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Blockchain-Based Digital Transaction Security System: Perspective of Imam al-Shāṭibi's Maqāṣid al-Sharī'ah Concept

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Keywords:
Blockchain; Imam al-Shāṭibi; Maqāṣid al-Shari'ah.

Abstract.
Blockchain is a technological advancement that does not yet have regulatory certainty, especially regarding taxation and its use in certain domains does not fulfill *shari'ah* provisions. This research is a literature study that explain the benefits of blockchain technology when applied in the Islamic economic sector and analyses it based on *maqāṣid al-sharī'ah* according to Imam al-Shāṭibi. The method implemented: normative law with a statutory and conceptual approach. Data collection is done through literature research and documentation. This research analyses that the benefits of using blockchain technology in Islamic economics provides various significant advantages for human welfare, so it is considered *maṣlahah*. Applying this technology to economic activities is a form of *jalbu al-maṣālih*. Blockchain technology increases the operational ease of digital transactions and provides vigorous wealth protection through tokens generated from digitizing tangible assets. The blockchain application in digital transactions is a form of *dar'u al-mafāsid*. Analysed from the perspective of Imam al-Shāṭibi's *maqāṣid al-sharī'ah*, the blockchain technology efficiency and security for data and information in the digital transaction ledger are included as *ḥājiyyah* needs. Its use that facilitates cryptocurrency transactions is highlighted as haram because of its destruction of religion due to its prohibition. The protection afforded to real-world asset tokens and their overall usefulness elevates this technology's status as a *ḍarūriyyah min jānibi al-'adam* (protection of primary needs from absence).

Kata Kunci:
Blockchain; Imam al-Shāṭibi; Maqāṣid al-Shari'ah.

Abstrak.
Blockchain merupakan kemajuan teknologi yang belum memiliki kepastian regulasi, khususnya terkait perpajakan dan penggunaannya di ranah tertentu belum memenuhi ketentuan syariah. Penelitian ini merupakan studi kepustakaan yang menjelaskan manfaat teknologi *blockchain* ketika diaplikasikan dalam sektor ekonomi syariah, dan menganalisisnya berdasarkan *maqāṣid al-sharī'ah* menurut Imam al-Shāṭibi. Metode yang diterapkan: hukum normatif dengan pendekatan perundang-undangan dan konseptual *uṣūl al-Fiqh*. Pengumpulan data dilakukan melalui metode riset kepustakaan dan dokumentasi. Penelitian ini mengemukakan manfaat-maslahat penggunaan teknologi *blockchain* dalam ekonomi syariah memberikan berbagai keuntungan signifikan untuk kesejahteraan manusia. Ini termasuk kemaslahatan. Menerapkan teknologi ini pada aktivitas ekonomi merupakan bentuk *jalbu al-maṣālih*. Teknologi *blockchain* meningkatkan kemudahan operasional transaksi digital dan memberikan perlindungan kuat terhadap harta kekayaan dalam bentuk token yang merupakan hasil digitalisasi aset riil. Aplikasi *blockchain* dalam transaksi digital merupakan bentuk *daf'u al-mafāsid*. Berbasis analisis dalam perspektif *maqāṣid al-sharī'ah* Imam al-Shāṭibi, efisiensi dan keamanan dari teknologi *blockchain* terhadap data dan informasi dalam buku besar transaksi digital termasuk sebagai kebutuhan *ḥājiyyah*. Penggunaannya memfasilitasi transaksi *cryptocurrency* disoroti sebagai transaksi yang haram. Perlindungannya terhadap token aset nyata serta kemanfaatannya secara keseluruhan mengangkat status teknologi ini sebagai kebutuhan *ḍarūriyyah min jānibi al-'adam* (aspek menolak kerusakan).

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INTRODUCTION

In the era of society 5.0, human civilization is increasingly intensive in technological innovation. One of the latest technological developments that has skyrocketed today is digital currency transactions or the famous cryptocurrency with its blockchain technology.[1] Blockchain is one of the answers to several fintech that are skyrocketing, primarily because of its relationship with cryptocurrency.[2] Blockchain technology is the basis of all cryptocurrencies and has been widely used even in the more traditional financial industry. It also opens the door to new applications, such as smart contracts.[3]

Blockchain is one of the disruptive technologies. It can create significant changes and has the potential to change the way people do business.[4] The financial industry is a primary adopter of the blockchain concept driven by the substantial process inefficiencies of the systems used so far and the vast cost problem, specifically in this industry.[5]

An effort of digitization and disruptive technology tends to threaten risk. The application of the blockchain system to the Islamic economic industry needs to be given attention as it is related to its compliance with *shari'ah* because it is commonly used for digital currency transactions such as Bitcoin and the like. This shows a tendency to use it for transactions that are still prohibited in Islam, as it is based on research by Ausop et al. Bitcoin transactions contain *maysir* (gambling) and *gharar* (uncertainty).[6]

Some other risks are related to privacy vulnerabilities, where an activity carried out online has a high threat of breach or hacking of both personal and public information. On the other hand, regulations in Indonesia still need to be more robust to protect the use of this technology, especially in the economic industry. Research related to blockchain implementation in the Islamic economy is essential to answer the challenges of human life caused by technological developments while remaining in line with *shari'ah* principles.[7] In this research, the object will be studied with Imam al-Shāṭibi's theory of *maqāṣid al-sharī'ah* (purposes of the *shari'ah*). Some people agree that Imam al-Shāṭibi is the pioneer of *maqāṣid al-sharī'ah* (purposes of the *shari'ah*) conceptions, so he is called the Father of Maqāṣid.

Imam al-Shāṭibi, in his work al-Muwāfaqāt fi Uṣūli al-Sharī'ah, has built the foundation of this study strongly and systematically. He established an essential correlation between *maqāṣid al-sharī'ah* (purposes of the *shari'ah*) and *istinbāṭ* (the decision-making processes based on existing Qur'an and hadith evidence). Therefore, many Muslim scholars refer to his

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[1] Eikoh Chida, Masahiro Mambo, and Hiroki Shizuya, "Digital Money-A Survey," *Interdisciplinary Information Sciences* 7, no. 2 (2001): 135, https://doi.org/10.4036/iis.2001.135.

[2] Daffa Eka Septianda, Sitti Fatimah Khairunnisa, and Rachma Indrarini, "Blockchain Dalam Ekonomi Islam," *Sibatik Journal* 1, no. 11 (2022): 2630, https://doi.org/10.54443/sibatik.v1i11.407.

[3] Massimo Di Pierro, "What Is the Blockchain?," *Computing in Science & Engineering and the IEEE CS and the AIP*, October 2017, 92, https://doi.org/10.1109/MCSE.2017.3421554.

[4] Heribertus Yulianton et al., "Implementasi Sederhana Blockchain," *Prosding SINTAK* 2 (2018): 306.

[5] Michael Nofer et al., "Blockchain," *Bus Inf Syst Eng* 59, no. 3 (March 20, 2017): 183, https://doi.org/10.1007/s12599-017-0467-3.

[6] Asep Zaenal Ausop and Elsa Silvia Nur Aulia, "Teknologi Cryptocurrency Bitcoin Untuk Investasi Dan Transaksi Bisnis Menurut Syariat Islam," *Jurnal Sosioteknologi* 17, no. 1 (April 2018): 89, https://doi.org/10.5614/sostek.itbj.2018.17.1.8.

[7] Wepo, "Teknologi Blockchain Dan Keuangan Islam: Potensi Dan Tantangan," September 11, 2023, https://an-nur.ac.id/esy/teknologi-blockchain-dan-keuangan-islam-potensi-dan-tantangan.html.

works when making Islamic legal decisions.[8] The *maqāṣid al-sharī'ah* (purposes of the *shari'ah*) theory has become a significant theory in Islamic research and a fundamental research paradigm that should not be underestimated, reinforced by societal and sociological realities that show that every individual and group has the drive to achieve social and economic benefits and security.

As a responsible individual in religious life, it is imperative to ensure that humanity can flourish and properly apply the values of expediency.[9] Research into blockchain remains to be done because there is no evidence either validating its kosherness or forbidding it, so everything still needs to be discussed and studied. In addition, eliminating all potential threats, both to individuals and others, is an action that is recommended according to *shari'ah*.[10]

Research by Rina Candra Noorsanti et al. explains the implementation of blockchain technology in various industries.[11] Daffa Eka Septianda, et al. explained the potential location of blockchain applications in the Islamic economy.[12] Muhammad Bahanan explained the influence of blockchain on Islamic banking.[13] Based on previous studies, researchers focus on the implementation of blockchain in the Islamic economic industry from the perspective of *maqāṣid al-sharī'ah* (purposes of the *shari'ah*) formulated by Imam al-Shāṭibi.

Some issues that can be identified from the impact of the implementation of blockchain technology in the Islamic economic industry are related to privacy security. The vulnerability of privacy data protection still haunts the digitisation of information. Some uses of blockchain also facilitate transactions, which previous research has declared haram (forbidden). Therefore, the benefits power or *maslahah* (expediency) offered by blockchain technology, especially for the Islamic economic industry, still need to be measurable.

Thus, the researcher limits the discussion to the study of the advantages and disadvantages that blockchain can cause from its implementation in digital transactions in the Islamic economic industry, as well as analysing its benefits in terms of the concept of *maqāṣid al-sharī'ah* (purposes of the *shari'ah*) according to Imam al-Shāṭibi.

RESEARCH METHODS

The method applied is normative legal research, qualitative in nature, using a statute approach and conceptual approach. Data collection is done through literature study and documentation methods. After collecting the data, the information is processed and organised as narrative descriptions with inductive mindset analysis. This mindset takes a

[8] Al Ikhlas et al., "The Concept of Maqasid Al-Shariah As an Instruments of Ijtihad According to Imam al-Shatibi in al-Muwafaqat Fi Ushuli al-Shariah," *Media Syariah: Wahana Kajian Hukum Islam Dan Pranata Sosial* 23, no. 2 (2021): 207, https://doi.org/10.22373/jms.v23i2.10138.

[9] Dimyati, Moh. Imron Rosyadi, and Achmad Fageh, "Smart Sukuk Berbasis Blockchain Tinjauan Maqasid Syariah Al-Najjar," *JIEI: Jurnal Ilmiah Ekonomi Islam* 9, no. 3 (2023): 4145–46, https://doi.org/10.29040/jiei.v9i3.10409.

[10] Abdul Haq, Ahmad Mubarok, and Agus Ro'uf, *Formulasi Nalar Fiqh: Telaah Kaidah Fiqh Konseptual*, Buku Satu (Surabaya: Khalista Surabaya and Kaki Lima Lirboyo, 2009), 211.

[11] Rina Candra Noorsanti, Heribertus Yulianton, and Kristophorus Hadiono, "Blockchain - Teknologi Mata Uang Kripto (Crypto Currency)," *Prosiding Sendi_U*, 2018, 306.

[12] Septianda, Khairunnisa, and Indrarini, "Blockchain Dalam Ekonomi Islam," 2629.

[13] Muhammad Bahanan, "Analisis Pengaruh Penggunaan Teknologi Blockchain Dalam Transaksi Keuangan Pada Perbankan Syariah," *I'tishom: Jurnal Ekonomi Syariah* 2, no. 1 (April 2023): 43–44.

specific statement and then draws a general conclusion.[14]

RESULTS AND DISCUSSION

Maqāṣid al-Sharī'ah (Purposes of The *Shari'ah*) according to Imam al-Shāṭibi

Imam al-Shāṭibi is a Maliki school of Islamic law philosopher[15] whose long name is Abu Isḥāq Ibrāhim bin Musa bin Muḥammad al-Lakhmy al-Gharnāṭy.[16] However, he is more popularly known as al-Shāṭibi. Islamic scholars and historians agree that he died on the 8th of Sha'ban 790 Hijri or 1388 AD,[17] precisely on Tuesday and was buried in Granada.[18] With this, it can be estimated that Imam al-Shāṭibi lived for about 70 years.[19] During his life, Imam al-Shāṭibi not only deepened the science of fiqh (jurisprudence) but also mastered the various basic sciences needed to become a mujtahid.

His fields of knowledge included Arabic grammar, fiqh (jurisprudence), kalam (rationally theological science), and other Islamic sciences. His knowledge of the Mu'tazilah school and other rational thought was acquired from Abu Ali al-Manṣur and al-Sharif al-Tilimsāni.[20] In pursuing his scientific development, this figure who follows the Malikis explores various fields of science, including *'ulūm al-wasā'il* (method) and *'ulūm al-maqāṣid* (essence). Al-Shāṭibi was educated by native teachers and scholars who came, studied, and became scholars in Granada.[21]

Imam al-Shāṭibi began his education by learning Arabic grammar and literature from Abu Abdillah Muhammad bin Ali al-Fakhkhar, a grammarian in Andalusia. He stayed with this teacher until 754 AH/1353 AD. He began studying fiqh (jurisprudence) in 754 AH/1353 AD. Most of his understanding of the field of fiqh (jurisprudence) came from his teacher, Abu Sa'adah Ibn Lubb. Ibn Lubb was famous in Andalusia as a jurist who made high-level decisions in fatwas.[22]

All of Imam al-Shāṭibi's written works are about two fields of knowledge that consists of *'ulūm al-wasīlah* (method) or Arabic language science, and *'ulūm al-maqāṣid* (essence).[23] His monumental work is the book namely al-Muwāfaqāt[24] which, in this book Imam al-Shāṭibi explains the concept of *maslahah* (expediency). The element that attracts the

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[14] Sirajuddin Saleh, *Analisis Data Kualitatif* (Bandung: Pustaka Ramadhan, 2017), 74.
[15] Moh Toriquddin, "Teori Maqashid Syari'ah Perspektif Al-Syatibi," *De Jure: Jurnal Syariah Dan Hukum* 6, no. 1 (June 2014): 34, https://doi.org/10.18860/j-fsh.v6i1.3190.
[16] Muhammad as-Sa'id al-Jaza'iri, *Badru Al-Tamām Fi Ikhtiṣār al-I'tiṣām* (Dar al-Jinan al-Islamiyyah, 1991), 7.
[17] Al Ikhlas et al., "The Concept of Maqasid Al-Shariah As an Instruments of Ijtihad According to Imam al-Shatibi in al-Muwafaqat Fi Ushuli al-Shariah," 208–9.
[18] Toriquddin, "Teori Maqashid Syari'ah Perspektif Al-Syatibi," 34.
[19] Al Ikhlas et al., "The Concept of Maqasid Al-Shariah As an Instruments of Ijtihad According to Imam al-Shatibi in al-Muwafaqat Fi Ushuli al-Shariah," 209.
[20] Muhammad Mawardi Djalaluddin, "Pemikiran Abu Ishaq Al-Syatibi Dalam Kitab al-Muwafaqat," *Al-Daulah* 4, no. 2 (December 2015): 292–93.
[21] Muslimin Kara, "Pemikiran Al-Syatibi Tentang Maslahah Dan Implementasinya Dalam Pengembangan Ekonomi Syariah," *ASSETS* 2, no. 2 (2012): 175.
[22] Toriquddin, "Teori Maqashid Syari'ah Perspektif Al-Syatibi," 34.
[23] Abdurrahman Kasdi, "Maqasyid Syari'ah Perspektif Pemikiran Imam Syatibi Dalam Kitab al-Muwafaqat," *Yudisia: Jurnal Pemikiran Hukum Dan Hukum Islam* 5, no. 1 (June 2014): 51.
[24] Kara, "Pemikiran Al-Syatibi Tentang Maslahah Dan Implementasinya Dalam Pengembangan Ekonomi Syariah," 176; Djalaluddin, "Pemikiran Abu Ishaq Al-Syatibi Dalam Kitab al-Muwafaqat," 293.

attention of modern Muslim scholars to this book is the renewal element inside, which contributes to the formation of modern Islamic legal concepts.[25]

Imam al-Shāṭibi did not explicitly explain the definition of *maqāṣid al-sharī'ah* (purposes of the *shari'ah*). Instead, he stated that all the objectives of a law must be covered in all aspects of what Allah has prescribed. Thus, his explanation of *maqāṣid al-sharī'ah* (purposes of the *shari'ah*) goes straight to the heart of the topic.[26] Etymologically, the word *maqāṣid al-sharī'ah* (purposes of the *shari'ah*) comes from a combination of two words: *maqāṣid*, which is the plural form of *maqṣad*, a derivative of the word قَصَدَ-يَقْصُدُ, meaning: goal, direction, straight path. Then, the word *al-sharī'ah* etymologically means a straight path. According to fiqh (jurisprudence) terminology, *al-sharī'ah* means a law on the decree of Allah Swt revealed through the Qur'an and hadith to the Prophet Muhammad PBUH.[27]

Imam al-Shatibi formulated a method of determining the purpose and intent of Islamic law by exploring the *'illah* (legal causation) contained in the commands and prohibitions of *shari'ah*. Every command and prohibition of Allah SWT is determined based on *'illah* (legal causation). *'illah* (legal causation) is the effective cause behind a law. When the *'illah* (legal causation) is well understood in a command or prohibition, it can be used to determine the law. In other words, *'illah* (legal causation) is the main reason behind the law given by *al-Shāri'* (law creator).[28]

Regarding the purpose or *maqāṣid* (aim or purpose), Imam al-Shāṭibi divided it into two parts, namely *qaṣdu al-shāri'* (God's purpose) and *qaṣdu al-mukallaf* (human purpose).[29] *Qaṣdu al-shāri'* (God's purpose) is the intention or purpose of a law based on God's intention as the creator of the law.[30] In his opinion, God made a law for the benefit of humans or servants (*maṣālih al-'ibād*/servants expediency)[31] both in this world and in the hereafter.[32] The purpose of the *shari'ah* is to gain benefit and eliminate harm (*jalbu al-maṣāliḥ wa dar'u al-mafāsid*/bringing interests and preventing harm).[33]

It should be noted that to realise the benefit is not based on the lust and desire of the servant. Instead, it is based on the goal of realizing the benefit of the hereafter because the benefits of the world exist for the sake of creating the benefits of the hereafter. So, if the worldly benefit to be achieved does not contain the benefit of the hereafter, it is not a benefit that is the purpose of *shari'ah*.[34]

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[25] Djalaluddin, "Pemikiran Abu Ishaq Al-Syatibi Dalam Kitab al-Muwafaqat," 293; Kasdi, "Maqasyid Syari'ah Perspektif Pemikiran Imam Syatibi Dalam Kitab al-Muwafaqat," 51.
[26] Al Ikhlas et al., "The Concept of Maqasid Al-Shariah As an Instruments of Ijtihad According to Imam al-Shatibi in al-Muwafaqat Fi Ushuli al-Shariah," 213.
[27] Ahmad Imam Mawardi, *Fiqh Minoritas: Fiqh Al-Aqaliyyat Dan Evolusi Maqashid al-Syari'ah Dari Konsep Ke Pendekatan* (Yogyakarta: LKiS, 2010), 178–79.
[28] Al Ikhlas et al., "The Concept of Maqasid Al-Shariah As an Instruments of Ijtihad According to Imam al-Shatibi in al-Muwafaqat Fi Ushuli al-Shariah," 215.
[29] Abu Ishaq Ibrahim bin Musa bin Muhammad al-Lakhmi al-Shaṭibi, *Al-Muwāfaqāt*, n.d., 7–8.
[30] Galuh Nashrullah Kartika Mayangsari Rofam and Hasni Noor, "Konsep Maqashid Al-Syariah Dalam Menentukan Hukum Islam (Perspektif Al-Syatibi Dan Jasser Auda)," *Al-Iqtishadiyah: Jurnal Ekonomi Syariah Dan Hukum Ekonomi Syariah* 1, no. 1 (December 2014): 53, https://doi.org/10.31602/iqt.v1i1.136.
[31] Djalaluddin, "Pemikiran Abu Ishaq Al-Syatibi Dalam Kitab al-Muwafaqat," 296.
[32] Toriquddin, "Teori Maqashid Syari'ah Perspektif Al-Syatibi," 35.
[33] Mayangsari Rofam and Noor, "Konsep Maqashid Al-Syariah Dalam Menentukan Hukum Islam (Perspektif Al-Syatibi Dan Jasser Auda)," 53.
[34] Djalaluddin, "Pemikiran Abu Ishaq Al-Syatibi Dalam Kitab al-Muwafaqat," 296.

Qaṣdu al-mukallaf (human purpose) relates to the desires that humans have.[35] This goal focuses on *maslahah* (expediency), which is concerned with the good of humans, not the interests of God. However, this is done without prioritizing desires and does not deny the role of the *shari'ah* because religious laws also benefit humans.[36]

In al-Muwāfaqāt, Imam al-Shāṭibi divided this *maqāṣid* (aim or purpose) into three levels, namely *ḍarūriyyah* (primary needs) (ضَرُورِيَّةٌ), *ḥājiyyah* (secondary needs) (حَاجِيَّةٌ), and *taḥsīniyyah* (tertiary needs) (تَحْسِيْنِيَّةٌ).[37]

1. *Ḍarūriyyah*

Ḍarūriyyah (primary needs), which can be translated as essential needs, is the highest and most crucial level of *maslahah* (expediency) that everyone must have.[38] In al-Muwāfaqāt, Imam al-Shāṭibi explains that enforcement at this level must uphold the interests of religion and the world. If it is not upheld, then the benefit to the world will not run well. Instead, it leads to damage, chaos, and the loss of life.[39]

An example of a need at this level is a shelter for humans. A shelter that can protect from the heat of the sun and the cold, even if it is a cave in the mountain.[40] Two kinds of efforts must be made to preserve this level. From the perspective of existence (*min jānibi al-wujūd*), that is, by realizing the existence of this primary need. Then, in terms of non-existence (*min jānibi al-'adam*), that is, trying to reject or eliminate things that can harm this primary need, both those that have already occurred and those that can (potentially) occur.[41]

According to Imam al-Shāṭibi, the human benefit can be realized if the five essential elements of human life can be realised and maintained.[42] The first essential element is *ḥifẓu al-dīn* (protecting religion). The religion is a set of creeds, worship, and rules prescribed by Allah Swt as *al-Shāri'* (law creator). The purpose of guarding this religion is to regulate and maintain the relationship between humans and their God and the relationship between humans and their neighbors.[43]

The next main element is *ḥifẓu al-nafs* (protecting the soul) and *ḥifẓu al-'aqli* (protecting the intellect), which is the guarding of things other than worship in terms of efforts to maintain the existence or realization of needs, such as eating, drinking, clothing, shelter, and the like.[44] The necessity to eat and drink is

[35] Sidik Tono, "Pemikiran Dan Kajian Teori Hukum Islam Menurut Al-Syatibi," *Al-Mawarid* 13 (2005): 107.
[36] Djalaluddin, "Pemikiran Abu Ishaq Al-Syatibi Dalam Kitab al-Muwafaqat," 296–97.
[37] al-Shaṭibi, *Al-Muwāfaqāt*, 17.
[38] Mohd Shahid Mohd Noh and Mohamed Syakir Abu Bakar, "Cryptocurency as A Main Currency: A Maqasidic Approach," *Al-Uqud: Journal of Islamic Economics* 4, no. 1 (January 2020): 119, https://doi.org/10.26740/al-uqud.v4n1.p115-132.
[39] al-Shaṭibi, *Al-Muwāfaqāt*, 17–18.
[40] Abdul Wahhab Khallaf, *'Ilmu Uṣūli al-Fiqhi* (Beirut: Dar al-Kotob al-Ilmiyah, 2010), 160.
[41] al-Shaṭibi, *Al-Muwāfaqāt*, 18; Kasdi, "Maqasyid Syari'ah Perspektif Pemikiran Imam Syatibi Dalam Kitab al-Muwafaqat," 57.
[42] Mayangsari Rofam and Noor, "Konsep Maqashid Al-Syariah Dalam Menentukan Hukum Islam (Perspektif Al-Syatibi Dan Jasser Auda)," 61.
[43] Abdul Wahhab Khallaf, *Ilmu Ushul Fiqih*, trans. Moh. Zuhri and Ahmad Qarib (Semarang: Dina Utama Semarang, 2014), 371–72.
[44] Kara, "Pemikiran Al-Syatibi Tentang Maslahah Dan Implementasinya Dalam Pengembangan Ekonomi Syariah," 178.

a form of maintaining the human soul to stay alive.[45] The prohibition of drinking alcohol is a form of protecting the mind from harmful things.[46]

Then the last two essential elements are *ḥifẓu al-nasl* (protecting offspring) and *ḥifẓu al-māl* (protecting property). The safeguarding included in this case is a matter of muamalat/relations between humans and includes the safeguarding of existence (*min jānibi al-wujūd*).[47] Islam prescribes an obligation to strive for sustenance to produce and acquire wealth by legalizing all forms of muamalat as long as no evidence forbids this form of muamalat.[48]

In order to fulfill the existence of *maslahah* (expediency), an effort in the form of maintenance (*min jānibi al-'adam*/ in terms of non-existence), *al-Shāri'* (law creator) also prescribed the prohibition of acts that are destructive to human property, such as fraud and usury.[49] Everything that moves towards realizing these five essential aspects aligns with *maqāṣid al-sharī'ah* (purposes of the *shari'ah*). Thus, human welfare can be achieved by fulfilling and safeguarding these five aspects.[50]

2. *Ḥājiyyah*

Imam al-Shāṭibi explained that what is meant by a need at the level of *ḥājiyyah* (secondary needs) is a need that can reduce difficulties or obstacles, where it can cause difficulties that lead to the expected loss. If this need is not met, there will be difficulties and heavy burdens on the *mukallaf* (the person in charge of religious rules/human), but not to the extent of severe damage that threatens the general benefit.[51] *Hājiyyah* can be translated as complementary needs and is the second benefit level after *ḍarūriyyah* (primary needs).[52] The main principle of the *ḥājiyyah* (secondary needs) level of necessity is to relieve hardship, ease the burden, and facilitate human affairs.[53]

At this level, the protected benefit is divided into three aspects of legal action. The first is the aspect of worship, such as the permissibility of combining prayers for traveling people called *rukhṣah* (relief) as a form of convenience. The second aspect of legal action is related to muamalat. The *shari'ah* allows Islamic commercial transactions, such as debts and credits, buying and selling, and *al-salām* transactions (buying and selling where the merchandise is unavailable at the time of the sale and purchase contract), to provide flexibility and convenience for humans in transactions. Third, the aspect of *jinayah* (felony), which is the obligation of *diyat* (mulct) in *qiṣāṣ* (punishment) to ease the burden

[45] Al Ikhlas et al., "The Concept of Maqasid Al-Shariah As an Instruments of Ijtihad According to Imam al-Shatibi in al-Muwafaqat Fi Ushuli al-Shariah," 213.
[46] Al Ikhlas et al., 213.
[47] Kara, "Pemikiran Al-Syatibi Tentang Maslahah Dan Implementasinya Dalam Pengembangan Ekonomi Syariah," 178.
[48] Khallaf, *Ilmu Ushul Fiqih*, 373.
[49] Khallaf, 373.
[50] Mohd Noh and Abu Bakar, "Cryptocurency as A Main Currency: A Maqasidic Approach," 119.
[51] al-Shaṭibi, *Al-Muwāfaqāt*, 21.
[52] Mohd Noh and Abu Bakar, "Cryptocurency as A Main Currency: A Maqasidic Approach," 119.
[53] Djalaluddin, "Pemikiran Abu Ishaq Al-Syatibi Dalam Kitab al-Muwafaqat," 297.

of the murderer or the perpetrator of the crime to take responsibility for his wrongdoing.[54]

3. *Taḥsīniyyah*

Taḥsīniyyah (tertiary needs), translated as accessories/jewelry/decoration, is the lowest level of *maslahah* (expediency).[55] Imam al-Shāṭibi explained *taḥsīniyyah* (tertiary needs) as a form of need that takes what is appropriate from good customs and avoids dirty behaviour that is rejected by common sense. All of this constitutes good morals.[56] Imam al-Shāṭibi explained that the need at this level is a need that comes from things that are considered appropriate from a good community custom. Also, it is essential to avoid what is considered a bad thing.

In short, these needs are the ornaments that create good morals and character.[57] By fulfilling these needs, life will be smooth and not cause difficulties. Needs at this level are value-adding or complementary to the previous two levels of needs.[58] This level of need is closely related to the preservation of aesthetics by propriety. It will not complicate or threaten the existence of the five essential things at the *ḍarūriyyah* (primary needs) level.[59]

As in the context of worship, Islam prescribes the purity of the body, place, and clothes used for worship. It also prescribes cleaning and adorning oneself when going to the mosque and adding sunnah acts of worship. Besides prescribing the pillars and prerequisites, Islam recommends various ethics intending to familiarise people with the best customs in the context of muamalat, such as the prohibition of fraud, extravagance, and miserliness.[60] In terms of the context of *jinayah* (felony), the example is the prohibition of *qiṣāṣ* (punishment) between enslaved and free people. Regarding customs, Islam prescribes good manners when eating, drinking, and avoiding unhealthy food.[61]

Each of the above levels has something that completes or complements each of the things or needs included in the category of that level. However, the completion is not the essence of the level itself. Therefore, it is not a necessity. If they are not applied, they will not harm the original principle of the level.

For example, in the category of *ḍarūriyyah* (primary needs), in buying and selling, the consent of both parties is sufficient without a witness. However, this *ḍarūriyyah* (primary needs) as buying and selling can be completed with a testimony. Although it is not a problem

[54] Al Ikhlas et al., "The Concept of Maqasid Al-Shariah As an Instruments of Ijtihad According to Imam al-Shatibi in al-Muwafaqat Fi Ushuli al-Shariah," 214.
[55] Mohd Noh and Abu Bakar, "Cryptocurency as A Main Currency: A Maqasidic Approach," 119.
[56] al-Shaṭibi, *Al-Muwāfaqāt*, 22.
[57] Al Ikhlas et al., "The Concept of Maqasid Al-Shariah As an Instruments of Ijtihad According to Imam al-Shatibi in al-Muwafaqat Fi Ushuli al-Shariah," 214.
[58] Kara, "Pemikiran Al-Syatibi Tentang Maslahah Dan Implementasinya Dalam Pengembangan Ekonomi Syariah," 179.
[59] Mayangsari Rofam and Noor, "Konsep Maqashid Al-Syariah Dalam Menentukan Hukum Islam (Perspektif Al-Syatibi Dan Jasser Auda)," 62.
[60] Khallaf, *Ilmu Ushul Fiqih*, 377.
[61] Al Ikhlas et al., "The Concept of Maqasid Al-Shariah As an Instruments of Ijtihad According to Imam al-Shatibi in al-Muwafaqat Fi Ushuli al-Shariah," 214.

to do without it, it is better to do so. Therefore, these enhancements can be considered as a category of the *ḍarūriyyah* (primary needs) itself (as if it is a necessity in that *ḍarūriyyah*/primary needs). In this case, the necessity of the *ḥājiyyah* (secondary needs) level can be considered as a complement to the *ḍarūriyyah* (primary needs) level, and the *taḥsīniyyah* (tertiary needs) level is a complement to the *ḥājiyyah* (secondary needs) level. The *ḍarūriyyah* (primary needs) level is the original nature of *maṣāliḥ* (benefits).[62]

Blockchain Technology, Development, and Principles

Blockchain is a collection of blocks that are interconnected (chained) and contain information about transactions that occur.[63] This technology stores data and information and secures it using cryptography. The data and information are in the form of a database, which is then stored in a ledger and distributed to all users who contribute to the network. Each transaction then goes through a validation process by most participants, who approve the incoming data. This authentication process is called the consensus mechanism.[64]

In addition, this distribution process forms the basis of trust in the information contained therein without requiring a central administrator's intervention to guarantee the information's validity.[65] The data is recorded in a block after a transaction based on the consensus agreed upon in the network. Then, the block is linked to the chain of previous blocks, making it a chronological, immutable, and permanent storage.[66] When information is entered into the system, it cannot be cancelled or not completed.[67]

This consensus mechanism minimizes the possibility of fraud. Key to blockchain technology is the ability to trace back chronological information in a distributed network of databases.[68] The main emphasis of this technology is to create a decentralized environment, and there is no need for third-party involvement in transactions or data inventory.[69]

When a user on the blockchain network wants to execute a transaction, the request for that transaction is stored in a ledger. A copy of that ledger is publicly available to all other users on the network. All users verify the requested transaction on a node (user, computer). Then, when all users verify the transaction as authentic, it is added to the network. If anyone wants to change or hack the transaction, the hacker would have to infiltrate more than 51% of the nodes in the network, which is almost impossible.[70]

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[62] al-Shaṭibi, *Al-Muwāfaqāt*, 24–25.
[63] Yulianton et al., "Implementasi Sederhana Blockchain," 306.
[64] Gurinder Singh, Vikas Garg, and Pooja Tiwari, "Introduction to Blockchain Technology," in *Transforming Cybersecurity Solutions Using Blockchain*, ed. Rashmi Agrawal and Neha Gupta (Singapore: Springer Singapore, 2021), 2, https://doi.org/10.1007/978-981-33-6858-3_1; Yulianton et al., "Implementasi Sederhana Blockchain," 306.
[65] Mohamad Faozi and Edo Segara Gustanto, "Kripto, Blockchain, Bitcoin, Dan Masa Depan Bank Islam: Sebuah Literatur Review," *Quranomic: Jurnal Ekonomi Dan Bisnis Islam* 1, no. 2 (2022): 129–30.
[66] Center for Risk Management & Sustainability, "Mengenal Blockchain Dan Manfaatnya Bagi Dunia Bisnis," September 11, 2023, https://crmsindonesia.org/publications/mengenal-blockchain-dan-manfaatnya-bagi-dunia-bisnis/; Yulianton et al., "Implementasi Sederhana Blockchain," 306.
[67] Singh, Garg, and Tiwari, "Introduction to Blockchain Technology," 2.
[68] Yulianton et al., "Implementasi Sederhana Blockchain," 306.
[69] Singh, Garg, and Tiwari, "Introduction to Blockchain Technology," 2.
[70] Suyel Namasudra and Kemal Akkaya, "Introduction to Blockchain Technology," in *Blockchain and Its Applications in Industry 4.0*, ed. Kemal Akkaya and Suyel Namasudra (Singapore: Springer Nature Singapore, 2023), 4, https://doi.org/10.1007/978-981-19-8730-4_1.

In the late 1990s, two researchers, Haber, a cryptographer, and Stornetta, a physicist, conducted collaborative research. Their research focused on developing a reliable registration concept for digital files. Along the way, they developed a fundamental concept that became the cornerstone of blockchain technology, covering both cryptography and registry aspects. They proposed the idea of a basic structure with a chain of timestamped records, which are interconnected to prevent the manipulation of a single item without disrupting the entire chain.[71]

These concepts were later combined and applied to electronic money in 2008, as described in a paper published in "Bitcoin: A Peer-to-Peer Electronic Cash System." The journal was published pseudonymously by Satoshi Nakamoto. Later, in 2009, the cryptocurrency blockchain network Bitcoin was founded. Nakamoto's paper contains the blueprints followed by most other modern cryptocurrency schemes (with variations and modifications).[72]

According to Mukherjee and Pradhan's presentation, the development or evolution of blockchain technology occurs in 4 (four) phases. The first phase (Blockchain 1.0) is the initial implementation phase of Distributed Ledger Technology (DLT). The most prominent application of this technology is digital currency or cryptocurrency. For example, some digital money is Bitcoin and other cryptocurrencies.[73]

The second phase (Blockchain 2.0) is the development of solutions to the problems found in implementing the first phase of blockchain technology. Problems such as the perceived poor scalability of the blockchain and the wastefulness of the Bitcoin mining scheme gave rise to the idea of users to expand the use of this technology from its limited use in cryptocurrency. Smart contracts and Proof of Work consensus mechanisms emerged in this second phase. So that activities in other industries besides cryptocurrencies can be carried out using this technology.[74]

Then, the third blockchain phase (Blockchain 3.0) produces decentralized applications called dApps. A dApps application is a digital program that can run not only on one computer but also on a group of computer networks. In this phase, there are innovations in dApp applications, and various new consensus mechanisms are considered faster than previous ones.[75] The fourth blockchain generation, or Blockchain 4.0, is an advanced development in which changing technology becomes fully mainstream. Blockchain and AI (Artificial intelligence) technology are integrated in this fourth phase, creating large and fast transactions.[76]

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[71] Faozi and Gustanto, "Kripto, Blockchain, Bitcoin, Dan Masa Depan Bank Islam: Sebuah Literatur Review," 129–30.
[72] Dylan Yaga et al., *Blockchain Technology Overview* (United States: NIST: National Institute of Standards and Technology, 2018), 2, https://doi.org/10.6028/NIST.IR.8202.
[73] Pratyusa Mukherjee and Chittaranjan Pradhan, "Blockchain 1.0 to Blockchain 4.0—The Evolutionary Transformation of Blockchain Technology," in *Blockchain Technology: Applications and Challenges*, ed. Sandeep Kumar Panda et al. (Cham: Springer International Publishing, 2021), 37–39, https://doi.org/10.1007/978-3-030-69395-4_3.
[74] Mukherjee and Pradhan, 39.
[75] Mukherjee and Pradhan, 41–42.
[76] Mukherjee and Pradhan, 42.

The central phenomenon that gave rise to the name blockchain is a series of blocks connected sequentially to each other like a chain.[77] The first block in a chain of blocks created by a node is called a Genesis Block.[78] Each block contains multiple validated transactions.[79] A block has two parts: the block header and the block body.[80] The block body contains the new transaction created and is an encryption code.

There are various elements contained in the block header. Each block has a code element, or a hash, that identifies the block. The hash code will be included in the following published block. The previous block's hash is located in the "prev_hash" element in the next block. Then, the timestamp element lists the time when the block was created.

The transaction codes in the block body are narrowed down to one main code called the Merkle tree root.[81] The block header also contains the protocol version used by the node and the result of the Proof of Work scheme, the nonce.[82] Some bits indicate the difficulty level of the Proof of Work mechanism used.[83]

The things that characterize and manifest the advantages offered by this technology are the principles or characteristics of this digital technology. Cryptography is one of the main principles of blockchain technology. Blockchain stores information by obscuring it into a specific code of mathematical algorithms so that humans or machines cannot read the information content directly without knowing the key.[84]

This concept of obfuscating data is called cryptography and is one of the reasons for the strong security offered by blockchain. This technology is also decentralized. A central authority does not manage transaction activity, as any information created is directly distributed to all users on the network. This decentralized principle creates a consensus scheme, which is the principle of blockchain technology.[85] Consensus is an algorithm in which all nodes/users of the blockchain network agree on new transactions created if they are added validly.[86]

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[77] Giang-Truong Nguyen and Kyungbaek Kim, "A Survey about Consensus Algorithms Used in Blockchain," *JIPS: Journal of Information Processing Systems* 14, no. 1 (February 2018): 104, https://doi.org/10.1109/ICBCTIS55569.2022.00050.

[78] Namasudra and Akkaya, "Introduction to Blockchain Technology," 4.

[79] Nguyen and Kim, "A Survey about Consensus Algorithms Used in Blockchain," 104.

[80] Namasudra and Akkaya, "Introduction to Blockchain Technology," 4.

[81] Nguyen and Kim, "A Survey about Consensus Algorithms Used in Blockchain," 105; Namasudra and Akkaya, "Introduction to Blockchain Technology," 4.

[82] Jake Frankenfield, "Nonce: What It Means and How It's Used in Blockchain," November 22, 2023, https://www.investopedia.com/terms/n/nonce.asp; Nguyen and Kim, "A Survey about Consensus Algorithms Used in Blockchain," 105; Namasudra and Akkaya, "Introduction to Blockchain Technology," 5.

[83] Nguyen and Kim, "A Survey about Consensus Algorithms Used in Blockchain," 105; Namasudra and Akkaya, "Introduction to Blockchain Technology," 5.

[84] Ahmad Fuadi Tanjung, Patma Wati, and Nurlaila, "Penerapan Teknologi Blockchain Dalam Akuntansi Syariah," *Jurnal Masharif Al-Syariah: Jurnal Ekonomi Dan Perbankan Syariah* 8, no. 2 (2023): 1222; Badan Pengembangan dan Pembinaan Bahasa, "KBBI VI Daring," accessed November 16, 2023, https://kbbi.kemdikbud.go.id/.

[85] Ishaani Priyadarshini, "Introduction to Blockchain Technology," in *Cyber Security in Parallel and Distributed Computing*, 2019, 92, https://doi.org/10.1002/9781119488330.ch6; Jian Yang and Hong Shen, "Blockchain Consensus Algorithm Design Based on Consistent Hash Algorithm," in *2019 20th International Conference on Parallel and Distributed Computing, Applications and Technologies (PDCAT)*, 2019, 471, https://doi.org/10.1109/PDCAT46702.2019.00090.

[86] Yang and Shen, "Blockchain Consensus Algorithm Design Based on Consistent Hash Algorithm," 471.

Types of Blockchain

There are three blockchains: public, private, and consortium. Public blockchains are also known as permissionless blockchains, while private and consortium blockchains are also known as permissioned blockchains. A permissioned blockchain is a block that uses a stricter consensus system than a permissionless one. Public blockchains do not limit who can become a block-issuing node. All blockchain network users can access the transaction wallet, write data to it, and check it at any time as long as they follow the rules of the blockchain server.[87]

Consortium blockchains have control held by an entity or set of individuals that comprise the group. Meanwhile, private blockchains are only open to some. Some permissions must be passed if someone wants to join or transact in the network.[88] Blockchain networks are not entirely free of centralised control as there are still software developers, issuing nodes, and blockchain network users who all play a role in the governance of the blockchain network regulator.[89]

For this reason, the blockchain network is not entirely free from centralised control, despite its well-known decentralised principles. However, it still creates a transaction environment free of centralised control compared to not blockchain-based transactions; this technology succeeds with transaction automation and trusts in the security of its peer-to-peer nature.

Blockchain Implementation Benefit in Digital Transactions in The Islamic Economic Industry

The banking industry is one of the economic industries not left behind in implementing advances in blockchain technology. Permata Bank is the first bank in Indonesia to implement trade financing transactions through the blockchain system. Permata Bank collaborated with Contour, a blockchain-based technology service provider company, and issued a Letter of Credit with Bangkok Bank PLC (Thailand). The process of issuing a Letter of Credit has to be communicated with Buyer, Seller, Issuing Bank, and Receiving Bank on different platforms. By applying blockchain technology, the process can be completed through a single platform with a much shorter end-to-end process time and can be monitored in real-time.[90]

The application of blockchain technology in the banking industry uses smart contract technology, a derivative program of blockchain. Smart contracts run automatically, execute, and complete contract agreements when predetermined conditions are met.[91] Blockchain technology provides advantages for banks in creating immutability and information security

[87] Janvi Dattani and Harsh Sheth, "Overview of Blockchain Technology," *Asian Journal of Convergence in Technology* 5, no. 1 (n.d.): 1, https://doi.org/10.33130/ajct.2019v05i01.013.
[88] Dattani and Sheth, 1.
[89] Yaga et al., *Blockchain Technology Overview*, 35.
[90] PermataBank, "PermataBank Dan Chandra Asri Gunakan Teknologi Blockchain Pertama Di Indonesia," November 25, 2021, https://www.permatabank.com/en/article/menjadi-pionir-permatabank-dan-chandra-asri-selesaikan-transaksi-trade-finance-menggunakan.
[91] Septianda, Khairunnisa, and Indrarini, "Blockchain Dalam Ekonomi Islam," 2634; International Business Machines Corporation, "What Are Smart Contracts on Blockchain?," accessed December 15, 2023, https://www.ibm.com/topics/smart-contracts.

in data storage. Its cryptographic algorithm protects data from manipulation, fraud, and leakage due to cyber-attacks. Thus, the application of this technology strengthens the integrity of the data.

Its decentralised consensus system creates data transparency for interested parties while maintaining the privacy of data owners and protection of confidential data. Thus, external audit parties can receive reports quickly and save time and energy.[92] Automating transactions from smart contracts and eliminating the role of third parties can degrade the energy and administrative costs that banks must mobilise. Banking operations become more efficient with a distributed ledger that produces one integrated data.[93]

Blockchain technology can process banking payments quickly and cost-effectively. Blockchain acts as an anti-money laundering monitoring tool and even offers an alternative option to gauge the creditworthiness of customers applying for credit.[94] Smart contracts ensure that the financial services offered comply with Islamic law standards because smart contracts can reduce uncertainty and speculation in a contract.[95]

Blockchain is starting to be viewed and voiced in 7 resolutions agreed upon at the 2019 World Zakat Forum international conference from the theme "Optimising Global Zakat Role Through Digital Technology." The seven resolutions call for the development of global zakat that utilises today's latest technology, especially blockchain technology.[96] Using blockchain systems minimises the need for more efficiency and non-transparency in the collection, management, and distribution of zakat with transparency, data security, and the principle of sustainability. This can prevent misuse, misplacement, loss, theft, and other factors contributing to zakat collection's potential.[97] The reduction of operational costs from the distribution of zakat provided by blockchain is stated in Article 3 (a) of Law No. 23 of 2011 Concerning Zakat Management, which states that the management of zakat aims to increase the effectiveness and efficiency of services.[98]

One of the digital waqf products that applies blockchain technology is Waqf Chain, which Finterra developed. Waqf Chain integrates options for campaign management, capital raising, waqf management, asset management, and impact reporting to benefit stakeholders and the wider community.[99] The use of blockchain technology in waqf is in the form of fundraising, fund transfer transactions, and transfer of waqf ownership. Members can participate in building and strengthening waqf properties by submitting project proposals

[92] Bahanan, "Analisis Pengaruh Penggunaan Teknologi Blockchain Dalam Transaksi Keuangan Pada Perbankan Syariah," 50–52.
[93] Rafiqi Ihsan, "Peluang Dan Tantangan Penggunaan Blockchain Technology Pada Perbankan Syariah Di Indonesia," *E-QIEN: Jurnal Ekonomi Dan Bisnis* 11, no. 3 (November 2022): 1046; Bahanan, "Analisis Pengaruh Penggunaan Teknologi Blockchain Dalam Transaksi Keuangan Pada Perbankan Syariah," 51.
[94] Sam Daley, "16 Blockchain Banking Examples to Know," December 1, 2023, https://builtin.com/blockchain/blockchain-banking-roundup.
[95] Septianda, Khairunnisa, and Indrarini, "Blockchain Dalam Ekonomi Islam," 2635.
[96] Baznasko, "World Zakat Forum 2019 Lahirkan 7 Resolusi," November 8, 2019, https://baznaskotatanjungpinang.org/world-zakat-forum-2019-lahirkan-7-resolusi/.
[97] Septianda, Khairunnisa, and Indrarini, "Blockchain Dalam Ekonomi Islam," 2635.
[98] Indonesia, "Undang-Undang No. 23 Tahun 2011 Tentang Pengelolaan Zakat" (n.d.).
[99] Finterra, "Islamic Fintech," *FinTech* (blog), 2023, https://finterra.org/fintech/.

that will be approved once the project goals are achieved. Several waqf tokens will then be created and awarded to participating funders.[100]

No law in Indonesia defines the supply chain within the scope of civil law. However, from a legal perspective, a supply chain can be defined as a series of processes from the beginning to the end of a product. The process includes design, manufacturing, sales, and delivery and acceptance by consumers.[101] It records the flow and process of trade, resulting in a large amount of inventory that must be recorded every time.

The actual recording of transactions as a product moves from one hand to another can reduce the time delay in recording. Vendors and suppliers also benefit from more accessible and accurate information sharing and monitoring of goods movement.[102] Applying blockchain in the Halal Supply Chain can improve sustainability and increase consumer confidence in the kosherness of a product. Clear records from the production stage to purchase by consumers make kosher products more trusted and better known globally.[103]

Distributed Ledger Technology of blockchain applied in retail sukuk can provide a transparent and immutable record of transactions. This technology also increases Sukuk's transparency in its structure, issuer, sukuk holders, underlying assets, and cash flows from both digital and actual business activities. Therefore, the involvement of third parties and the costs associated with sukuk issuance to settlement can be reduced. Applying blockchain in retail sukuk also benefits investors with real-time data provided so that investors can make the right decision to make transactions in retail sukuk, which benefits the secondary market.[104]

Blockchain technology creates a sense of security for the decision to conduct real-world asset transactions in the digital world with its asset tokenisation. Asset tokenisation is creating a token or digital identity for a real asset. The token issued can name a real asset partially, not entirely, which is an advantage of asset tokenisation because buying and selling can be done on the actual asset partially. So that financial transactions can be carried out more broadly and efficiently with these tangible assets.[105]

Tokenising can be done to various tangible assets ranging from fiat money (Stablecoins), works of art known as non-fungible tokens (NFTs), property/real estate assets, and commodities such as gold, silver, and even oil.[106] The blockchain cryptography of data storage guarantees the security of ownership of tangible digital assets. Any contract transactions made on these tokens can run smoothly according to the purpose of digitizing transactions.

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[100] Septianda, Khairunnisa, and Indrarini, "Blockchain Dalam Ekonomi Islam," 2635.
[101] Muhammad Vicky Afris Suryono, "Legal Reforming of Smart Contract in Supply Chain Demands Process between Retailer and Consumer," *Jurnal Kajian Pembaruan Hukum* 3, no. 1 (2023): 107, https://doi.org/10.19184/jkph.v3i1.33610.
[102] Priyadarshini, "Introduction to Blockchain Technology," 94.
[103] Septianda, Khairunnisa, and Indrarini, "Blockchain Dalam Ekonomi Islam," 2635.
[104] Sarah Iftikhar, "Blockchain Based Retail Sukuk for Infrastructure Development and Financial Inclusion in Pakistan," *Joural of Business Administration and Management Sciences* 4, no. 1 (January 2022): 50, https://doi.org/10.58921/jobams.4.1.76.
[105] Rafi Brilliyanto, "Blockchain Dengan Prinsip-Prinsip Syariah," September 25, 2023, https://amf.or.id/blockchain-dengan-prinsip-prinsip-syariah/.
[106] Indodax, "Mengenal Keajaiban Real-World Asset (RWA) Dalam Dunia Nyata," December 26, 2023, https://indodax.com/academy/apa-itu-rwa/.

Blockchain Future Challenges in Digital (Islamic) Transactions

Several threats and risks still overshadow the use of blockchain technology. Especially in security, the change of information storage and transaction activities to be purely digital is a weak point of blockchain technology because digitalisation raises the risk of cyber-attacks, which are 51% attack and other attacks in the case of blockchain. For example, a 51% attack is in which an attacker controls more than half of the blockchain network's computing power.

However, despite the threatening cyber-attack forms, blockchain can still survive and be reliable with excellent and continuous maintenance efforts. In line with that, the human resource aspect is also a challenging aspect of applying blockchain technology. Public knowledge of blockchain technology still needs to be improved because the utility of this technology still needs to be maximised.

Solving this human resource problem requires cooperation from all parties, including the government, academia, organisations, communities, and the private sector, to jointly create a reliable digital workforce.[107] This cooperation is to take full advantage of the potential of blockchain technology in Islamic financial transactions.[108] Improving human resources, who will be the expert holders of blockchain operations in a business, can also be a solution and a form of effort that saves from security threats.

Using blockchain technology to conduct transactions using cryptocurrencies is a challenge regarding blockchain compliance with *shari'ah* rules. The scheme of digital money circulation from fees to rewards in the mining process is reasonable, does not harm any party, and is still within the corridors of *shari'ah* provisions. However, several studies have been conducted to outline that the law of transacting using digital money in Islam is haram *lighairihi* (forbidden based on purchasing method) because it contains elements of *gharar* (uncertainty).[109] Based on this, the halal (permitted) aspect of transactions in smart contracts and anything else on a blockchain server that uses cryptocurrency as a means of payment is also jeopardised.

Regarding its use in smart contracts, as long as the user or software developer can create a contract that complies with the corridors of Islamic law and can ensure that it works, then *shari'ah* compliance with this blockchain technology can be realised. It shows that there is still a need for a human touch on the compliance of the existing Islamic law values towards the implementation of blockchain as more and more transactions on the blockchain server create many new blocks that store data in each block. If the blockchain is not supported by solid technology, several system failures will occur. Related to this scalability challenge, a solution can be sought by optimising blockchain storage or redesigning the blockchain as a whole.[110]

[107] Ihsan, "Peluang Dan Tantangan Penggunaan Blockchain Technology Pada Perbankan Syariah Di Indonesia," 1046.
[108] Bahanan, "Analisis Pengaruh Penggunaan Teknologi Blockchain Dalam Transaksi Keuangan Pada Perbankan Syariah," 51.
[109] Hardian Satria Jati and Ahmad Arif Zulfikar, "Transaksi Cryptocurrency Perspektif Hukum Ekonomi Syariah," *Jurnal Al-Adalah: Jurnal Hukum Dan Politik Islam* 6, no. 2 (July 2021): 146, https://doi.org/10.35673/ajmpi.v6i2.1616.
[110] Priyadarshini, "Introduction to Blockchain Technology," 95.

Law No. 19/2016 on the Amendment to Law No. 11/2008 on Electronic Information and Transactions has covered blockchain technology. However, Indonesian regulations still need to improve their oversight of blockchain taxation with its smart contracts. Regulation of the Minister of Finance Number 69/PMK.03/2022 on Income Tax and Value Added Tax on the Implementation of Financial Technology regulates the imposition of taxes on lending and borrowing services, the implementation of financial technology in investment management, and other financial activities.

Smart contracts have a pseudonymous nature, aka disguising the identity of the parties, and a decentralised nature that eliminates the role of third parties other than the parties involved. Both characteristics can eliminate government supervision of ongoing transactions so that taxation cannot be maximised. The government's intervention as a regulator in smart contracts will reduce the confusion over the advantages and advantages of blockchain technology itself. For this reason, there is still a need for solid regulations and infrastructure related explicitly to tax imposition on implementing blockchain technology in Islamic economic traffic.

The application of smart contracts in business can backfire on practitioners who are concerned about Islamic law. If the clauses made in the smart contract do not fulfil *shari'ah* aspects, the contract will run with transactions that violate *shari'ah* rules. In this regard, an education of the contract parties regarding *shari'ah* rules can be sought to create clauses in contracts that are under *shari'ah* principles.

Maqāṣid al-Sharī'ah **(Purposes of The *Shari'ah*) Concept Review according to Imam al-Shāṭibi on The Implementation of Blockchain Technology in Digital Transactions**

Blockchain technology is a disruptive technology, an innovation that can significantly impact an activity, especially the way of doing business. With blockchain technology, an activity initially carried out offline and online can become fully digital because a transaction no longer runs with manual processing by humans. In addition, blockchain can create a variety of new digital activity and transaction models, which can rapidly replace the current model.

According to Imam al-Shāṭibi, one of the purposes of legislating a law for humans is to gain benefit (*jalbu al-maṣālih*/bringing interests) and eliminate harm (*dar'u al-mafāsid*/preventing harm). The existence of blockchain not only makes it easier for humans to do their work. Since smart contracts have been widely used, blockchain technology has the potential to become the primary transaction system model in the future. Asset tokenisation gives rise to real asset transactions on the blockchain server, thus encouraging this technology to be increasingly needed. Based on the benefits provided by blockchain to its implementation in the world of Islamic and conventional economies show that these benefits are elements that can be referred to as *maslahah* (expediency) in this blockchain technology.

Imam al-Shāṭibi explained that if a matter contains more *maslahah* (expediency) than *mafsadah* (damage), then the matter is *maslahah* (expediency). Meanwhile, if a matter contains less *maslahah* (expediency) and more *mafsadah* (damage), it is preferable to

eliminate the *mafsadah* (damage). Similarly, if a benefit is equal to the *mafsadah* (damage), it takes precedence to eliminate the *mafsadah* (damage). If there are two *mafsadahs* (damage) in a case, the lesser of the two *mafsadahs* (damage) should be chosen.

The losses arising after implementing blockchain technology, as stated in Table 1, are not fatal because a solution can still be sought to overcome these losses. Where efforts to implement the solution can even lead to benefits, ignoring this technology can lead to critical future losses.

Table 1 Blockchain Advantage and Disadvantage

Advantages of Blockchain Technology	Disadvantages of Blockchain Implementation	Disadvantages of Neglecting Blockchain Implementation
1. Reduced third parties 2. Cost-effective 3. Energy efficiency 4. Time efficiency 5. Data immutability 6. Data security assurance 7. Data Transparency 8. Reduced data manipulation, creating data integrity 9. Access to information is fast, accurate, and real-time 10. Assurance of user identity and privacy	1. An IT expert is needed to manage, maintain, and hold responsibility and control over the company's servers (in addition to the transacting parties and important information holders). 2. More education is required for employees/employees/community. 3. Maintenance/maintenance of platforms and applications is quite serious. 4. Requires up-to-date equipment and solid infrastructure. 5. The majority of implementations facilitate the use of digital money. 6. According to *Shari'ah*, we still need a touch of human supervision to guarantee that the system will run smoothly. 7. The ability of blockchain to handle large transactions simultaneously still needs to be improved. 8. The certainty of the legal shade of taxation has yet to be guaranteed.	1. Vulnerable to cyber-attacks, security breaches, data theft and manipulation. 2. Non-transparency of the system (opportunities for fraud and deception) 3. Increased costs from dependence on third parties. 4. This leads to conflict or legal uncertainty due to a lack of integrity in ownership data and transaction history. 5. Slower and less efficient transaction process. 6. It hinders the

		ability to adopt new technologies.

Source: Data processed by the author

In addition, applying blockchain technology to business activities is a manifestation of *dar'u al-mafāsid* (preventing harm). The hardship that is eliminated by this technology is a form of eliminating *ḍarār* (harm). The backwardness in using the rapidly growing and beneficial technological advancements is also a form of *ḍarār* (harm) where there are disadvantages that can result from ignoring its development.

Implementing blockchain technology into business activities is a manifestation of *dar'u al-mafāsid* (preventing harm). The elimination of the harms arising from neglecting blockchain implementation is a form of removal of *ḍarār* (harm). The removal of *ḍarār* (harm) is nothing but a form of benefit. Based on the legal maxim "اَلضَّرَرُ يُزَالُ," the effort to implement blockchain technology for trade and business is an attempt to eliminate the *ḍarār* (harm) (*dar'u al-mafāsid*/preventing harm) caused by abandoning rapid and profitable technological advances. This elimination of *ḍarār* (harm) is nothing but a form of benefit itself following the purpose of the law based on *qaṣdu al-shāri'* (God's purpose) or the purpose of the lawmaker, which is to create benefits for humans.

The form of adaptation of blockchain technology into the Islamic economic industry that applies to this technological advancement lies in four aspects. First, blockchain implementation is the security and protection of data and information, such as zakat, waqf, and supply chain management. Second, blockchain is an aspect that provides efficiency in carrying out economic activities, such as the application of smart contracts in transactions. These two aspects of implementation fall into the category of *ḥājiyyah* (secondary) needs because blockchain is a complementary need and provides convenience for humans for their *ḍarūriyyah* (primary needs) needs in the form of *ḥifẓu al-māl* (protecting property).

The use of blockchain in the third aspect, namely as a platform for cryptocurrency transactions, is only a need that falls into the tertiary category. In Imam al-Shāṭibi's concept of *maqāṣid al-sharī'ah* (purposes of the *shari'ah*), tertiary needs are *taḥsīniyyah* needs, which will not complicate or threaten the existence of the five essential *ḍarūriyyah* (primary needs) because the use of digital money is still not a necessity that, if abandoned, can cause damage to humans. The use of blockchain in the third aspect, namely as a platform for cryptocurrency transactions, is only a necessity that falls into the tertiary category. Based on previous research, the use of cryptocurrency is haram (forbidden) because digital money contains *gharar* (uncertainty) from its high fluctuation due to its unclear underlying assets. Thus, the use of cryptocurrencies for transactions becomes a destroyer of *ḍarūriyyah* (primary needs) needs, namely from the aspect of *ḥifẓu al-dīn* (protecting religion).

The fourth aspect is the role of blockchain as a guarantor of tangible assets and the security of these transactions, which makes this technology necessary; if abandoned, it will cause damage to the property. The tokens of these tangible assets are included in wealth and become a *ḍarūriyyah* (primary needs) necessity. If the tokenised tangible assets are not

secured with a guaranteed security system, the tokens are in danger of being destroyed. The token model can guard against data theft, ownership transfer, and data deletion on the token. This condition makes blockchain technology a *darūriyyah* need to maintain the property so it is not lost or destroyed (*min jānibi al-'adam*/in terms of non-existence).

Aside from the category of necessity based on the aspects of the location of blockchain implementation in the Islamic economy, overall, the use of blockchain falls into the category of *ḍarūriyyah* (primary needs) in terms of the property maintenance/*min jānibi al-'adam* (in terms of non-existence) because the use of blockchain in Islamic economic transactions in the future will be very much needed. Implementing blockchain is a form of effort to work and strive for better results. One of them is by maximising the protection of wealth.

The implementation of blockchain technology in the Islamic economy is a form of *ḥifẓu al-māl* (protecting property) in terms of *min jānibi al-'adam* (in terms of non-existence) because information and data, as well as real asset tokens, are a form of wealth. Blockchain, in this case, becomes the guardian of these assets from scorching and a form of protection from something that can damage property.

CONCLUSION

Blockchain provides benefits that are a *maslahah* (expediency) for humans. The advantage lies in its implementation in digital transactions in the Islamic economic industry, shown by its decentralized nature, which eliminates the role of third parties in transactions. The *maslahah* (expediency) aspects also come from its immutability, which ensures unchangeable data and guarantees data integrity; maintains asset ownership data; increases operational efficiency to save time, costs, and energy; and provides data transparency and access to information quickly, accurately, and in real-time. Blockchain technology not only improves the operational ease of digital transactions but also protects wealth in the form of tokens generated from the digitization process of tangible assets.

Based on Imam al-Shāṭibi's concept of *maqāṣid al-sharī'ah* (purposes of the *shari'ah*), blockchain is considered *maslahah* (expediency) because the advantages and benefits it provides outweigh the *mafsadah* (damage) aspects. Its implementation eliminates *ḍarār* (harm), which is nothing but a form of benefit. Blockchain applications in the Islamic economic industry consist of four different points, with each different level of need. The aspect of blockchain implementation as a guarantor of data and information security and as an efficiency enhancer in conducting trade and business is a *ḥājiyyah* (secondary needs). As a facilitator of digital money/cryptocurrency transactions, it is haram and becomes a destroyer of the *ḍarūriyyah* (primary) needs, namely on *ḥifẓu al-dīn* (protecting religion). The aspect as security for real-world assets falls into the category of *ḍarūriyyah* needs *min jānibi al-'adam* (protection of primary needs from absence).

REFERENCES

Abdul Haq, Ahmad Mubarok, and Agus Ro'uf. *Formulasi Nalar Fiqh: Telaah Kaidah Fiqh Konseptual*. Buku Satu. Surabaya: Khalista Surabaya dan Kaki Lima Lirboyo, 2009.

Al Ikhlas, Desi Yusdian, Alfurqan, Murniyetti, and Nurjanah. "The Concept of Maqasid Al-Shariah As an Instruments of Ijtihad According to Imam al-Shatibi in al-Muwafaqat Fi Ushuli al-Shariah." *Media Syariah: Wahana Kajian Hukum Islam Dan Pranata Sosial* 23, no. 2 (2021). https://doi.org/10.22373/jms.v23i2.10138.

Ausop, Asep Zaenal, and Elsa Silvia Nur Aulia. "Teknologi Cryptocurrency Bitcoin Untuk Investasi Dan Transaksi Bisnis Menurut Syariat Islam." *Jurnal Sosioteknologi* 17, no. 1 (April 2018). https://doi.org/10.5614/sostek.itbj.2018.17.1.8.

Badan Pengembangan dan Pembinaan Bahasa. "KBBI VI Daring." Accessed November 16, 2023. https://kbbi.kemdikbud.go.id/.

Bahanan, Muhammad. "Analisis Pengaruh Penggunaan Teknologi Blockchain Dalam Transaksi Keuangan Pada Perbankan Syariah." *I'tishom: Jurnal Ekonomi Syariah* 2, no. 1 (April 2023).

Baznasko. "World Zakat Forum 2019 Lahirkan 7 Resolusi," November 8, 2019. https://baznaskotatanjungpinang.org/world-zakat-forum-2019-lahirkan-7-resolusi/.

Brilliyanto, Rafi. "Blockchain Dengan Prinsip-Prinsip Syariah," September 25, 2023. https://amf.or.id/blockchain-dengan-prinsip-prinsip-syariah/.

Center for Risk Management & Sustainability. "Mengenal Blockchain Dan Manfaatnya Bagi Dunia Bisnis," September 11, 2023. https://crmsindonesia.org/publications/mengenal-blockchain-dan-manfaatnya-bagi-dunia-bisnis/.

Chida, Eikoh, Masahiro Mambo, and Hiroki Shizuya. "Digital Money-A Survey." *Interdisciplinary Information Sciences* 7, no. 2 (2001). https://doi.org/10.4036/iis.2001.135.

Daley, Sam. "16 Blockchain Banking Examples to Know," December 1, 2023. https://builtin.com/blockchain/blockchain-banking-roundup.

Dattani, Janvi, and Harsh Sheth. "Overview of Blockchain Technology." *Asian Journal of Convergence in Technology* 5, no. 1 (n.d.). https://doi.org/10.33130/ajct.2019v05i01.013.

Di Pierro, Massimo. "What Is the Blockchain?" *Computing in Science & Engineering and the IEEE CS and the AIP*, October 2017. https://doi.org/10.1109/MCSE.2017.3421554.

Dimyati, Moh. Imron Rosyadi, and Achmad Fageh. "Smart Sukuk Berbasis Blockchain Tinjauan Maqasid Syariah Al-Najjar." *JIEI: Jurnal Ilmiah Ekonomi Islam* 9, no. 3 (2023). https://doi.org/10.29040/jiei.v9i3.10409.

Djalaluddin, Muhammad Mawardi. "Pemikiran Abu Ishaq Al-Syatibi Dalam Kitab al-Muwafaqat." *Al-Daulah* 4, no. 2 (December 2015).

Faozi, Mohamad, and Edo Segara Gustanto. "Kripto, Blockchain, Bitcoin, Dan Masa Depan Bank Islam: Sebuah Literatur Review." *Quranomic: Jurnal Ekonomi Dan Bisnis Islam* 1, no. 2 (2022).

Finterra. "Islamic Fintech." *FinTech* (blog), 2023. https://finterra.org/fintech/.

Frankenfield, Jake. “Nonce: What It Means and How It’s Used in Blockchain,” November 22, 2023. https://www.investopedia.com/terms/n/nonce.asp.

Iftikhar, Sarah. “Blockchain Based Retail Sukuk for Infrastructure Development and Financial Inclusion in Pakistan.” *Joural of Business Administration and Management Sciences* 4, no. 1 (January 2022). https://doi.org/10.58921/jobams.4.1.76.

Ihsan, Rafiqi. “Peluang Dan Tantangan Penggunaan Blockchain Technology Pada Perbankan Syariah Di Indonesia.” *E-QIEN: Jurnal Ekonomi Dan Bisnis* 11, no. 3 (November 2022).

Indodax. “Mengenal Keajaiban Real-World Asset (RWA) Dalam Dunia Nyata,” December 26, 2023. https://indodax.com/academy/apa-itu-rwa/.

Indonesia. Undang-Undang No. 23 tahun 2011 tentang Pengelolaan Zakat (n.d.).

International Business Machines Corporation. “What Are Smart Contracts on Blockchain?” Accessed December 15, 2023. https://www.ibm.com/topics/smart-contracts.

Jati, Hardian Satria, and Ahmad Arif Zulfikar. “Transaksi Cryptocurrency Perspektif Hukum Ekonomi Syariah.” *Jurnal Al-Adalah: Jurnal Hukum Dan Politik Islam* 6, no. 2 (July 2021). https://doi.org/10.35673/ajmpi.v6i2.1616.

Kara, Muslimin. “Pemikiran Al-Syatibi Tentang Maslahah Dan Implementasinya Dalam Pengembangan Ekonomi Syariah.” *ASSETS* 2, no. 2 (2012).

Kasdi, Abdurrahman. “Maqasyid Syari’ah Perspektif Pemikiran Imam Syatibi Dalam Kitab al-Muwafaqat.” *Yudisia: Jurnal Pemikiran Hukum Dan Hukum Islam* 5, no. 1 (June 2014).

Khallaf, Abdul Wahhab. *Ilmu Ushul Fiqih*. Translated by Moh. Zuhri and Ahmad Qarib. Semarang: Dina Utama Semarang, 2014.

———. *’Ilmu Uṣūli al-Fiqhi*. Beirut: Dar al-Kotob al-Ilmiyah, 2010.

Mawardi, Ahmad Imam. *Fiqh Minoritas: Fiqh Al-Aqaliyyāt Dan Evolusi Maqāshid al-Syarī’ah Dari Konsep Ke Pendekatan*. Yogyakarta: LKiS, 2010.

Mayangsari Rofam, Galuh Nashrullah Kartika, and Hasni Noor. “Konsep Maqashid Al-Syariah Dalam Menentukan Hukum Islam (Perspektif Al-Syatibi Dan Jasser Auda).” *Al-Iqtishadiyah: Jurnal Ekonomi Syariah Dan Hukum Ekonomi Syariah* 1, no. 1 (December 2014). https://doi.org/10.31602/iqt.v1i1.136.

Mohd Noh, Mohd Shahid, and Mohamed Syakir Abu Bakar. “Cryptocurency as A Main Currency: A Maqasidic Approach.” *Al-Uqud: Journal of Islamic Economics* 4, no. 1 (January 2020). https://doi.org/10.26740/al-uqud.v4n1.p115-132.

Muhammad as-Sa’id al-Jaza’iri. *Badru Al-Tamām Fi Ikhtiṣār al-I’tiṣām*. Dar al-Jinan al-Islamiyyah, 1991.

Mukherjee, Pratyusa, and Chittaranjan Pradhan. “Blockchain 1.0 to Blockchain 4.0—The Evolutionary Transformation of Blockchain Technology.” In *Blockchain Technology: Applications and Challenges*, edited by Sandeep Kumar Panda, Ajay Kumar Jena, Santosh Kumar Swain, and Suresh Chandra Satapathy, 29–49. Cham: Springer International Publishing, 2021. https://doi.org/10.1007/978-3-030-69395-4_3.

Namasudra, Suyel, and Kemal Akkaya. “Introduction to Blockchain Technology.” In *Blockchain and Its Applications in Industry 4.0*, edited by Kemal Akkaya and Suyel

Namasudra, 1–28. Singapore: Springer Nature Singapore, 2023. https://doi.org/10.1007/978-981-19-8730-4_1.

Nguyen, Giang-Truong, and Kyungbaek Kim. "A Survey about Consensus Algorithms Used in Blockchain." *JIPS: Journal of Information Processing Systems* 14, no. 1 (February 2018). https://doi.org/10.1109/ICBCTIS55569.2022.00050.

Nofer, Michael, Peter Gomber, Oliver Hinz, and Dirk Schiereck. "Blockchain." *Bus Inf Syst Eng* 59, no. 3 (March 20, 2017). https://doi.org/10.1007/s12599-017-0467-3.

Noorsanti, Rina Candra, Heribertus Yulianton, and Kristophorus Hadiono. "Blockchain - Teknologi Mata Uang Kripto (Crypto Currency)." *Prosiding Sendi_U*, 2018.

PermataBank. "PermataBank Dan Chandra Asri Gunakan Teknologi Blockchain Pertama Di Indonesia," November 25, 2021. https://www.permatabank.com/en/article/menjadi-pionir-permatabank-dan-chandra-asri-selesaikan-transaksi-trade-finance-menggunakan.

Priyadarshini, Ishaani. "Introduction to Blockchain Technology." In *Cyber Security in Parallel and Distributed Computing*, 91–107, 2019. https://doi.org/10.1002/9781119488330.ch6.

Saleh, Sirajuddin. *Analisis Data Kualitatif*. Bandung: Pustaka Ramadhan, 2017.

Septianda, Daffa Eka, Sitti Fatimah Khairunnisa, and Rachma Indrarini. "Blockchain Dalam Ekonomi Islam." *Sibatik Journal* 1, no. 11 (2022). https://doi.org/10.54443/sibatik.v1i11.407.

Shaṭibi, Abu Ishaq Ibrahim bin Musa bin Muhammad al-Lakhmi al-. *Al-Muwāfaqāt*, n.d.

Singh, Gurinder, Vikas Garg, and Pooja Tiwari. "Introduction to Blockchain Technology." In *Transforming Cybersecurity Solutions Using Blockchain*, edited by Rashmi Agrawal and Neha Gupta, 1–18. Singapore: Springer Singapore, 2021. https://doi.org/10.1007/978-981-33-6858-3_1.

Suryono, Muhammad Vicky Afris. "Legal Reforming of Smart Contract in Supply Chain Demands Process between Retailer and Consumer." *Jurnal Kajian Pembaruan Hukum* 3, no. 1 (2023). https://doi.org/10.19184/jkph.v3i1.33610.

Tanjung, Ahmad Fuadi, Patma Wati, and Nurlaila. "Penerapan Teknologi Blockchain Dalam Akuntansi Syariah." *Jurnal Masharif Al-Syariah: Jurnal Ekonomi Dan Perbankan Syariah* 8, no. 2 (2023).

Tono, Sidik. "Pemikiran Dan Kajian Teori Hukum Islam Menurut Al-Syatibi." *Al-Mawarid* 13 (2005).

Toriquddin, Moh. "Teori Maqashid Syari'ah Perspektif Al-Syatibi." *De Jure: Jurnal Syariah Dan Hukum* 6, no. 1 (June 2014). https://doi.org/10.18860/j-fsh.v6i1.3190.

Wepo. "Teknologi Blockchain Dan Keuangan Islam: Potensi Dan Tantangan," September 11, 2023. https://an-nur.ac.id/esy/teknologi-blockchain-dan-keuangan-islam-potensi-dan-tantangan.html.

Yaga, Dylan, Peter Mell, Nik Roby, and Karen Scarfone. *Blockchain Technology Overview*. United States: NIST: National Institute of Standards and Technology, 2018. https://doi.org/10.6028/NIST.IR.8202.

Yang, Jian, and Hong Shen. “Blockchain Consensus Algorithm Design Based on Consistent Hash Algorithm.” In *2019 20th International Conference on Parallel and Distributed Computing, Applications and Technologies (PDCAT)*, 461–66, 2019. https://doi.org/10.1109/PDCAT46702.2019.00090.

Yulianton, Heribertus, Rina Candra Noor Santi, Kristophorus Hadiono, and Sri Mulyani. “Implementasi Sederhana Blockchain.” *Prosding SINTAK* 2 (2018).