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Gold-Based Financial Information System Design Using Blockchain Application

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Abstract

In the current era of monetary inflation involving several countries worldwide, between 3% and more than 25% of the value of currencies has declined in 2019. Inflation is the decrease in the value of a currency relative to a currency with a price. Increase on a large scale and take place over some time. This event occurs in currency (paper and metal). One reason is that the physical nature of silver has no intrinsic value, is easy to print and distribute, and today's silver no longer uses gold as the standard of the exchange rate. Gold has an intrinsic value against inflation. Its role as a medium of exchange can be reused in the computer age thanks to communication applications that run on top of the information system. An information system manages savings, payments, remittances, investments, and other financial activities. The current situation shows that gold is no longer a medium of exchange but a tradable commodity. This information system aims to make gold the basis of the currency circulating within the system. This information system uses blockchain technology as the transaction backbone to manage transactions. You cannot change the transaction data on the blockchain. All data affects the encryption sequence for the next block. In addition, the blockchain will be distributed to all users in the blockchain to protect transactions. The user must use a computer connected to the internet. This study aims to determine the potential of blockchain systems for use in gold-based financial information systems design. This information system is gold-based, resistant to inflation, and gives users confidence.

Keywords: *Blockchain, Gold, Inflation, Financial, Information System*

1. Introduction

Currency inflation occurs in almost every country in the world. In 2019, about 3% to more than 25% of currencies fell. Many factors, from security, health, and supply chains to politics, are causing the currency to depreciate. On the other hand, from 2020 to March, Indonesia suffered from health problems due to the outbreak of COVID 19[1]. As a result of this epidemic, the rupiah's exchange rate against the US dollar is about Rp. It has dropped by 2,000. At the time of writing, the rupiah exchange rate was the previous Rp. From 14,000 to about Rp. It was 16,000. In the economic context, the exchange rates of currencies in almost all countries are based on the US dollar[2]. This provision inevitably leads to continuous inflation every year. Judging by the internal elements of the currency currently in use, the

value given to money and the materials that make it up are irrelevant. In addition, historical records prove that gold is of stable value[3]. For example, the currency unit of the dinar used by gold is 4.25 grams per dinar. If 1 gram of gold is now equal to Rp, the goat will cost 2 dinars. For 500,000, one goat is Rp. Equivalent to 4,250,000. From the beginning to the present, the price of one goat remained dinar (gold) or equivalent currency (rupiah). Therefore, gold has an intrinsic value that can hold the selling price and protect its value from inflation. Currencies currently in circulation, such as the rupiah, can use gold as the basis for exchange rates. The rupiah is used as a certificate of ownership of gold.

On the other hand, the current development of information technology will bring about new business processes, including the financial sector—E Wallet or money service to online finance. Gold has also become part of the development of business processes in the financial sector[4]. Some e-commerce companies offer gold installment services. Users of these services can buy gold from as little as 0.001 grams. However, this practice is flawed when viewed from the point of view of the Islamic Shariah. Especially the Muslims, the majority of them are in Indonesia. According to Sharia, gold and silver are precious objects that are a god (background), as they are both a medium of exchange. Referring to the hadith narrated by Muslims number 2970, "If gold for gold, silver for silver, fine wheat for fine grain, wheat plant for grain, date palm, salt for salt, then the amount must be the same and must be in cash." In addition, the process of exchanging gold for silver incurs exchange fees. When you decide to use it, the value of the rupee gradually decreases [5].

Based on these issues, it is claimed that gold has become the standard of money circulating in the system. The money will become a balance in the e-wallet so that the gold can be used immediately without incurring conversion fees. Based on these issues, gold became the standard currency circulating in the system [6]. The money will become a balance in the e-wallet so that the gold can be used immediately without incurring conversion fees. At that time, the system will have many gold distributors to support the transaction, especially the gold deposit process [7]. This process will create an agreement between the buyer and the distributor of gold. The functionality of the e-wallet and the gold deposit process are some of the features that will be incorporated into the design of this financial information system. Then, the blockchain system will be applied to the design of this information system. Blockchain provides guarantees about data security. Any data is hard to change as it will make the following chain of transactions irrelevant, so if that happens, it will be easily traced. Meanwhile, the blockchain distributes each blockchain among the participating members [8].

2. Research Method

The methods used in this study are literature review, observation, system analysis, and system design. Literary criticism focuses on the topic presented in literary criticism. Meanwhile, observations were made using the gold purchase function available in the well-known e-commerce and the e-wallet function in the transport application [9].

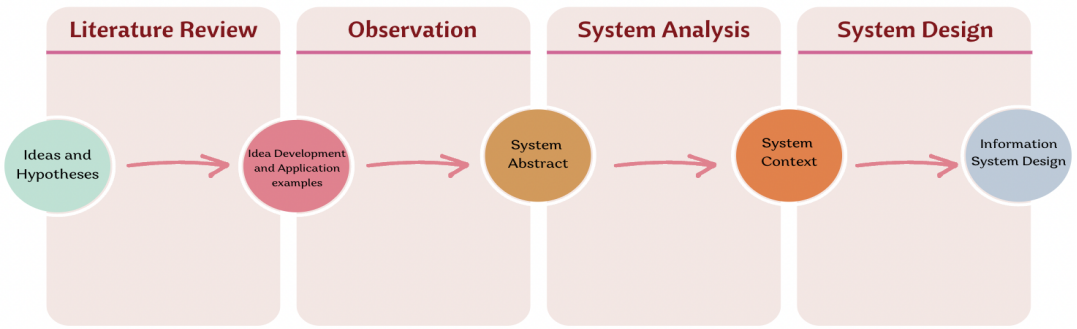

Figure 1. Research Method

2.2 Literature Review

This study reviews the literature dealing with the design of information systems, blockchain, and Islamic law about gold [10]. To analyze the complexity of a system, each object-oriented entity, role, process, and event are abstracted into classes and objects. Objects will be classified according to their relevance to the business process. Additionally, the visualization will use Unified Modeling Language (UML) notation.

Gold-based financial information system design starts with analysis and design of system architecture. The analysis is the stage of defining system requirements, and design is the specification phase. The system architecture is the step that defines the hardware, software, and network components that will be used in the system [11].

2.3 Blockchain

The growth of the e-commerce industry is encouraging efforts to find secure means of online transactions [12]. Satoshi Nakamoto came up with the idea of money and a digital wallet called Bitcoin. Bitcoin is obtained through mining and is a reward for miners who successfully perform hash computations on transaction blocks.

Blockchain is a transaction management technology. Each transaction will be listed in a block. Each block will be interleaved with the next block based on a hash function, so it is called a blockchain [13]. The hash is formed from the time, the block data, and the previous hash. To obtain a hash on a block requires resources independent of each computer node managed by an individual. Each hash has a difficulty (difficulty) and a nonce. The compute node continues to mine how to get the hash that matches the difficulty and nonce. On the other hand, Blockchain processes typically perform the steps listed in Table 1.

Tabel 1. Blockchain Process in General

Use Case	Description
Signing Transaction	The computer on the internal node interacts with the public key pair using the private key. The private key and node address used for the (signature) transaction can be used through the public key stored on the system.
Validation	Signed transactions will be validated before entering the block. At this point, each computer node will perform a hash calculation. The hash found will save the marked transaction in the transaction block
Add to Blockchain	Valid transactions and hashed blocks are entered into the blockchain and broadcast to each computing node.

Consensus is a validator that manages blocks and blockchains. This validator will determine the validity of the hash pattern on the blockchain. There are two types of validators commonly used on blockchains, ProofofWork and ProofofStake [14]. In the proof of work, before entering the transaction block, it will be broadcast to all the computing nodes, and then each node will do mining to get the hash of the transaction block. If one of the nodes has found the hash, another computer node is notified that there is a hash for the transaction block. In addition, the successful computer node will receive a reward [15].

Meanwhile, proof-of-work has a longer processing time than proof-of-stake because proof-of-work involves all computer nodes, and each computer node has different processing capabilities [16]. Then, in Proof of Stake, validating transactions and mining hashes for blocks of transactions involves only the computer nodes (members) that have deposited funds into the system. The system determines the minimum margin value, then the confirmation and

extraction process is the same as for proof of work. In Proof of Stake, the validation and mining process is faster as it involves only a few members [17]. The IT specifications used can be standardized for the efficiency and validity of the process. In addition, the bonus will be adjusted according to the member's deposit amount.

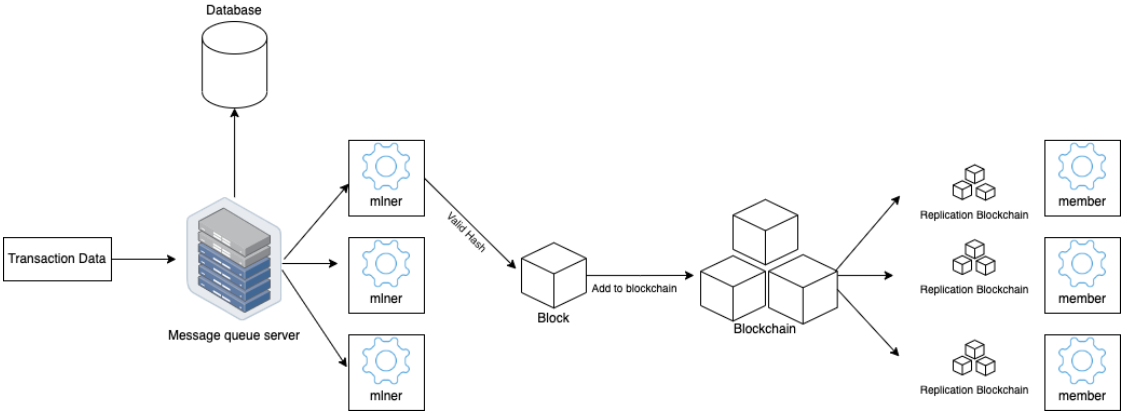

Figure 2. *Consensus Proof-of-Stake*

Depending on the type, blockchain can be divided into 3 (three): Public, Private, and Federated. The public is an open access blockchain. Private is a centrally managed, restricted access blockchain that the organization manages. Federated is an open access blockchain with the limited organization.

2.4 Sharia trade in gold

Since 1973, after the cancellation of the Bretton Wood Agreements in the United States, gold was no longer the base of the dollar, but at that time, almost all the currencies of the world were denominated in the dollar. After the deprecation, the monetary standard was regulated, which resulted in high inflation rates and unstable exchange rates. This story can see the importance of gold to people's finances [18]. Since 1973, after the cancellation of the Bretton Wood Agreements in the United States, gold was no longer the base of the dollar, but at that time, almost all the currencies of the world were denominated in the dollar. Dollars. After the deprecation, the monetary standard was regulated, which resulted in high inflation rates and unstable exchange rates. This story can be seen very clearly the importance of gold to people's finances [19].

Gold-primarily based monetary statistics structures ought to follow relevant sharia principles. Referring to the hadith narrated via way of means of Muslim quantity 2970, "If gold is bartered for gold, silver for silver, best wheat for best wheat, sya'ir wheat for sya'ir wheat, dates for dates, salt for salt, then the quantity ought to be the identical and ought to be cash [20]. Furthermore, cash circulating within the community, whether or not paper, metallic or different materials, should depend on gold. In its application, the characteristic of cash is truly most effective as a medium of trade and is now no longer a commodity that may be traded for profit. The traits of cash are not for consumption. However, they are a vital method for shopping for items to satisfy the desires of human life.

A gold-based financial information system will provide blockchain-confirmed digital currency for each transaction. This digital currency will use the gold standard already stored in the system. The owner of this information system manages gold, and then the data is represented in digital currency (cryptocurrency). The implementation of blockchain on transactions is Shariah-compliant as it supports a future financial system. Blockchain acts as a safeguard against tampering attempts and prevents immutable transactions.

3. Result and Discussion

3.1 System Analysis and Design

At this stage, it is determined what business processes exist following the problems found. The system will use the gold dinar unit. The weight of one dinar is 4.25 grams of gold. Therefore, the system will use digital money based on gold in dinar units. Then, the roles involved in the system include Customers, Agents, and Gold Distributors. Next, this gold-based financial information system's main behaviors (use cases) are shown in Table 2 and Figure 1.

Use Case	Description
Save Gold	The process of converting silver to gold or storing gold is instantaneous.
Gold Transfer	The process of sending a particular value of gold from one customer to another. In addition, this transfer can be used as a payment method.
Claim Gold	This process processes requests for physical gold from customers.
Transaction Validation	This process is performed by the blockchain system. Based on Proof of Stake consensus.
Appointment	This process requires a meeting between the buyer and the seller of gold or in the process of claiming gold.
Authorization	The process of determining access as a transaction validator
View Balance	This process includes viewing the gold balance held by the customer as well as one of the ways to use the e-wallet

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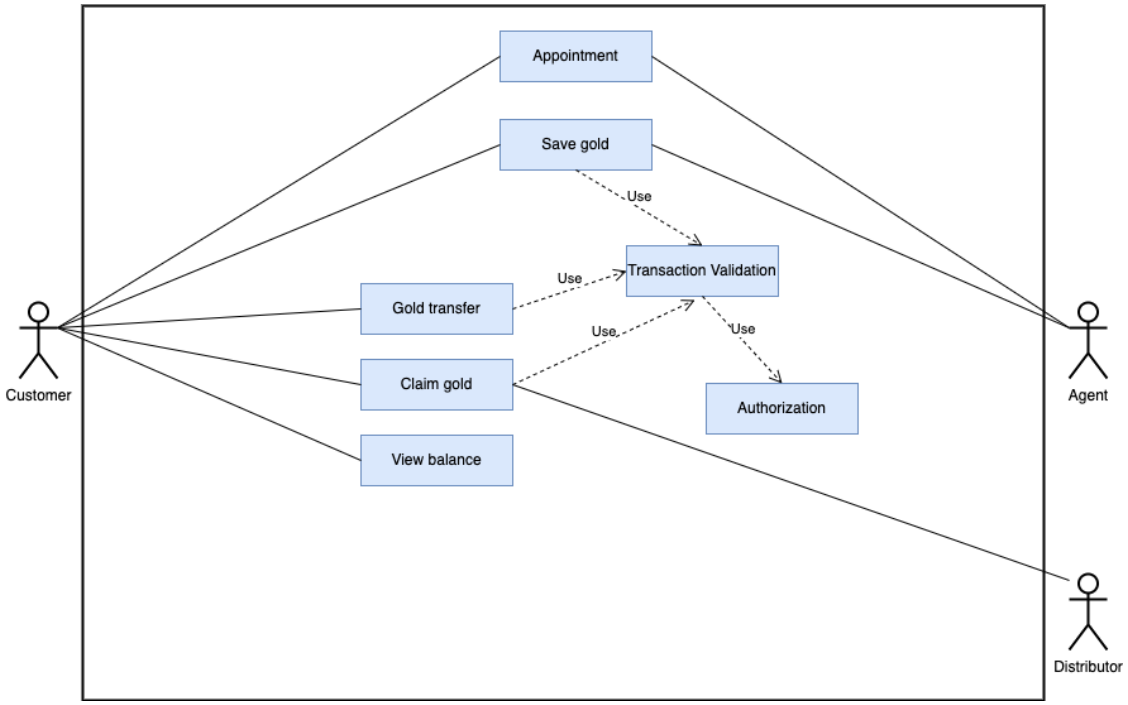

Figure 3. Architectural Diagram of a Gold-Based Financial Information System

Meanwhile, the type of blockchain used is private and uses consensus proof-of-stake. Private means that the members participating in this information system must be registered and each transaction can only be made by the members. The consensus used in this system is proof of stake. Each transaction will be validated by the members, including customers, agents, and distributors; they will be validated and hashed each block of transactions. There must be a repository in the system for the roles that will be validators and enslaved people for this consensus application. This study did not determine what the optimal minimum deposit amount is. This consensus has been chosen for a relatively quick, efficient, and effective process to secure transactions. The transaction management process in the Proof Of Stake blockchain is shown in Figure 3.

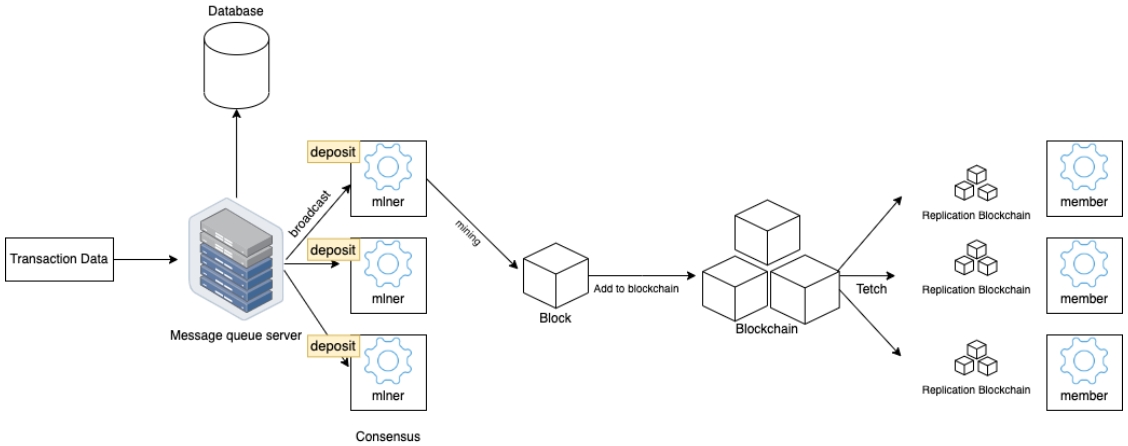

Figure 4. Blockchain with *Consensus Proof-of-Stake*

3.2 System Architecture

At this stage, determine what components are involved in the system, hardware, software, and network. Next, determine the architecture that matches the system requirements defined at the system analysis and design stage. The architecture of this financial information system is shown in Figure 4. A gold-based financial information system that uses blockchain as the backbone of all transaction processes. Blockchain requires hardware such as a workstation or personal computer (PC) with certain specifications to perform calculations when generating a hash for each block in the blockchain. Meanwhile, software that interacts with the user must be in the form of an executable and installed on each computer (workstation).

This software plays a role in promoting the transaction validation process as it calculates the hash value. The speed of the calculation results depends on the specifications of the computer. In addition, it must be connected to the Internet to communicate with the server. This communication aims to get the latest blockchain, publishing hashes, and deposits. Meanwhile, the client software can be accessed through mobile and web apps. The software plays a role in saving gold, transferring gold, claiming gold, and appointments (agreements). Then the server will be divided into three i.e., Message Queuing Server, Consensus Server, and REST API Server. The message queue server will be responsible for broadcasting the message to each validator computer, and the consensus server will be responsible for validating and authorizing the validator. In addition, there are two databases, a database for storing user data and a database for the blockchain and its replication. The clone is only accessible by validators. The REST API server is responsible for managing client transactions, user information, validator gold deposits, and establishing access to the blockchain.

4. Conclusion

The design of this gold-based financial information system will directly address financial regulation, both nationally and internationally. Therefore, realizing this system is always a big challenge. However, this study tries to give hope for better economic order and not harm many parties. It is hoped that this information system design can contribute to the community by educating the importance of gold in trading. This research could be continued by being more specific about the technology that fits the design and architecture of this information system or by studying similar business processes that could use blockchain.

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