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The Legal Perspective of Blockchain's Potential Use For Sharia Banking Institutions In Indonesia

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Abstract

In nowadays era, sharia banking shall face many challenges. Sharia banking shall be able to create innovation and disruption to avoid being eroded by current development. Blockchain is one of the technology disruptions. It may be applicable within the sharia finance industry, including sharia banking, outside its use related to the sale and purchase of the crypto asset. This research discusses how to use blockchain technology for the development of sharia banking, as well as the opportunity and challenges in applying blockchain for sharia banking in Indonesia. It is normative legal research using the descriptive-qualitative data analysis method. This research's secondary data consists of primary legal and secondary legal sources. The former are laws and regulations related to blockchain and sharia banking. The latter are books, academic writings, journals and other primary-source-explanatory documents. The results of this research show that the sharia finance industry, especially banking, can utilize the blockchain such as by using its smart contract for the collection of zakat, improvement of waqf utility, and effective and efficient halal supply chain. Blockchain has opportunities as there have been Financial Supervisory Authority and Bank Indonesia Regulation concerning blockchain in certain area. FSA and BI regulation concerning blockchain in certain area, support of blockchain development manifested in Sharia Economic Masterplan, demographic bonus in Indonesia, the use of smart contract, the use of blockchain for supporting halal supply chain, zakat collection, waqf utility, as well as the security guarantee in minimalizing fraud risk. Among others, the challenges blockchain shall face are, the policy and regulations of blockchain are still limited to only in some sectors such as payment and equity crowdfunding, there is no fatwa from MUI (Indonesian Ulema

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Board) regarding the use of blockchain for sharia economic activities, and the complexity of blockchain.

Keywords

Blockchain; Smart Contract; Islamic Bank.

Introduction

In Indonesia, as of January 2022, there are 12 Islamic Banks and 21 Sharia Business Units (OJK, 2022). The discourse of the merger of Sharia Banks and Sharia Business Units (*Unit Usaha Syariah* hereinafter referred to as UUS) from State-Owned Enterprises (BUMN) is a momentum that has started the intense competition of the Islamic banking industry. Islamic banks and non-state-owned UUSs must be ready to compete no longer with conventional banks, but in the merger of state-owned sharia banks and the financial technology (fintech) industry (Rini, 2020). In 2020, three State-Owned Islamic Banks, PT Bank BRI Syariah Tbk (BRIS), PT Bank BNI Syariah (BNIS), and PT Bank Syariah Mandiri (BSM) conducted merger and established a newly Bank Syariah Indonesia (BSI) as a bigger State-Owned Islamic Bank in Indonesia (Ulfa, 2021). In current industry 4.0. era, it is important for the Islamic banking industry to compete properly in the era of the industrial revolution 4.0. which is full of challenges by always making innovations and disruptions so as not to be eroded by the times.

Disruption is a change that occurs due to the presence of the "future" to the "present". Tomorrow is today and not just an ordinary change (Kasali, 2018: 111). The characteristic of disruption is the existence of technology that allows the presence of new products or services that are cheaper, of better quality, faster, and easier for the public to access (Kasali, 2018: 117). Blockchain is a form of technology disruption. So far, prohibitions or fatwas are haram on cryptocurrency or bitcoin which is a type of service with blockchain technology (Abu-Bakar, 2017; Abubakar et al., 2018). Meanwhile, the presence of blockchain itself does not have a fatwa regulating it.

Fatwa is a legal opinion on a problem that arises among Muslims, issued by a certain person or institution that has the authority to do so (Triyanta, 2014 :5). According to Ibn Qayyim Al Jauziyah in 'Illamul Muwaqqi'in' an Rabb 'Alamin states that fatwas change and differ according to changing times, places, circumstances, intentions, and customs (Jauzyah, 1991). "Islam is founded on simplicity," said El Amri. Prophet Muhammad SAW said, "Religion (Islam) is easy, and whoever makes religion rigid, it will defeat it. So, follow the middle path (in worship); if you cannot do this then do something close to it and give good news and seek help (from Allah) in the morning and evening and part of the night." (Amri & Mohammed, 2019; Saleh et al., 2020).

In addition, El Amri explained, "jurisprudence and fundamentals, we see, three out of the five play rules revolve around simplicity. Harm must be eliminated. Hardship begets facility." (Amri & Mohammed, 2019; Saleh et al., 2020). This remark demonstrates the idea that any rule of law should govern human activities and make things simpler rather than more complicated. In short, as long as it does not contradict other precepts, Islam

accepts any good deed that promotes simplicity. Therefore, whether or not a new technology is accepted in Islam depends on how it is used, provided that it does not conflict with Islamic teachings. Criminals are breaking the law if they employ technology to carry out their crimes. In Islamic law, technology is acceptable as long as it is used responsibly and without harming others. (Saleh et al., 2020).

Islamic finance is already flourishing in many nations, but on a worldwide scale it only represents a tiny portion of trade finance, largely because non-compliant institutions make it difficult to invest in Islamic finance. Therefore, it is expected and timely to assimilate Muslim investors' demand for investment structures that are in accordance with Sharia so that fintech firms will include Islamic finance to take advantage of global trade financing driven by technology and financial markets (Muneeza & Mustapha, 2019). Thomson Reuters forecasts predict that by 2020, Islamic financial assets would reach $3.2 trillion. This demonstrates how Islamic finance has the ability to promote the SDGs by offering creative funding options. Zakat and almsgiving through official organizations, as well as investing in Islamic bonds, can improve outreach, target those in need, and offer more strategic and long-lasting solutions than individual donations. There are, however, certain difficulties, inefficiencies, a lack of transparency, and conflicting opinions among experts over how this should be addressed through ulama rulings or fatwas. (Ningrat, 2018).

In 2017, On November 30, 2017, Bank Indonesia published Regulation Number 19/12/PBI/2017 regarding the Implementation of Financial Technology. The operation of financial technology is divided into several categories, according to article 3 section (1) of this regulation, including "a payment system." The payment system is defined as including permission, clearing, final settlement, and payment execution in the explanation of article 3 paragraph (1) letter a. Blockchain is an example of a financial technology being used in a payment system, such as one used for mobile payments, electronic wallets, and fund transfers. In addition, Financial Services Authority published Regulation Number 37/POJK.04/2018 on Crowdfunding Services through Information Technology-Based Stock Offerings in 2018 (Equity Crowdfunding). The latter regulation was changed by FSA Regulation No. 57 /POJK.04/2020 concerning Crowdfunding Services through Information Technology-Based Securities Offerings (Securities Crowdfunding). Blockchain was briefly discussed by the latest regulation as a fintech-based support service as stated in its elucidation of article 68 section (1).

In practice in Indonesia, Blockchain is originally used in financial transactions involving digital currencies like bitcoin, Ethereum, ripple, and so on. However, because the rupiah is the only currency permitted to be used as a form of payment on Republic of Indonesian territory under Law Number 7 of 2011 Concerning Currency, this coin is regarded as a crypto asset. Apart from being used in financial activities for digital asset transactions, blockchain technology is also used in several other use cases, such as taxation by onlinepajak.co.id (OnlinePajak, 2018). Until January 2020, there were around 400 banks using blockchain technology, including PT Bank Central Asia. This shows that, basically,

blockchain technology is very likely to be used for Islamic economic activities (Joshua, 2020).

However, what is interesting is how blockchain technology can be used to help develop Islamic economic activities. The usage of blockchain will also present a number of adaptation obstacles because it is a relatively new technology, but these difficulties will also present opportunities that could enhance Islamic economic activity. According to the Indonesian Sharia Economic Masterplan for the years 2019–2024, this research is in accordance with the goal of making Indonesia the world's foremost sharia economic hub. The Master Plan describes four main strategies to realize this vision, namely: (i) strengthening the halal value chain; (ii) strengthening Sharia finance; (iii) strengthening micro, small and medium enterprises (UMKM); and (iv) strengthening the digital economy.

It is interesting to examine the potential use of blockchain in the Islamic financial sector, as well as a study of the opportunities and challenges of using blockchain in Islamic banking in Indonesia, by looking at the reality of blockchain technology that can be separated from the paradigm of using cryptocurrencies such as bitcoin. The use of blockchain for the growth of the Islamic financial sector and the advantages and disadvantages of using blockchain in Indonesian Islamic banking are the issues in this study.

Method

This study is normative research to examine Sharia banking industry rules and the potential application of blockchain. Legal primary sources and legal secondary sources make up secondary data. The former includes the Law No. 21 of 2008 concerning Sharia Banking, the Law No. 7 of 2011 concerning Currency, the Ministry of Commerce Regulation No. 99 of 2018 concerning Public Policy of Implementation of Crypto Asset Future Trading, the Financial Services Authority No. 57/POJK.04/2020 concerning Securities Crowdfunding, and the Indonesian Bank Regulation No. 19/12/PBI/2017 concerning the Implementation of Financial Technology. Secondary data are materials that provide context for primary legal sources like books, scholarly articles, earlier research, etc. Then, using logical reasoning patterns and the syllogism method, the legal sources were qualitatively evaluated.

Discussion

1. Blockchain Technology's Application to the Growth of the Islamic Financial Sector

In Islam, *muamalah* is known. *Muamalah* is a concept of intercourse with fellow human beings regardless of ethnicity, race, religion, culture and nation but cannot be separated from the teachings of Islam itself. If worship is a relationship between humans as servants and God as God, it is a vertical relationship that refers to the afterlife, while *muamalah* is a relationship between fellow humans (horizontal with worldly goals). The basic principle of *muamalah* is permissible (permissible), unless there are arguments that

forbid it. However, although *muamalah* is a relationship between humans and is oriented towards world affairs, in Islam it cannot be separated from Islamic law. *Muamalah* with Islamic law is closely related to business activities.

Business activity for Muslims is nothing new (Amalia, 2013: 449). The legal basis for a business relationship is "Allah makes buying and selling legal and forbids usury (Al Baqarah: 275). Qur'an Surat An-Nisa: 29 says O you who believe, do not eat each other's wealth in an immoral way, except by way of commerce that applies conscientiously among you and don't kill yourselves. Indeed, Allah is Most Merciful to you." The primary tenets of Islamic finance include the rejection of interest or usury, the avoidance of uncertainty, the sharing of risks and rewards, the encouragement of moral investments that advance society and do not contravene Qur'anic prohibitions, and the encouragement of tangible assets (Elasrag, 2019). Rami Ahmad lists the following as Islamic finance tenets:

1. Islamic finance is by definition pro-development and a tool for shared prosperity (sharia objectives).
2. Pay attention to social justice and economic inclusivity.
3. Gharar (no guesswork or ambiguity)
4. Managing actual assets
5. Based on open and transparent contracts and risk sharing.
6. Promotes innovation, entrepreneurship, and ethics
7. Solidarity initiatives (Zakat, Waqf, interest-free loans, etc.)
8. Can assist in empowerment (across the chain: before, during and after the subject's economic activity) (Ahmad, 2017)

Essentially, *muamalah* activities include business activities. The fundamental tenet of *mualamah* is that all types of *muamalah* are permissible to do unless there are justifications or Sharia regulations that forbid them (Ali, 2008: 69). The application of blockchain technology to Islamic business operations is a part of *muamalah* activities. Further deep research in regards to its conformity to sharia principle remains an interesting issue for the future research.

A blockchain is a distributed public ledger (public distributed ledger) or peer-to-peer made up of "blocks" that are kept up-to-date by a distributed network of computers and contain numerous records of transactions that are validated *decentralizedly* and without the use of middlemen. (Muneeza & Mustapha, 2019: 71). Each user will have a record of every transaction since the blockchain will connect users without using third party intermediaries. Because the blockchain system can only add transactions, which add new blocks to each user device in the form of various encrypted data, it does not permit changes to transaction data. (Bhiantara, 2018: 173). Because the data it holds has no bearing on how blockchain works. As a result, the blockchain's data storage capabilities and application fields are as diverse and wide-ranging as human endeavor itself. It is therefore hard to give a comprehensive overview of all blockchain applications. Drescher claims that this part offers a number of options for real blockchain

application fields where the blockchain is already being used or may be employed right away: (Elasrag, 2019: 6)

1. Payments: Control possession and exchange of digital fiat money.
2. Cryptocurrency: Controls the development of new digital payment instruments and the ownership of those that already exist, independent of the government, central bank, or other central agency.
3. Micropayments: Sending little sums of money when more typical transfer methods would cost too much.
4. Manage the development, ownership, and transfer of digital commodities that are valuable in and of themselves or that stand in for valuable goods in the physical world.
5. Digital Identification: Uses distinctive digital elements to authenticate and prove identity.
6. Notary services: digitizing, archiving, and attestation of legal papers, contracts, and ownership or transfer evidence.
7. Compliance and Audit: Examining the commercial activity of individuals or groups in the sector that are subject to audit.
8. Tax: Reduce tax dodging or double taxation by calculating and collecting taxes based on transactions or single ownership.
9. Voting: Produce, distribute, and tabulate electronic ballots.
10. Record-keeping: Making and keeping track of medical records.

The use of smart contracts, cloud storage, digital currency, zakat collection, increased use of waqf, effective and efficient halal supply chains, flow Remittance transactions using cryptocurrency and blockchain, Islamic insurance (takaful), and smart sukuk are just a few of the advantages of blockchain that Hussein Elasrag (2019) claims can be used to implement blockchain applications in Islamic financial activities. Three different sorts of blockchains can be distinguished: hybrid, private, and public. Because this kind of blockchain is not particularly owned by either party, it is accessible to everyone utilizing the blockchain network and is known as a public blockchain. As a result, all parties that are a part of this wholly decentralized public blockchain can observe the consensus process in full transparency. Bitcoin, Ethereum, and Litecoin are three examples of public blockchains in use. Private blockchains demand permission to manage anyone who can access or add transaction data on the blockchain, in contrast to public blockchains. Because one entity owns and controls the act of creating a "block" in the blockchain network, consensus or mining algorithms are not necessary in this kind of blockchain. This kind of blockchain can be utilized by certain organizations with a constrained number of nodes and is beneficial for addressing issues with efficiency, security, and fraud. However, "decentralized" use is not possible on private blockchains. The last type of blockchain is a hybrid or also known as a consortium. This blockchain is public but limited only to certain groups. The consensus process is controlled by certain parties which has been agreed upon by the parties as a whole (Elasrag, 2019: 3-4).

On the possible application of blockchain technology in the Islamic banking sector, the following will be discussed.

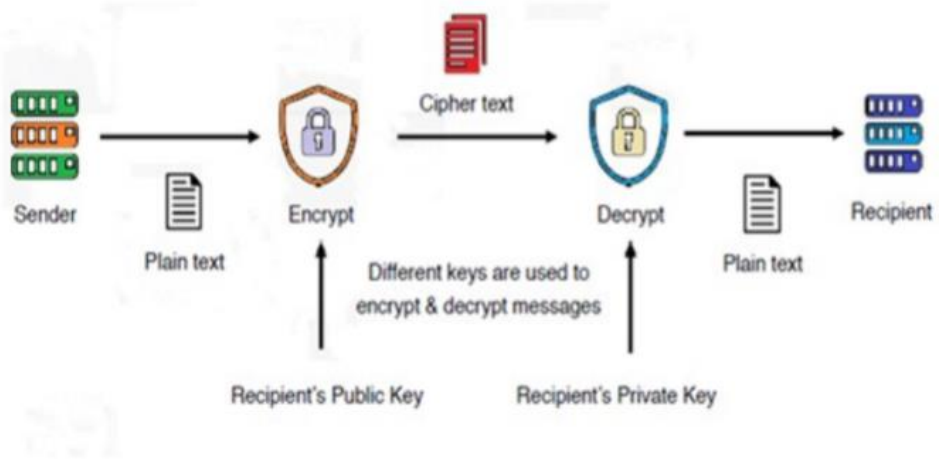
a. **Application of Smart Contracts**

Complex software with components called "smart contracts" is used to automatically execute and settle contracts and agreements. For instance, if two or more parties concur on the agreement's terms, they will cryptographically sign the smart contract and publish it as a distributed book. When the conditions required in a process code are met, the program will automatically trigger an adjustment. In this case, the smart contract will reduce the need to include humans. Thus, the use of smart contracts can be beneficial in terms of time efficiency and economy and has the potential to reduce errors, misunderstandings, delays or disputes.

Smart contracts can be a positive step in the Islamic financial sector to guarantee that the offerings of Sharia financial service providers are implemented in compliance with Sharia standards. In addition, smart contracts can also reduce uncertainty and speculation in a contract. Forms of contracts that can be applied by using blockchain such as production sharing contracts, agency agreements, and cooperation contracts. At the very least, a smart contract can function as a "multi-signature" account so funding is used only when a certain percentage of party approval is required, manages agreements between users, provides utilities on other contracts, stores information about applications such as domain registration information or membership records (Elasrag, 2019: 10).

Although at first, the use of smart contracts was first pioneered by bitcoin by utilizing the blockchain network to make transactions to one or more people. However, in essence, bitcoin is limited to the use of cryptocurrencies. During its development, there are new providers such as Ethereum which allow the use of blockchain such as the use of a computer language called Turing-complete which allows each developer to create their own program. So, through Ethereum, a specific developer or institution can create their own smart contract program (Elasrag, 2019). Another provider that can be said to be a trendsetter in blockchain activities for Islamic finance is Algorand. On 21 October 2019, the Algorand Foundation announced that the company's blockchain platform had been certified for Sharia compliant financing. Islamic institutions can now begin conducting financial transactions on the Algorand proof-of-stake blockchain. However, any decentralized application developed on Algorand must be assessed separately and certified for compliance (Cant, 2019).

Public key infrastructure is used in blockchain-based smart contracts to decode the terms and conditions of the contract. Public keys and private keys are the two different types of keys. To safeguard and secure the data, the sender will first send a plain text message, which is then encrypted to create a cipher text—a text that cannot be read directly—in the form of an algorithm or mathematical formula. The encrypted text can only be decrypted by the receiver who also has the secret key (Elasrag, 2019: 11).



Source : Elasrag

The advantages of blockchain technology are supported by smart contracts. Smart cotract transactions can create ownership and asset records and these transactions are irreversible and traceable. According to Lawrence (2017), Islamic banking can be revolutionized and service costs can be reduced by up to 95% by using smart contracts in place of financial contracts. Contributing to social objectives is one facet of Islamic finance and banking. Typically, contributors delegate this responsibility to Islamic Finance and Banking organizations, giving them the authority to transfer Shariah-compliant contributions for charitable causes on their behalf. The agency hypothesis makes the supposition that financial and banking actors work to optimize their pay and wellbeing. The monitoring and regulating procedure, however, can be simplified by merely writing a smart contract, according to Lacasse, who also claims that a smart contract can be a beneficial instrument in all financial transactions (Rabbani et al., 2020).

b. **Adaptation of Blockchain Technology for Zakat Collection**

The use of blockchain can then be used to collect zakat. Blockchain can help people to know the distribution of zakat. Some of the challenges that often occur in traditional zakat collection methods are, inefficiency, lack of transparency regarding how zakat is collected, managed and distributed (Noordin, 2018). By using the blockchain system, this problem can be minimized because it makes the process of collecting, managing and distributing zakat trackable, audited and most importantly having immunity to all forms of data changes (Elasrag, 2019: 14).

c. **Adaptation of Blockchain Technology for Improving Waqf Utilities**

Blockchain can also be utilized to increase the utility of waqf. One of the companies implementing blockchain for waqf management is Finterra. Finterra is a brand-new business that just revealed plans to build a platform for crowdfunding that leverages blockchain to generate smart contracts for certain waqf projects. It is envisaged that this will offer a more effective means to administer and transfer waqf ownership as well as raise funds. The waqf-chain allows members to grow and strengthen the waqf's properties through project proposals. By contributing money, others can get engaged in

this project proposal. The project proposal will be approved if the project's goals are achieved, after which a certain number of waqf tokens will be created and given to the participating funders. The Inter-Chain Protocol allows for the transfer and exchange of tokens within the larger Finterra ecosystem (as well as in other networks) and for the storage of tokens for stakeholder rights and revenue sharing (Elasrag, 2019: 15).

d. Blockchain technology to create an effective and efficient halal supply chain

Blockchain may be the best approach to offer precise information about a profitable and effective halal supply chain, in addition to the benefits outlined above. The halal supply chain will become more sustainable, consumer confidence in halal brands will increase, and halal products will be more widely recognized globally. This will increase trust in the halal supply chain from the point of production to the point of consumer purchase. Halal blockchain offers a number of advantages for manufacturers, brand owners, retailers, logistics service providers, distributors, and halal certification agencies to increase trust and authenticity (Elasrag, 2019; Tieman & Darun, 2017)

In the supply chain, sensors and intelligent packaging might be created to relay data to the blockchain fast for halal product tracking. In addition, environmental information, such as location and unique controls, can be kept on the blockchain system. Research from Universiti Malaysia Pahang in Kuantan demonstrates that the halal supply chain contains underlying issues or flaws, namely in (1) controlling product recalls and traceability (ability to confirm product location); (2) conformity with halal criteria of transportation and warehousing (storage) downstream of the supply chain; (3) End-to-end (unbroken) chain integrity, from the point of origin to the consumer's point of purchase; (4) various halal interpretations and systems in various markets; and (5) The IT infrastructure has not yet been fully integrated. These problems necessitate a fundamentally different method of structuring the halal supply chain. Blockchain technology for the halal business has the potential to address all of the aforementioned issues. (Tieman & Darun, 2017). An example of using blockchain for the halal supply chain can be seen in the following illustration regarding halal food products.

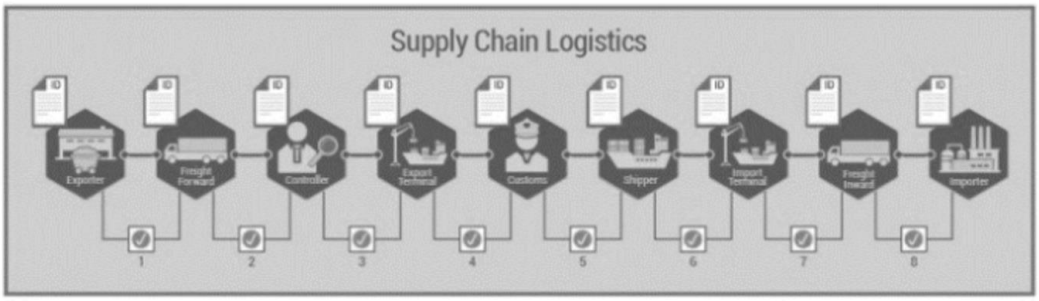
1. Halal food producers upload product details along with the certification cations from their respective publishing authorities to the blockchain platform, such as Halalticate;
2. The platform uses product descriptions and Halal descriptions in its blockchain database to register things and create an immutable digital footprint. The unique ID for a product, batch, or category in various formats (alphanumeric code, secure pattern, QR code, barcode, or short link) will be the digital footprint; (Tieman & Darun, 2017: 548)
3. The producer labels the goods with the Unique ID and starts shipping.

On the basis of Rana and Akinlaso Contrarily, Halal customers will use the procedures outlined below to confirm the product's legitimacy before they purchase it (Elasrag, 2019; Rana & Akinlaso, 2018) :

1. Customers are looking for a unique (Halal) product ID;

2. Using a mobile device and SMS, QR scan, or NFC capabilities, customers provide at least one distinct ID to the Halalticate platform for location verification;
3. Customers obtain real-time product reports and audit trails (with detailed product descriptions and halal information).

In relation to blockchain applications in Islamic banking, blockchain for the halal supply chain will be very useful to support banks in developing the real sector as a place for channeling third party funds. Figure 2 shows an example of supply chain management. The use of blockchain can be used to ensure the halalness of products in the real sector in each process.



Source: Arief, L., & Sundara, T. A.,2017.

2. Opportunities and Challenges of Blockchain Use in Islamic Banking in Indonesia

Sharia banking is a banking industry alternative made available to the Muslim population, particularly for those seeking Sharia-based banking services. Sharia Banking is defined as everything that is related to sharia banks and Sharia Business Units, including institutions, business activities, as well as methods and processes for carrying out their business activities, according to Article 1 Number 1 of Act Number 21 of 2008 concerning Sharia Banking. According to article 2, Sharia banking shall base its operations on Sharia principles, economic democracy, and prudential principles. In accordance with article 1 point 12, Sharia principles are the tenets of Islamic law applied to banking activities based on fatwas given by organizations with the power to decide on such fatwas. The Indonesian Ulema Council is now the organization with the power to issue fatwas. The fundamental tenets of Islamic banking are that it must be free of interest (usury), speculative activities that are not productive, such as gambling (maysir), items that are unclear and dubious (gharar), assets that are damaged or invalid (invalid), and only finance legal economic activity.

The use of blockchain technology for Islamic banking activities is possible as long as it meets the principles described previously. So, in its implementation, blockchain will face various opportunities and challenges. One of the concepts and global realities that can be applied to such opportunities as well as unique problems for businesses and governments is blockchain technology. Locally and internationally, the acceptability of such a novel concept or solution within the Islamic finance sector is expanding quickly. However, in order to achieve this, there needs to be a strong push from national and

local authorities, as well as strong international cooperation. This is done to ensure that a stronger, more responsible end-to-end Shariah compliance is built, which promotes better industry stability and growth (Muneeza & Mustapha, 2019: 70).

With the use of blockchain technology, it is now possible to record the values of assets and currencies through a digitally decentralized ledger in addition to creating cryptocurrencies like bitcoin. According to Akram Laldin, the inherent disclosure, transparency, and greater trust in transfers and exchange transactions provided by blockchain might be deemed very useful in that regard as a requirement of Sharia. Blockchain can be used to enforce the terms of trade in real-world currency and/or commodity transactions (Muneeza & Mustapha, 2019: 77). Table 1 shows the disparities between banks using blockchain technology and banks using traditional technology in the banking sector.

Table 1: The difference between conventional banking activities, internet-based finance, and the combination of blockchain with banks

	Traditional banking businesses	Internet finance businesses (FinTech 1.0)	Blockchain + banks (FinTech 2.0)
Customer experience	Uniform scenarios	Rich scenarios	Rich scenarios
	Homogenous service	Personalized service	Personalized service
	Poor customer experience	Good customer experience	Good customer experience
Efficiency	Many intermediate links	Many intermediate links	Point-to-point transmission, disintermediation
	Complex clearing process	Complex clearing process	Distributed ledger, transaction = clearing
	Low efficiency	Low efficiency	High efficiency
Cost	Large amount of manual inspection	Small amount of manual inspection	Completely automated
	Many intermediate links	Many intermediate links	Disintermediation
	High costs	High costs	Low costs
Safety	Centralized data storage Can be tampered	Centralized data storage Can be tampered	Distributed data storage Cannot be tampered
	Easy to leak users' personal information	Easy to leak users' personal information	Use of asymmetric encryption, Users' personal information is more secure
	Poor safety	Poor safety	Good safety

Source : (Guo & Liang, 2016: 6)

Interbank payments frequently depend on processing by intermediary clearing firms. These firms use a sophisticated range of procedures, such as bookkeeping, transaction reconciliation, balance reconciliation, payment initiation, etc. As a result, the procedure is time-consuming and costly. Taking cross-border payments as an example, remittances took over 3 days to arrive because the clearing processes for each nation varies. This points to a very high amount of occupied funds and bad efficiency. Blockchain technology can also be used to implement point-to-point payments, removing the need for intermediary ties with outside financial institutions. This will significantly increase service effectiveness and lower bank transaction costs.

Additionally, it gives banks the ability to provide a quick and convenient payment clearing service for international business transactions (Guo & Liang, 2016).

Several financial institutions are currently beginning to test transactions on the blockchain network. For its first cross-border transaction, Standard Chartered employs Ripple, an enterprise-grade blockchain technology. For instance, the platform completed the settlement process in 10 seconds as opposed to the 2 days it currently takes the banking system and network to do so. The National Australia Bank (NAB) has also successfully transferred $10 from a worker account at NAB to a different worker account at the Canadian Imperial Bank of Commerce using the Ripple ledger technology. Additionally, it requires 10 seconds (Guo & Liang, 2016).

Additionally, the inefficiency of bank credit information systems is primarily the result of the following factors: first, a lack of data and poor data quality make it challenging to evaluate an individual's credit situation; second, data sharing between agencies is challenging; and third, it is unclear who owns user data, making it challenging to distribute due to privacy and security concerns. Although many different parties will need to work together and participate in finding a solution to this issue, blockchain technology can help in some ways. Regarding data ownership, every person creates a sizable amount of data online, which is quite useful as proof of their credit condition. Major Internet providers now hold a monopoly on this data, though. Individuals are unable to claim ownership of or use of this data. Additionally, data flow between these businesses is challenging to achieve in order to maintain user privacy, which results in the creation of data islands. Data encryption is a capability of blockchain technology, which can help us manage our vast data and create ownership. This also lowers the cost of data collection for credit institutions while ensuring the accuracy and reliability of the information (Guo & Liang, 2016).

Big data containing blockchain technology can serve as a source of credit with unambiguous personal ownership and perhaps lay the groundwork for a new credit system in the future. In addition to keeping and sharing an encrypted version of the customer's credit status within the institution, promoting blockchain data sharing can help credit agencies automatically record huge data. This makes credit information transferable. Blockchain credit solutions include the following: Banks must first save customer data in their own databases as part of the know your customer (KYC) procedure before using encryption technology to transfer data summaries for storage on the blockchain. The blockchain can be used to notify the original data provider when a query is made and then the query can be executed. In order to avoid leaking their key business data, all parties can search for external big data. (Guo & Liang, 2016).

The provision of incorrect information that could deceive their partners can be avoided thanks to encryption technology, which can verify that the summary and the real material are consistent. Blockchain has the ability to provide encryption and automated exchange of client information and transaction records within the legal framework of data protection for customers. This reduces the need for duplicative KYC

effort between institutions. Financial transactions with distributed innovation Paper-based transactions and manual inspection are prevalent in supply chain financing. Additionally, the procedure includes a lot of middlemen, a significant potential for unlawful transactions, high costs, and poor efficiency. Blockchain technology uses smart contracts to digitize highly document-dependent processes, greatly reducing the need for manual intervention. This will lower manual operational hazards and significantly increase the supply chain's financial efficiency (Guo & Liang, 2016).

Smart contracts can make sure that payments are delivered automatically after they are determined ahead of time and outcomes are achieved through the use of suppliers, purchasers, and banks as the primary trading parties and the sharing of contractual information on a decentralized distributed ledger. For banks and trade finance firms, the use of blockchain technology in supply chain finance can result in cost savings. McKinsey estimates that blockchain technology will enable banks to cut operating costs by USD 13.5–15 billion annually and risk costs by USD 1.1–1.6 billion annually. Additionally, the two parties will be able to lower operational costs by USD 1.6-2.1 billion and capital costs by USD 1.1-1.3 billion annually (Guo & Liang, 2016).

Furthermore, increased transaction efficiency guarantees a smoother operation of the trade finance channel as a whole, significantly raising the total revenue of the trade chain. The first trading transaction using a blockchain was conducted by Barclays Bank and an Israeli firm. This agreement ensures that the Irish company Ornua will be able to export cheese and butter goods to the Seychelles Trading Company for about USD 100,000. The exchanges take place on a platform created by Wave, a business partner of Barclays Bank. The transaction procedure, which typically takes 7–10 days, is substantially sped up to 4 hours using blockchain technology. A distributed ledger will also be used by UBS to create a trade finance system that will make international import and export operations simpler. In today's huge transactions, the buyer's bank can utilize a letter of credit to remove the seller's credit risk while the merchandise is still in route. Letters of credit can weigh up to 500 grams and contain 36 documents, which take 7 days to process and present additional dangers. In contrast, blockchain technology can be used to incorporate this process into smart contracts, speeding up letter of credit processing to just one hour while lowering operational risk (Guo & Liang, 2016).

The advantages of blockchain technology are supported by smart contracts. Smart cotract transactions can create ownership and asset records and these transactions are irreversible and traceable. According to Lawrence (2017), Islamic banking can be revolutionized and service costs can be reduced by up to 95% by using smart contracts in place of financial contracts. Contributing to social objectives is one facet of Islamic finance and banking. Typically, contributors delegate this responsibility to Islamic Finance and Banking organizations, giving them the authority to transfer Shariah-compliant contributions for charitable causes on their behalf. The agency hypothesis makes the supposition that financial and banking actors work to optimize their pay and wellbeing. However, the creation of a smart contract can serve as a helpful instrument

for all financial activities, simplifying the monitoring and regulatory procedure (Rabbani et al., 2020).

Financial transactions can be streamlined with blockchain technology. According to some estimates, financial institutions may save at least $ 20 billion on cross-border transfers, regulations, and settlement expenses. Although it is not an easy undertaking, integrating blockchain with current financial systems is possible. With the use of third party software, efforts have been undertaken to combine blockchain with already-existing digital solutions. This may signal a change in strategy for the application of blockchain technology to Islamic banking and Shariah-compliant financial services (Rabbani et al., 2020).

In order to develop a platform based on the R3 enterprise blockchain platform Corda, Dubai-based fintech business Wethaq teamed up with R3, a provider of corporate software, in August. Sukuk securities, Islamic financial certificates akin to bonds, will be issued and traded on the platform. Stellar's capabilities and applications were studied by SRB, which then published a manual allowing Islamic financial institutions to adopt Stellar technology. Al Hilal Bank, based in Dubai, executed its first Sukuk deal using blockchain technology in November 2018. To sell and settle in the secondary market a portion of its $500 million five-year sukuk, the bank uses distributed ledger technology (Cant, 2019).

The key characteristics of Blockchain are that it is an autonomous process, a peer-to-peer transaction system, and is built on a fully distributed system (AI). Islamic banking focuses on enforcing the proper behavior, and blockchain focuses on "coding" such behavior into a full AI system, which will then make sure that the behavior is followed autonomously, free from further interference from outside parties. The platform then transforms into one that is "self-enforcing," "self-regulating," "self-correcting," and "self-enforcing" (Elasrag, 2019: 8). However, Blockchain in Islamic finance has some difficulties. For the advancement of blockchain, these include technological, business/market, legal/regulatory, and behavioral/educational difficulties. Scalability (technical), innovation (commercial), trusting networks (behavior), and contemporary regulation are a few of the most significant obstacles (law). A crucial skill that needs to be developed is the ability to weigh tradeoffs and make sensible decisions when it comes to databases and blockchain. This begins with having a clear awareness of the advantages and disadvantages of each strategy. Part of the magic that needs to be continually sought after is striking the correct mix between blockchain-specific knowledge and merging the advantages acquired with an existing back-end database or application (Elasrag, 2019).

The advantages and disadvantages of implementing blockchain in Islamic banking can be mapped based on a number of factors, in addition to the potential and difficulties already mentioned, namely: (i) aspects of policy and regulation (law); (ii) Human resources; (iii) scalability and infrastructure; (iv) innovation; (v) behavior; (vi) security as in Table 2 below.

Table 2. Opportunities and Challenges of Using Blockchain Technology in Islamic Banking in Indonesia

Aspect	Opportunity	Challenge
Policies and Regulations	1. The Financial Services Authority Regulation Number 57/POJK.04/2020 concerning Crowdfunding Services through Information Technology-Based Securities Offerings (Securities Crowdfunding) and the Bank Indonesia Regulation Number 19/12 / PBI / 2017 concerning the Implementation of Financial Technology both have a legal foundation and address the use of blockchain in the payment and equity crowdfunding sectors. 2. There is support for the implementation of blockchain use, especially in the strategy of creating an ecosystem that is conducive to the adoption and implementation of Industry 4.0 technology for industry and MSMEs and Facilitate capital-based financing by providing marketplace stock investment based on advanced technology as manifested in the Indonesian Sharia Economy Master Plan 2019-2024	1. The existing regulatory policies regarding blockchain are still limited to several areas, namely payment and equity crowdfunding. 2. The Indonesian Ulema Council has not issued an official fatwa addressing the use of blockchain in the operations of the Islamic financial sector.
Human Resources	1. The bulk of the population in Indonesia is Muslim, and according to the BPS estimate, by the year 2035, approximately 70% of Indonesia's population will be of working age. 2. Academics and practitioners in the field of Islamic economics and technology are being produced by	The majority of people struggle with technology's growing complexity, especially when a complicated underpinning technology like blockchain is involved.

	an increasing number of educational institutions.	
Business Innovation	1. The use of smart contracts is very possible to be adapted to Islamic banking 2. Blockchain technology is possible to be applied to the payment system in Islamic banking 3. Activities involving the collection, management, and distribution of zakat as well as enhancing the usefulness of waqf can be done using blockchain technology. 4. The use of blockchain can support an effective and efficient halal supply chain that can support Islamic banking in the real sector	The use of blockchain, which is often associated with crypto currencies, makes blockchain not enough to get the trust of the public, especially users of Islamic banking services. In this case, further research is needed regarding the potential for creating digital fiat currencies, such as the digital rupiah currency, so as to allow blockchain to be implemented without reducing the rules regarding fiat currencies in Indonesia.
Behavior	The establishment of a new paradigm in society and the desire to follow religious dictates have caused the halal industry to expand beyond the food industry to include the fashion, travel, pharmaceutical, cosmetic, and financial industries.	The use of blockchain, which is still related to crypto assets, is still the basis for the lack of trust in transactions using blockchain.
Security	Because records that have been entered into the blockchain cannot be modified or tampered with once the data has been recorded, blockchain offers a reasonably solid assurance of security. There is very little chance of being duped.	There is no legislative protection, and people are still unaware of how crucial transaction data and personal data security are.

Conclusion

It is possible to adapt blockchain technology for usage in the Islamic finance sector. Smart contract adaptation, zakat collection, expanding waqf use, and a productive and efficient halal supply chain are a few examples of applications for utilization. Even though a blockchain is a distributed ledger, a business or organization can set one up privately or using a hybrid system, limiting the number of people who can participate in transactions.

The use of blockchain technology in Indonesian Islamic banking is a possibility. The Sharia Economic Master Plan 2019–2024 expresses support for the use of blockchain technology, Indonesia receives a demographic bonus, the use of smart contracts is very helpful to reduce costs, the use of blockchain that can support the halal supply chain, zakat collection, the use of waqf, and blockchain can provide a platform for Islamic banking, among other opportunities for blockchain technology applications. The challenges faced are the existing regulations and policies that are still limited to the payment system and equity crowdfunding, there is no fatwa from the Indonesian Ulema Council regarding the provisions for the use of blockchain technology for Islamic economic activities, the complexity of using blockchain, there is no clear legal umbrella regarding data security issues.

Based on the description above, on the use of blockchain to grow the Islamic banking sector, more study is required. In addition, a regulatory product that specifically regulates the use of the blockchain system in Islamic economic activities is needed, especially Islamic banking, which should be supported by a fatwa from the Indonesian Ulema Council regarding the use of the blockchain. The policies and fatwas from the MUI will be able to foster a sense of public trust in blockchain beyond its use with crypto assets. Additionally, this can aid in the growth of the Sharia economy, including assisting in the realization of the 2019–2024 Sharia Economic Master Plan's objective of an autonomous, prosperous, and civilized Indonesia by making Indonesia the world's foremost sharia economic center.

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