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# THE ROLE OF BLOCKCHAIN AS DIGITAL INFRASTRUCTURE IN SHARIA-BASED MSME FINANCING

**Hurriah Ali Hasan**
Universitas Muhammadiyah Makassar
Email: hurriahalihasan@unismuh.ac.id

***Abstract***

*This research aims to analyze the role of blockchain as a digital infrastructure to support sharia-based MSME financing in Indonesia. The focus of the research is directed at how blockchain can improve the transparency, accountability, and effectiveness of sharia contract processes such as murabahah, mudharabah, musyarakah, and qardhul hasan. The research uses an exploratory qualitative approach through semi-structured interviews with sharia MSME actors, sharia microfinance institutions (BMT and sharia cooperatives), blockchain technology providers, and sharia regulators. The data is strengthened through observation of the financing process and contract documentation. Data analysis was carried out using thematic coding techniques and source triangulation.The results of the study show that blockchain provides an immutable, transparent, and real-time transaction recording system so that it can improve the verification and monitoring process of sharia compliance. Blockchain enables the automation of margin calculation and profit sharing through smart contracts, reduces the risk of asymmetric information, and helps build a digital track record of MSMEs as the basis for assessing financing eligibility. However, the adoption of this technology is still hampered by low digital literacy, infrastructure readiness, and lack of sharia regulations related to new technologies.*

*The implementation of blockchain can increase the effectiveness of sharia MSME financing, simplify sharia audits, reduce the administrative burden of financing institutions, and expand access to financing for MSMEs. The findings of this study provide guidance for BMTs, sharia cooperatives, and regulators to develop a digital financing model that is secure, transparent, and in accordance with sharia principles.*

*This research offers an empirical understanding and conceptual model of blockchain as a digital infrastructure for sharia financing, a topic that is still very limited in the Indonesian literature. This study integrates the perspectives of MSME actors, financing institutions, technology providers, and regulators, resulting in a holistic analysis related to the readiness of the digital ecosystem for sharia-based MSME financing.*

***Keywords:*** *blockchain; digital infrastructure; Islamic finance; MSMEs*

## A. INTRODUCTION

Micro, Small and Medium Enterprises (MSMEs) have become one of the main pillars of the Indonesian economy which has a very strategic role in maintaining national economic stability and growth (Khumairo, Hersiyah, and Mashudi, 2025). Its contribution of more than 60% to the Gross Domestic Product (GDP) shows that MSMEs not only absorb a large number of workers, but also become the driving force of economic activity in various regions, including rural and suburban areas (Dawu et al., 2025). MSMEs are able to maintain the local economic turnover through equitable production, distribution, and consumption of goods and services, so that their existence greatly determines national economic resilience, especially in times of crisis (Siwiyanti et al., 2025).

With a very large and diverse population of business actors, MSMEs are an important foundation for economic inclusion and community empowerment, while opening up a wide space for innovation and creativity (Alie, 2025). According to data from the Ministry of Cooperatives and SMEs, by 2024, the number of MSMEs in Indonesia will reach more than 65 million units (Judijanto, 2025). However, despite having a large population, MSMEs still face obstacles in improving the quality of business governance, including through the use of digital technology (Khairani and Putri, 2025). Meanwhile, the current digital era requires MSMEs to be able to increase efficiency, transparency, and competitiveness in the modern economic era (Sovania, 2025).

The changing digital economy landscape requires MSMEs to adopt digital systems to remain relevant and competitive (Hidayatullah & Zuraidah, 2025). In the sharia finance sector, digitalization provides advantages in the form of easier data verification, neater transaction recording, and faster and more transparent access to financial services (Nurazizah & Vidiati, 2025). Digital systems are no longer just an option, but a need to ensure business continuity in the midst of competition and the demands of service speed (Hasibuan et al., 2025).

However, there are still many MSME actors who have not fully utilized digital technology, both due to limited digital literacy, uneven internet access, and lack of understanding of the long-term benefits of digitalization (Fathurrahman & Prawiro, 2025). This limitation results in MSMEs having difficulty preparing valid financial statements, slow to respond to market needs, and less able to meet the administrative requirements of sharia financing (Istiqomah et al., 2025). In contracts such as murabahah, mudharabah, and musyarakah, this delay is often an obstacle in the process of verifying business feasibility and analyzing financing risks.

Meanwhile, in the modern era of Islamic finance, the use of digital systems—including blockchain—has become increasingly important because it is able to provide accurate, transparent, and non-manipulative data (Mujennah et al., 2025). Digitalization can help MSMEs build a trustworthy transaction footprint for Islamic microfinance institutions, thereby simplifying the financing application process and increasing access to business capital (Hasibuan et al., 2025). The digital system also ensures that sharia principles such as trust, justice, and openness can be applied more consistently in financial relationships (Nurazizah & Vidiati, 2025). Therefore, MSMEs can no longer ignore the important role of digital transformation as a

foundation in business development and sharia financing (Fathurrahman & Prawiro, 2025).

Blockchain is a technology that can provide digital infrastructure to strengthen the sharia financing process (Noviarita et al., 2025). This digital technology is transparent and distributed in accordance with the principles of accountability and trust in sharia (Najwa & Syarif, 2025). A number of studies show that blockchain can reduce the risk of fraud, provide sufficient and relevant information, and improve sharia compliance (Istiqomah et al., 2025). On the other hand, blockchain as an Islamic financing infrastructure for MSMEs, its use is still very limited (Makarim et al., 2025). Therefore, this study analyzes the views of MSME actors related to blockchain and its use as data infrastructure in MSME financing (Hidayatullah & Zuraidah, 2025). This study also examines the potential of blockchain implementation for MSMEs and the obstacles faced in the use of blockchain (Hasibuan et al., 2025).

## B. LITERATURE REVIEW

### 1. Blockchain

Blockchain is a Distributed Ledger Technology (DLT) that allows transaction data to be stored decentrally across many nodes, so that it is no longer dependent on a single central authority (Mujennah et al., 2025). Every transaction that occurs is recorded in cryptographically interconnected blocks of information, so changes to one block will affect the overall structure (Mizwar & Nugroho, 2023). The main strength of blockchain lies in its fixed nature, where already recorded data cannot be changed without the network's approval (Suprapto et al., 2024). This makes blockchain particularly relevant for financial systems, supply chains, and the public sector that require a high level of transparency and data integrity (Alhashmi et al., 2022).

In addition to being fixed, blockchain also uses a consensus mechanism to validate transactions (Putra & Fajar, 2022). Mechanisms such as Proof of Work (PoW), Proof of Stake (PoS), and Practical Byzantine Fault Tolerance (PBFT) ensure that all nodes on the network reach an agreement on the validity of transactions without having to trust each other (Nugroho & Hidayatullah, 2024). Modern consensus technologies are increasingly efficient and adaptive to the needs of small and medium-sized industries, especially when used on permissioned-type blockchains (Makarim et al., 2025). This consensus works as a security mechanism against data misappropriation, cyberattacks, and transaction manipulation (Nasution et al., 2025).

Recent developments show that blockchain no longer only functions as a record of transactions, but has evolved into a digital infrastructure that supports smart contracts, digital identities (decentralized identities), and cross-platform interoperability (Alie, 2025). Blockchain has been widely used in the inclusive finance sector, MSMEs, as well as Islamic finance due to its ability to provide transparent transaction trails, automated trail audits, and risk reduction of unclear and irrelevant information (Hasibuan et al., 2025). By the ability to record transactions accurately, securely, and in real-time, blockchain is becoming a very important foundation in the

modern financial ecosystem, which demands high efficiency and unconditional trust between parties (Najwa & Syarif, 2025).

## 2. The Potential of Blockchain in Sharia-Based MSME Financing

### a. Price Transparency and Proof of Transaction

Transparency of cost of goods and margin is the main requirement for transactions to run in accordance with sharia principles, for example in murabahah transactions (Thong, 2025). Murabahah is a sale and purchase contract in which Islamic financial institutions buy goods needed by MSMEs, then resell them to business actors at the cost of goods plus the agreed profit margin (Tarmizi et al., 2024). This contract is the most popular form of financing because it is simple, measurable, and relatively low risk (Nurazizah & Vidiati, 2025). However, in practice, murabahah faces the challenge of verifying transaction documents such as purchase invoices, proof of handover of goods, and suitability of the use of funds (Mujennah et al., 2025). Many MSMEs do not have neat business records, unclear proof of purchase of goods, price manipulation, or incomplete transaction documents, making it difficult for financing institutions to ensure that transactions are in accordance with sharia contracts (Najwa & Syarif, 2025).

Blockchain can avoid this situation by providing records of proof of purchase, invoices, cost of goods, margins, and transaction flows in an immutable and timestamped manner (Thong, 2025). Every document or transaction uploaded to the blockchain cannot be changed, increasing the trust of finance institutions in MSMEs (Suprapto et al., 2024). In addition, smart contracts can validate that the margin, payment schedule, and handover of goods are in accordance with the contract (Thong, 2025). Thus, blockchain reinforces the principles of transparency (tabyīn) and honesty (amanah) in murabahah (Hasibuan et al., 2025).

### b. Automatic Profit and Profit Sharing Validation

Mudharabah is a cooperation agreement between the owner of the capital (shahibul maal) and the business manager (mudharib), where the profits are divided based on the agreed ratio, while the losses are borne by the owner of the capital unless there is negligence of the manager (Thong, 2025). This financing is ideal for MSMEs that have growth potential but lack capital (Tarmizi et al., 2024). The main challenge is the need for transparency of business reports as finance institutions rely heavily on revenue and cost data for profit sharing calculations (Mujennah et al., 2025). If MSMEs do not have good bookkeeping, then the risk of asymmetric information is higher (Najwa & Syarif, 2025). Monitoring sharia compliance is also an obstacle, especially in ensuring that businesses do not violate halal principles (Istiqomah et al., 2025). Therefore, an accurate and auditable digital system is the main need in mudharabah financing.

In mudharabah contracts, the main source of risk is the inaccuracy of business reports that affect the calculation of the profit sharing ratio (Nugroho & Hidayatullah, 2024). MSMEs often have difficulty making manual financial reports, resulting in information asymmetry between business managers and capital owners (Fathurrahman & Prawiro, 2025). Blockchain can help address these risks

by providing automatic recording of revenue, costs, stock, and business transactions through point-of-sale integration or digital finance applications (Alhashmi et al., 2022). Transaction data that cannot be manipulated helps financial institutions ensure that profit sharing calculations are made based on real data, not on subjective reports (Hasibuan et al., 2025). *Smart contracts can be used to calculate and distribute revenue sharing automatically according to the agreed ratio* (Thong, 2025). Thus, blockchain strengthens the principle of justice (al-'adl) and reduces gharar in mudharabah (Nurazizah & Vidiati, 2025).

**c. Capital Transparency and Profit Sharing**

Musharakah is a cooperation contract in which two or more parties include capital to run a business together, then the profits are divided according to the portion of the capital contribution or other agreements that are valid according to sharia (Mutamimah & Kartika, 2023). In MSME financing, musharakah is considered flexible because it allows financial institutions to own a portion of the business and bear the risk (Rahmi et al., 2025). The obstacles arise in the process of transparency of business operations, especially the recording of incoming capital, business expenses, and real profits that need to be shared proportionally (Kismawadi, 2024). Without a good digital recording system, there are often differences in perception or data mismatches between MSMEs and financial institutions (Mutamimah & Kartika, 2023). Sharia monitoring must also ensure that business activities are in accordance with halal principles, so real-time recording technology is needed to ensure the accuracy and accountability of musharakah (Alsadi, 2025).

In deliberation, both MSMEs and financial institutions include capital and bear both risks. The problems that often arise in this cooperation are the recording of incoming capital, capital expenditures, and the amount of real profits that must be divided. Blockchain allows for transparent recording of capital so that each participant can see their own capital contribution (Kismawadi, 2024). All transactions of business expenses, purchase of raw materials, and income, are clearly recorded on the blockchain so that both parties have identical data (Fauzan, 2025). This can avoid suspicion of each other who are cooperating. Smart contracts in blockchain can regulate the distribution of profits automatically each period according to the portion of capital or agreements (Mousavi et al., 2025). Thus, blockchain strengthens accountability, clarity of roles, and fairness of profit-sharing in deliberation.

**d. Monitoring the Utilization of Funds and Social Track Record**

Qardhul Hasan is a no-return loan contract where MSMEs are only obliged to return the principal of the loan within a certain period of time (Hafidzi et al., 2025). This contract is social in nature and is widely used by BMT, zakat institutions, or sharia cooperatives for the empowerment of micro enterprises (Zafar & Jafar, 2025). The biggest challenge in its implementation is to ensure that funds are actually used for business activities and not personal consumption (Aderemi & Ishak, 2023), because there is no margin or return, making financing

institutions rely heavily on the honesty and transparency of MSMEs (Nadya et al., 2024). Another problem is the monitoring of loan repayments which is often constrained by the lack of adequate transaction records. Therefore, a digital system is indispensable in qardhul hasan financing, both to monitor the use of funds and to build a track record (credit history) that can help MSMEs access greater financing in the future (Hassan et al., 2022).

The biggest challenge in managing funds in qardhul hasan is to ensure that the recipient of the funds uses the loan for business purposes, not for personal consumption. Because of its social nature and no returns, sharia microfinance institutions urgently need clarity on the use of funds. Blockchain can help record the flow of qardhul hasan funds, ensuring that funds are used for transactions relevant to the business. Through a transparent digital recording system, institutions can monitor the progress of the borrower's business (Tayachi, 2019). Additionally, blockchain creates a digital track record that can serve as the basis for a feasibility assessment for subsequent financing. Smart contracts can set up refund reminders automatically without an interest element (Hassan et al., 2022). Thus, blockchain reinforces the principles of ihsan and amanah in qardhul hasan.

## C. METHOD

The research method used in this study is qualitative exploration, which aims to explore in depth the understanding, experience, and perception of stakeholders regarding the potential use of blockchain as digital infrastructure in sharia-based MSME financing. The data source was obtained from MSME actors and BMT managers as sharia microfinance providers for MSMEs. Data was collected through semi-structured interview techniques that allowed researchers to explore information flexibly and in-depth (Rashid et al., 2023), observation of the financing process in Islamic institutions to see operational dynamics, as well as documentation of financing contracts, transaction reports, and administrative records as supporting material for data validity.

All collected data was analyzed using a thematic coding approach, starting with a data reduction process to select relevant information, then grouping the findings into main themes related to contract transparency, digitalization needs, blockchain potential, and implementation challenges (Zafar & Jafar, 2025). The validity of the findings is strengthened through source triangulation, which is comparing information from different groups of informants to ensure data consistency (Tayachi, 2019). The results of the analysis were then used to develop a conceptual model that illustrates how blockchain can function as a digital infrastructure that supports the sharia-based MSME financing process effectively, transparently, and in accordance with sharia principles.

## D. RESULT AND DISCUSSION

### 1. Blockchain in the view of MSME Actors

The findings of the study show that most MSME actors in Indonesia still have a limited level of understanding of blockchain technology. The majority of informants know the term "blockchain" only in the context of crypto assets, not as a digital recording technology that can increase transparency and business efficiency. MSME actors usually still rely on manual recording through notebooks, simple applications such as WhatsApp, Excel, or even just remembering transactions without written evidence. This condition makes them vulnerable to miscalculations, data loss, and difficulty in making financial reports needed for sharia financing applications. However, after being given an explanation of the benefits of blockchain—such as automatic transaction recording, data that cannot be manipulated, and the ease of contract verification—many MSME actors showed interest because they thought that the technology could help overcome the problems of transparency and business management which have been the main obstacles.

In addition, MSME actors admit that they often face data mismatches between sales, stock of goods, and business capital which results in weak transaction evidence when applying for financing. Some MSME actors mentioned that financing institutions often ask for sales reports or proof of capital use that they find difficult to provide in full. With the problems that are commonly faced by MSME actors, blockchain is considered to have great potential to help in handling these problems, especially in recording transactions in real-time and transparently. Thus, MSME actors no longer need to prepare manual reports that are prone to errors.

However, some MSME actors still feel doubtful about new technology due to limited digital literacy and concerns about costs. This causes the use of blockchain among MSME actors to be accompanied by assistance and application simplification.

### 2. Blockchain as an MSME Financing Data Infrastructure

In the sharia financing system, sharia microfinance institutions such as BMTs or sharia cooperatives need valid business data to assess feasibility and monitor sharia compliance. The results of the study show that blockchain can act as a data infrastructure that provides a complete and immutable trace of business transactions. The finance institution explained that their challenge lies in verifying documents such as purchase receipts, proof of sales transactions, or stock reports, because many MSMEs do not have neat transaction records. The use of blockchain in helping financing providers in recording, where every business transaction can be recorded automatically and stored in a ledger that can be accessed by both parties, namely the financing provider and users, securely. This makes the verification process faster, reduces the potential for data manipulation, and strengthens the principle of trust in sharia financing.

In addition, blockchain also opens up opportunities for the implementation of smart contracts in MSME financing. In the murabahah contract, smart contracts can be used to record the cost of goods, profit margins, proof of handover of goods, and payment schedules automatically. In mudharabah and musyarakah contracts, blockchain can present real-time data on business income and expenditure so that

financial institutions can find out the real profit that is the basis for profit sharing. With this model, blockchain not only becomes a data storage medium, but also becomes a sharia control and audit mechanism that strengthens financing accountability. This is particularly relevant in the Indonesian context, where financing monitoring is often constrained by distance, limited human resources of financial institutions, and lack of data integration between parties.

**3. Potential of Blockchain Implementation for Sharia MSMEs**

The results of the study identified four main potentials for blockchain implementation for sharia-based MSME financing in Indonesia. First, blockchain can increase transaction transparency, as all financial activities are recorded automatically without being able to be changed. This helps financing institutions ensure that the use of funds is in accordance with sharia contracts and is not misused. Second, blockchain can expand access to sharia financing through the creation of digital track records. MSMEs that previously had difficulty showing business performance, with the support of blockchain, can build a digital reputation based on actual data.

Third, blockchain supports the automation of sharia financing through smart contracts. For example, the distribution of mudharabah proceeds can be calculated automatically based on the income recorded on the blockchain. This reduces the risk of disputes and ensures the principle of fairness in transactions. Fourth, blockchain can support the traceability of halal goods and products, which is increasingly important for food and cosmetic MSMEs that want to enter the export market or meet national halal standards. With a system that records the origin of raw materials, production processes, and distribution, MSMEs can provide product authenticity assurance to customers, increasing product trust and added value.

**4. Obstacles to MSMEs in Blockchain Utilization**

Although blockchain has great potential in supporting MSME business activities, research found that MSMEs in Indonesia face several important obstacles in their utilization. The biggest obstacle is the low digital literacy, especially among micro business actors who are still running businesses traditionally. Many business actors are not familiar with simple digital applications such as e-commerce, digital record-keeping, or application-based financial systems, so introducing more complex blockchain technology requires gradual education. Another obstacle is the limited cost of providing devices, internet connections, and training in the use of new technologies. Some MSME actors expressed concern that digital technology would increase operational burdens or require special human resources, which cannot be fulfilled by businesses that are still small-scale.

Meanwhile, from the technical side, there are other obstacles, namely the limitation of supporting infrastructure such as stable internet connections in rural areas, the lack of integration between blockchain systems and existing MSME applications, and the absence of special sharia regulations that regulate the use of blockchain in financing contracts. Islamic microfinance institutions also recognize that blockchain implementation requires organizational readiness and changes in work

patterns, especially in the audit process, contract verification, and financing reports. Therefore, although blockchain technology has great potential, the success of its implementation in sharia MSMEs in Indonesia depends on ecosystem support, training, and technology adaptation that is easy for MSME actors to understand.

## E. CONCLUSION

This research concludes that blockchain has a strategic role as a digital infrastructure in sharia-based MSME financing. From the perspective of MSME actors, blockchain can answer fundamental problems in the form of unorganized recording, lack of proof of transactions, and the need for transparency in financing applications. For Islamic microfinance institutions, blockchain strengthens the contract verification and monitoring process through immutable transaction recording, automated trail audits, and smart contract integration capabilities in murabahah, mudharabah, musyarakah, and qardhul hasan contracts. At the system level, blockchain opens up opportunities to increase access to financing through the formation of a digital track record of MSMEs and the reduction of the risk of asymmetric information which has been the main obstacle to sharia financing.

However, the research also found that blockchain adoption still faces various obstacles such as low digital literacy in MSMEs, limited costs and technological devices, uneven internet infrastructure, and the absence of sharia regulations that specifically regulate the implementation of blockchain. Thus, the successful implementation of blockchain in sharia MSME financing requires comprehensive support in the form of technology education, digital mentoring, system integration in microfinance institutions, and more adaptive regulatory policies. Overall, blockchain has great potential to strengthen the principles of trust, transparency, and fairness in sharia financing in Indonesia.

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