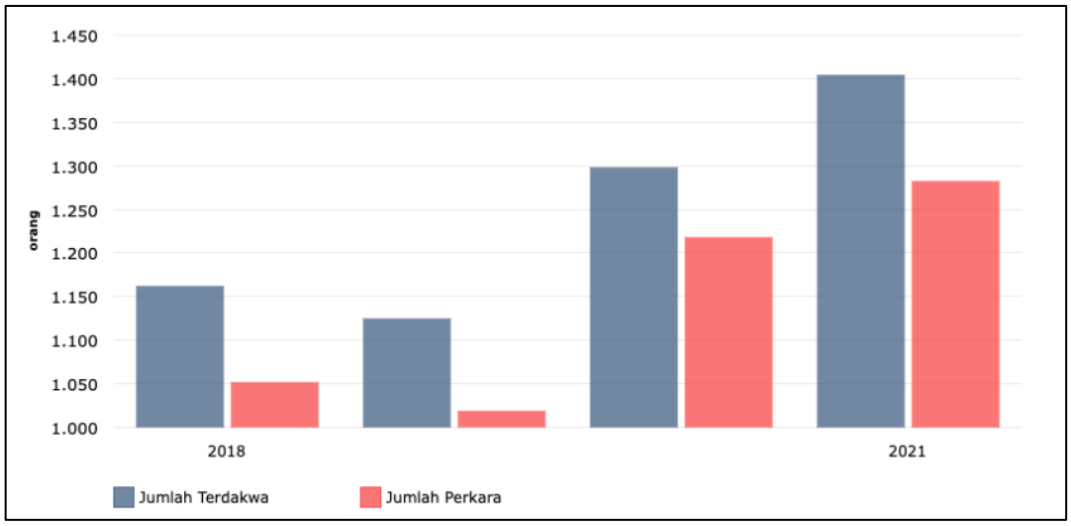

Figure 2. Number of Corruption Cases and Defendants (2018-2021) (ICW in (Kusnandar, 2022))

The above phenomenon raises the question, what efforts have been made to overcome the spread of corruption in Indonesia? In the 1990s, many organisations attempted to reform the bureaucracy, provide incentives to state administrators, and provide formal recruitment standards and promotion criteria. More recent efforts have focussed on eradicating corruption through transparency and accountability efforts, such as increasing monitoring/supervision of apparatus behaviour and creating positive and negative incentives for better behaviour (Fukuyama, 2018); for example, whistleblowing systems and participatory budgeting systems where the public is more involved in budgeting decisions, or installing CCTV, etc. (Rachman, 2018) argues that one way to tackle corruption is through public information disclosure, where the public can directly assess the transparency and accountability of state administrators in utilising resources for community welfare. In his study, (Astuti, 2013) states that various efforts to combat corruption have been carried out, for example strengthening the legal umbrella, promoting an anti-corruption culture, establishing anti-corruption institutions, and improving the quality of the state apparatus, etc. However, on the ground, the reality is that corruption is thriving and increasingly rampant. The International Corruption Watchdog (ICW) noted that there has been an increase in the value of state losses from year to year due to corruption (Javier, 2021).

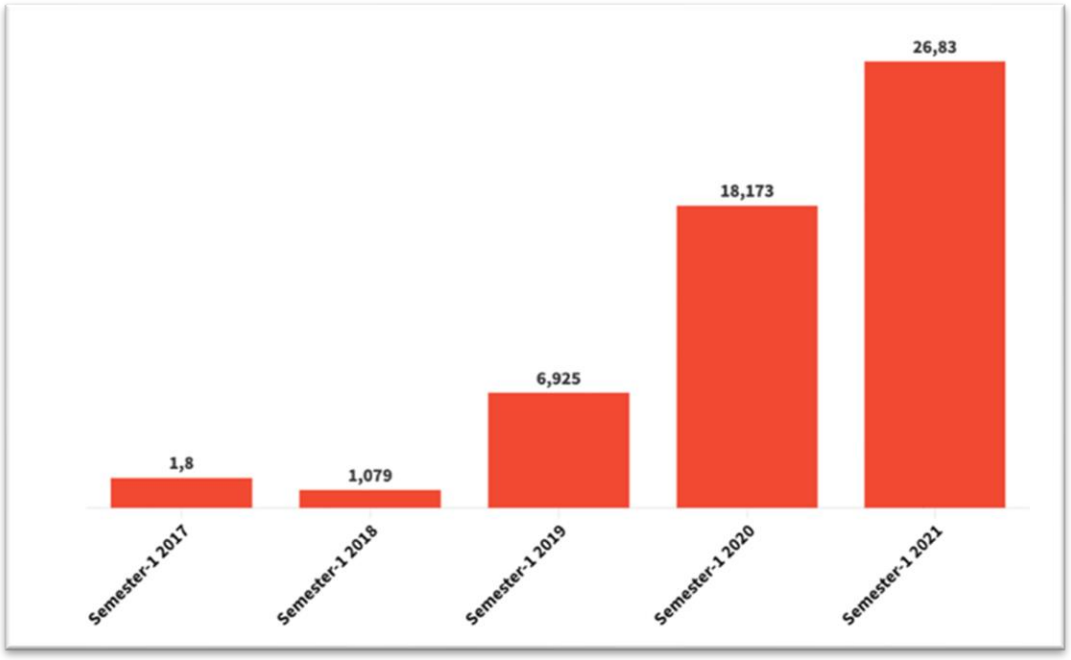

Figure 3. Value of State Losses Due to Corruption (in Trillion Rupiah) (ICW in (Javier, 2021))

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In 2020, the World Economic Forum (WEF) measured the level of government effectiveness and the results stated that corruption is the most chronic pathology of bureaucracy (Figure 4). It is alleged that corruption by the government has reduced Indonesia's investment potential.

Corruption is difficult to eradicate due to systemic obstacles, namely a culture of corruption that is rooted in apparatus and organisational systems (Priambodo et al., 2020; Santoso et al., 2014). This is supported by Laode M Syarief's statement (Novianto, 2018) that the challenge of corruption lies in planning systems and public services, as well as the need to improve the e-planning, e-budgeting, and the procurement of goods and services systems, as well as more adequate supervision. Existing corruption eradication efforts have been made, though have not yielded significant results. Although attention to corruption and anti-corruption policies has increased dramatically in recent policy studies and research, the results of many anti-corruption programs and good governance reform programs have so far been modest (Rothstein, 2018). This shows the need for a breakthrough that can amend the phenomenon of systemic corruption. In other words, the existing system, which has many loopholes for corrupt behaviour, must be modified in such a way that the loopholes are minimised to prevent corruption.

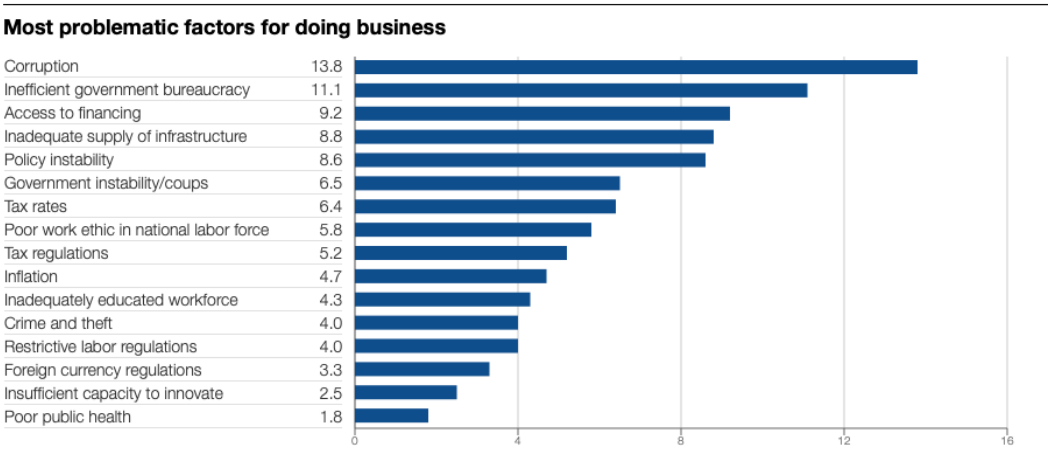

Figure 4. Bureaucratic Problems in Indonesia (WEF Report, 2020)

The developed governments of the world use advanced technologies to help them provide quality services which meet people's expectations. There are a number of recent studies regarding the use of technology to tackle corruption problems in both developed and developing countries (Afolabi et al., 2022; Miroslav et al., 2014; Oye, 2013; Rajon & Zaman, 2008; Sarker et al., 2021). In order to create a system that is free from the possibility of fraud and manipulation and is accountable and non-corrupt at work, blockchain technology can be utilised in such a way (Aarvik, 2020; Aggarwal & Floridi, 2018; Britchenko & Cherniavska, 2019; De Souza et al., 2018; Kaplan, 2021; Kshetri & Voas, 2018). Blockchain is a technology that claims to be proven capable of mitigating the risks of corruption and fraud (Sarker et al., 2021).

Conceptually, a blockchain is a distributed database that contains records of transactions that are shared among participating members. Every transaction is confirmed by consensus of the majority of members, meaning that a fraudulent form cannot pass collective confirmation. Once a record is created and accepted by the blockchain, it can never be changed or lost (Efanov & Roschin, 2018). Blockchain has many benefits for public sector management. In addition to reducing the potential for fraud, blockchain can also improve inventory management, minimise costs, increase public trust, identify problems/errors more quickly, and reduce delays due to convoluted administration (Khosla et al., 2019). In essence, blockchain solves problems and does work faster, more effectively and efficiently. In its application, it can also be in the form of a smart contract that can assist the government in budget management so that it is more transparent and trackable (usage can be traced).

In the private sector, blockchain is already widely used (Guo et al., 2020). Corporate management governance has become more accountable (Stockburger et al., 2021). In various countries, these developments have been widely adopted by the public sector. This adoption provides benefits in various aspects. For example, Kohli and Liang (2021) conducted a systematic literature

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review on research organisations strategically integrating blockchain. They reviewed some of the literature that examines the application of blockchain in four sectors, namely taxation, potential corruption in global shipping, public/private industry, and insurance. The results of the study showed that there is a strategic role for blockchain technology in organisations, with much to still be explored. Another example was revealed by (Parenti et al., 2022) who examined the smart government diffusion model using blockchain as an anti-corruption tool in smart cities. The resulting model, named the Smart Governance BT diffusion model, conceptualises blockchain diffusion as a multistep process including input, dynamic throughput, and output. This model aims to enhance conceptual understanding of technology diffusion in smart cities and highlight the potential of blockchain to mitigate the vulnerability towards corruption, which is relevant for academics and government representatives.

Research by (Casallas et al., 2020) examined smart contracts on blockchain in the public sector. This research explored blockchain's application in the public sector relating to transactions, agreements, registration of property and innovation, development, and other assets. The study was devoted to the application of smart contracts (a mechanism aimed at eliminating intermediaries to simplify the process) in public goods and services procurement procedures, bearing in mind that this is a type of activity which often contains high levels of corruption. This research recommends utilising blockchain together with smart contracts via platforms such as Ethereum or Lisk, due to the flexibility of their use and recent developments.

Blockchain technology enables 'networks of participants' who do not know each other to agree on a state of shared administration without having to rely on human intervention, a central control point, or regulatory oversight (Tan et al., 2022). From various studies, it appears that the use of blockchain in the public sector can reduce corruption (Aarvik, 2020; Kaplan, 2021; Yang & Li, 2020). However, most of the research that has been conducted is still limited to the context of developed countries (Tan et al., 2022). The prospect of using blockchain in developing countries such as Indonesia, which have a complexity of social, economic and political problems (Hadiz, 2004) has not been studied in detail.

In Indonesia, many efforts to eradicate corruption have been carried out, such as providing a legal umbrella related to criminal acts of corruption and establishing the KPK which focuses on preventing and prosecuting corruption. However, not many technologies have been utilised in efforts to eradicate corruption. Blockchain technology could become a breakthrough in efforts to eradicate corruption by creating an anti-corruption budgeting system in Indonesia.

Indonesia, which has a high corruption index, is an ideal laboratory for the adoption of blockchain technology in forming an anti-corruption system. Further analysis is needed regarding the potential of smart contracts in blockchain to reduce corrupt practices in Indonesia. This analysis is expected to provide a new model in the development of anti-corruption systems.

Based on the above, our researchers want to know and explore the potential uses of blockchain technology in the Indonesian public sector for increasing the transparency of financial accountability and preventing corruption. The researchers mapped and designed a model for utilising blockchain technology through smart contract applications, resulting in a modern anti-corruption system that could be implemented in Indonesia.

Methods

This study uses a qualitative method. Qualitative methods are suitable for constructing a model of an anti-corruption system (De Souza et al., 2018; Kaplan, 2021; Tan et al., 2022). An exploratory approach is taken when the research questions raised have never been studied in depth and the issue being studied is something new (Elman et al., 2020; George, 2021). The Table 1 describes the interview respondents in data collection.

WIR Group is a pioneer in blockchain and crypto development in Indonesia. With the experience they have, the researchers will source information on the potential for cloning this technology in the corruption eradication sector. The KPK, as a formal institution acting as the main authority in eradicating corruption, will provide information on the extent of regulatory readiness, Human Resources (HR) and Indoesian infrastructure in adopting blockchain. The Financial

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and Development Supervisory Agency (BPKP), as a financial supervisory agency whose role is in monitoring development, will provide information on the extent to which the human resources for development supervisors and organisations are prepared for the blockchain system to be developed. Meanwhile, blockchain practitioners will provide technical references for the blockchain system.

Table 1. Interview Respondents in Data Collection

No.	Narasumber	Keterangan
1.	KPK General Directorate asset tracking, evidence management, and execution (DIRJEN LABUKSI)	The interviews conducted included discussing state asset management, looking at the potential use of information technology, especially blockchain.
2.	KPK (Public Prosecutor)	The discussion included the current conditions of existing corruption, challenges that are present in the digital world related to corruption and discussing corruption from a legal perspective.
3.	KPK (IT Staff)	Discussed blockchain in terms of feasibility and whether it is adaptable for application in Indonesia.
4.	WIR Group	Discussed blockchain in terms of feasibility whether it is adaptable for application in Indonesia
5.	BPKP	This discussion focused on development monitoring to explore the current development monitoring process and the possibility of adopting blockchain technology in this process.
6.	Practicioner	This discussion thoroughly examined blockchain technology starting from its features, advantages and disadvantages and challenges that will be faced if blockchain is implemented in Indonesia.

The timeline of this research was as follows.

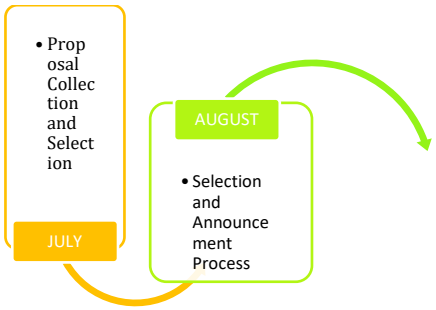

Figure 5. Research Timeline

All data that has been obtained is then triangulated and analysed to map and design an anti-corruption system model with blockchain technology. The research was conducted from August to December 2022.

Results and Discussion

Blockchain Work Process in Suppressing Corrupt Practices

The use of blockchain technology in the public sector is massive, including in efforts to suppress corrupt practices (Sarker et al., 2021). Various countries, especially developed countries, have captured the potential of using blockchain, especially when fighting corruption. This sub-section will explain how feasible blockchain is to implement.

Blockchain can be abstracted into three different layers, as illustrated in the image above. At the heart of a blockchain is layer 1: Consensus Byzantine Fault Tolerance (BFT)—also known as machine replication—which is a general approach to fault tolerance. BFT consensus takes

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different forms, ranging from conventional BFT protocols to Proof of Work (PoW) based consensus (see Figure 6.).

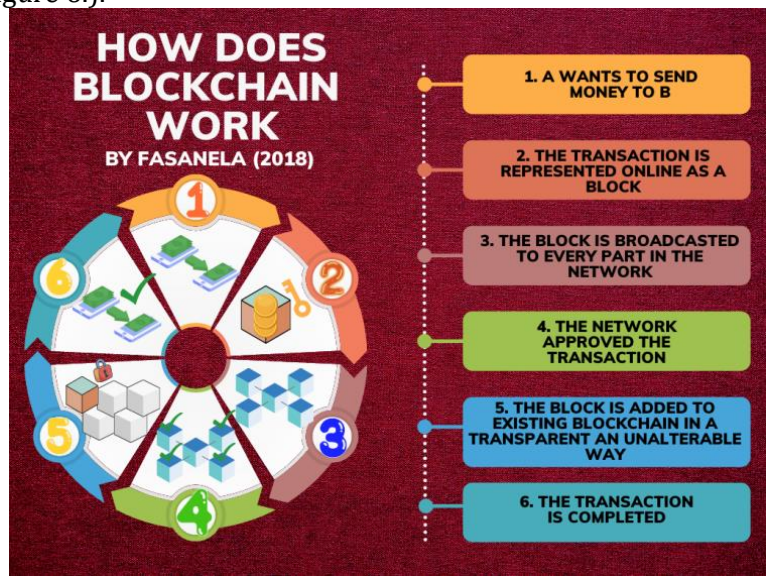

Figure 6. How Blockchain Works (Fasanella, 2018)

Despite the fundamental differences in how to reach consensus, all forms must solve the same problem: how to allow nodes to reach consensus about the total number of requests (that is, the consistency) of transactions submitted by clients. Once the nodes reach a consensus on the order, the data/operations from the transaction are then processed according to the order of the transaction. As a result, functionally distributed nodes behave as if they were one centralised node. This ensures that there is only one sequence of client transactions, known as the 'longest chain'. Layer two of the blockchain is the smart contract, which is basically software code. Smart contracts provide an interface for blockchain developers to implement new functionality. They can then facilitate, verify, or enforce the execution of business transactions. A smart contract can be seen as a program that links the underlying consensus protocol with layer three, applications, and use cases (Clavin et al., 2020).

A smart contract is a program that is automatically activated when the nodes reach a consensus, without the need for human intervention. They are unlike ordinary contracts that humans use. Instead, nodes in the blockchain are configured to check a set of conditions to see if the triggering criteria have been met. If all the requirements have been met, then the node can immediately carry out the agreed contract, which is a program that carries out the specified business function (Clavin et al., 2020). In other words, a smart contract means that the process of distributing digital assets between two or more parties is automatically stated by a formula obtained based on the data entered at the time of making the contract. A smart contract is an electronic program that implements a result on the blockchain that is registered by a consensus protocol. Consensus here is interpreted as if all nodes in the network support the transactions, then authentication will be carried out immediately. (Razzaq et al., 2019).

Blockchain technology has the ability to record transactions on a distributed ledger, offering new opportunities for governments to increase transparency, prevent fraud, and build trust in the public sector (Batubara et al., 2018). This is in line with WIR Group's resource person, who conveyed that blockchain is a technology that is expected to answer the needs of the public sector. The resource person explained that there are two types of blockchain, namely permissionless block-chain and permissioned blockchain (see Figure 8). Permissionless blockchain has the characteristics of freedom in making transactions and accessing data. The characteristics of a permissioned blockchain are freedom in accessing data and making transactions. Permissioned blockchain has private properties and is considered suitable for application in government and public services because it is synonymous with confidential data privacy. According to sources from BPKP, currently the government is aggressively encouraging the use of information

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technology in governance, in accordance with the policy mandate of the Electronic Based Government System (SPBE). Blockchain technology has a considerable opportunity to be realised and adopted into the development process.

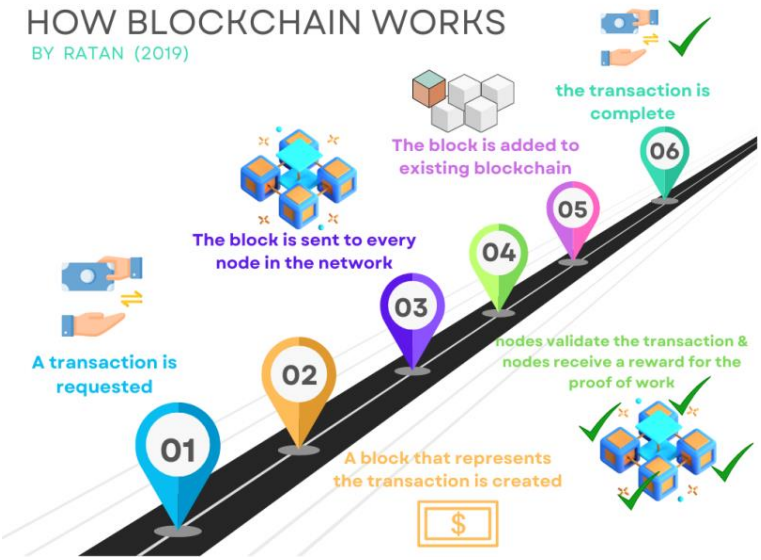

Figure 7. How Blockchain Works (Ratan, 2019)

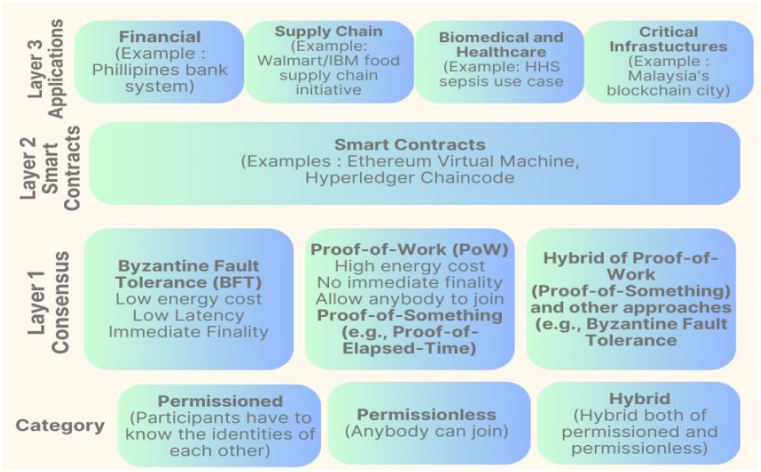

Figure 8. Image of Blockchain Technology Layer (Clavin et al., 2020a)

The Potential of Blockchain to Suppress Corrupt Practices

Currently, there are a number of information and technology systems in Indonesia that are used to increase transparency and accountability in financial management, planning and other government programs. For example, the Ministry of Finance uses the Agency Accounting System Application (SAIBA) for recording and reporting financial transactions, the People's Online Aspirations and Complaint Service Application (LAPOR) developed by the Ministry of Administrative and Bureaucratic Reform to submit complaints about certain public services, and the Collaborative Planning application and Budget Performance Information (KRISNA), which is a collaboration between three ministries to support the process of planning, budgeting, and reporting performance information. According to data from the Minister of Finance, Sri Mulyani, currently there are more than 24 thousand applications throughout the Indonesian public sector, which results in a waste of state finances. These applications are spread across various government agencies and the data has not been integrated (Judge, 2022). The existing information systems and applications have several weaknesses, including: (1) The data is not integrated because the data per application is on each system's management server; (2) Operation is highly dependent on the admin/operator meaning the system does not run independently; (3) System

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control is only on the server; (4) Low security level and easy infiltration; (5) Human error is still possible; and (6) Lots of room for abuse

These weaknesses could be amended by blockchain technology because according to the results of interviews with crypto practitioners, to design the implementation of a blockchain it is necessary to prepare massive amounts of data as the basis for the blockchain technology, so that with this data, data constraints which are not integrated will be handled by the technology itself. Blockchain technology does not depend on the admin; a smart contract is a system that can work alone because from the start it has been designed to run by itself without human intervention. This means that the possibility of intercepting or manipulating the system is minimal. Blockchain technology also minimises security breaches and the occurrence of human error.

Potential Adoption of Public Sector Blockchain Technology to Prevent Corruption

Blockchain technology allows for adoption using open source blockchain platforms that can be accessed for free, including Ethereum, HydraChain, Hyperledger fabrics, Stellar, Ripple, Klaytn, OpenChain, Hyperledger Iroha, Corda, Tron, and others. (Venkatesh et al., 2014). One example of using an open source blockchain platform in the public sector is the blockchain technology utilisation model used for housing rental in Dubai (Alketbi et al., 2020), for business registration and licensing in Dubai Smart City and for 21 other types of public services including a one single identity policy for its citizens (Khan et al., 2019). This makes Dubai one of the 'Smart Cities' of the world, almost 100% supported by blockchain technology. Other examples include digital identity policies in South Korea (Sung & Park, 2021), payment schemes for nature conservation performance through smart contracts in Namibia (Oberhauser, 2019) and digital public service schemes in Italy (Treiblmaier & Sillaber, 2020).

Given its decentralised nature, blockchain is already used for, among other things, land registration, speeding up the registration process and reducing the possibility of fraud and corruption (Khan et al., 2019). In the Republic of Moldova, it has contributed to increasing the flow of capital investment and reduced corrupt practices (Pilkington et al., 2017). In Estonia, blockchain has been at the forefront of securing public medical records (Lapointe & Fishbane, 2019). The main public sectors adopting blockchain technology are in the fields of healthcare, data management, state asset management, digital identity, and e-services (Clavin et al., 2020). The resource person from the KPK RI IT Team added that apart from being implemented in the form of cryptocurrency, blockchain technology has also been applied in several countries for e-voting (in elections) and identity.

Blockchain Adoption Model to Suppress Corrupt Practices

In this section the researchers will propose a model for using public sector blockchain technology to address the potential for criminal acts of corruption in the public sector planning and budgeting system.

The output of previous studies regarding public sector blockchain can be separated into concepts, system architecture (system design), design, prototype, development and evaluation of blockchain implementation (Batubara et al., 2018). In accordance with this research approach, namely at the Meso level, this research will present a model conception of an anti-corruption system that applies blockchain technology.

This anti-corruption system model was developed from two studies on the application of blockchain studied by Clohessy, et al and Liu, et al. in adopting blockchain technology in the public sector. There must be a model that supports the adoption for it to be successful, namely by implementing the TOE (Technology, Organisation and Environment) model. This model describes the process of technological innovation that is decided by the stakeholders of a particular organisation. This framework develops three contexts to explain the crucial elements that play a role in decision-making at the organisational level when adopting blockchain technology (Taherdoost, 2022). There are three important elements in an organization's decision making to adopt blockchain technology (Clohessy et al., 2019), including:

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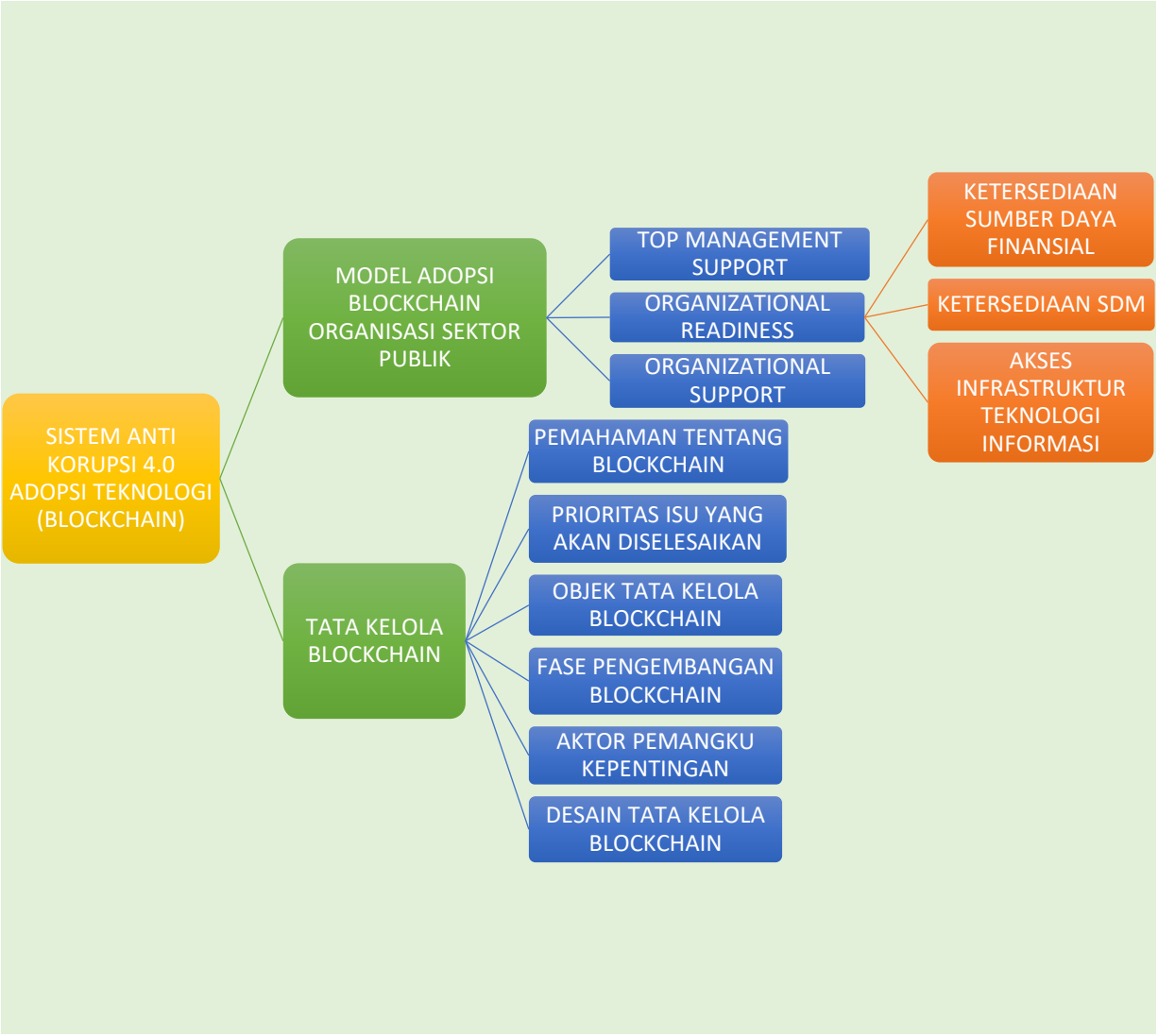

Figure 9. Anti-Corruption System Model through Adoption of Blockchain Technology (developed by researchers based on the model studied by (Clohessy et al., 2019; Liu et al., 2021)).

Support from Top Management Support

Support from top management is needed in the initiation of blockchain technology because leaders have a crucial role in decision making at the organisational level. Leadership support plays an important role because blockchain adoption can require new regulations and regulatory requirements, high levels of complexity, the acquisition of new resources, the integration of resources, reengineering of transactions and an exchange of information and development of new skills and competence.

Organisational Readiness

In terms of organisational readiness, an organisation must have three things, namely financial resources, human resources and information technology infrastructure. From a human resources perspective, the blockchain skills required by organisations in developing blockchain technology can be categorised under the following technological competencies: (1) basic technology (e.g. cryptography, public key architecture); (2) distributed ledger technologies (e.g. mining and consensus algorithms); (3) forensics and law enforcement (e.g. money laundering understanding, the darknet); (4) markets, economics and finance (e.g. game theory, business modelling); (5) industrial design (e.g. supply chain, IoT) and (6) regulations and standards (e.g. smart contracts and frameworks) (Clohessy et al., 2018). Some of the interviewees also explained the importance of the three resources above. Sources from WIR Group said that the financial resources required

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would be large but the results would be commensurate with the costs incurred. The budget is also a separate focus according to a source from the KPK IT Team who said that adopting blockchain technology requires high budgeting. Another concern that needs to be considered relating to organisational readiness is human resources. According to sources from practitioners, there is a clear difference/gap between employees of the millennial generation and the baby boomer generation when implementing a new technology.

Organisational Support

Organisations that adopt blockchain technology tend to be larger organisations. In the context of Indonesia, which is a large country with state institutions whose bureaucracy is not streamlined, blockchain technology will be very strategic in accelerating the effectiveness and efficiency of planning and budgeting processes.

After the three dimensions above are met, the model proposed by the researchers is the blockchain technology governance model itself., This contains several crucial aspects, including stakeholder understanding of blockchain technology, which priority issues need to be resolved with blockchain technology, the object of blockchain governance, phases in blockchain development, stakeholder actors involved and blockchain governance design.

The use of the process as above can be optimised to suppress corrupt practices. The existing information technology would still be centralised and thus prone to misuse. As stated by one of the IT experts from the Wir Group:

> *"It's going well because yes, the debt can be tracked well, every transaction can be caught but after a while it turns out that people realise that the person in the middle can act badly because the person who cheated can...what's it called...give gratuities... orgive a bribe to the person in the middle so that the debt is written off. (Interview, November 15, 2022)*

Within a centralised network, we will not know the processes that occur. As the resource explained;

> *"That's what's happening with the centralised system now, this is the risk that happens with, for example, the current centralised system....that could happen because we don't know who's inside." (Interview, November 15, 2022).*

By using blockchain technology that has a distributed network, the potential for fraud can be avoided. Networks that are interconnected allow for peer review, meaning that to make a transaction, for example, there must be an agreement from the majority of participants in the network, as stated by the source:

> *"Every time there is a transaction that occurs, they all write it down in their respective notebooks and when, for example, it's written down, they all scream that what's written in the place is like that because the majority have the same values." (Interview, 15 November 2022).*

The financial sector and procurement of goods and services can be the main focus of implementing blockchain. The government is developing a blockchain-based digital identity system. In the Ministry of Finance, state finances can be managed with a decentralised network mechanism and smart contracts, we can suppress abuse of authority. If a transaction is made, there must be approval (by consensus) from all participants who are members of the network.

Conclusion

Corruption is a public problem that is rooted in and results in a weakening of the nation and state. Even though efforts to eradicate corruption have been significant, the data shows that the frequency and interval of incidents of corruption has increased from year to year. The current technology-based system has not been able to get around the potential loopholes for corruption, especially in the financial planning and budgeting system. This research seeks to fill the gaps in corruption prevention studies by offering the conception of a public sector adoption of blockchain technology under the heading *'Anti-Corruption System 4.0'*. The researchers have explained how anti-corruption conditions can be achieved with blockchain technology and mapped out the important elements when making policies on blockchain technology adoption.

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Time limitations are a challenge faced by researchers in this study process. Further research requires more extensive time to examine more deeply the application of blockchain in the public sector when preventing corruption; not only at the level of conception, design and system design, but by producing a prototype of a specific blockchain technology that can be applied to tackle the problem of corruption in the public sector.

Further research related to the application of blockchain in the public sector, with more exploratory methods such as quantitative or experimental applied research, will be very useful for testing the extent to which blockchain technology can be a solution for corrupt behaviour in the public sector, a problem which so far has not been resolved by conventional methods.

Acknowledgment

Thanks and appreciation goes to the KPK RI, especially the Director General of Inter-Commission and Agency Network Development (PJKAKI) who have sponsored and facilitated the full implementation of this research. Gratitude is also conveyed to the leadership of the Polytechnic School of Administrative Sciences at the Makassar Institute of State Administration (STIA LAN) and the STIA LAN Jakarta Polytechnic under the auspices of the Republic of Indonesia State Administration Institute for supporting the implementation of this research collaboration. The researcher expresses his appreciation to the key informants from various agencies and research assistants, namely fellow students of the Bachelor of Applied State Development Administration (ST APN) STIA LAN Makassar Polytechnic, who helped collect and process data. The implementation and writing of the research results cannot be separated from the assistance of Mr. Rimawan Pradiptyo, SE, M.Sc, Ph.D who has provided meaningful input in the development of this research. The researcher has not forgotten to thank Kartika Handaruningrum for their suggestions for improving research articles.

Mr. Rizqi Bayhaqi, SH, LLM and Prof. Maman Setiawan SE, MT, Ph.D.

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