

SYSTEM DESIGN SECURITY EFFECTIVE ISLAMIC FINANCE FOR ISLAMIC FINANCIAL INSTITUTIONS IN INDONESIA

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Abstract: This article aiming For to design system security appropriate finance with sharia principles for institution Islamic finance in Indonesia. This study merge approach literature , interview with practitioners , and surveys to 65 respondents , consisting of from manager finance , auditors, and academics . The results of the study show that system effective security must covers management risk technology , customer data protection , and Sharia compliance . This article also presents design system security based on integration blockchain technology and values maqashid sharia which can implemented by the institution Islamic finance in Indonesia.

Keywords: System Security, sharia principles, Islamic Finance

Introduction

System Islamic finance in Indonesia continues developing , supported by regulation and improvements interest public to product finance sharia- based . However , progress This is also accompanied by challenges related security finance , such as risk technology , fraud , and data protection . As a country with the world's largest Muslim population , Indonesia needs system security Islamic finance that is not only fulfil standard technical , but also in line with sharia values (Judijanto, Muhtadi, et al., 2024).

Islamic finance in Indonesia has experienced significant growth and continuous development, driven by supportive regulations, increasing public awareness, and rising interest in Sharia-based financial products (Hidajat, 2020). The government, through regulatory bodies such as Otoritas Jasa Keuangan (OJK) and Bank Indonesia (BI), has actively encouraged the expansion of Islamic financial institutions, including Islamic banks, Islamic microfinance institutions, takaful (Islamic insurance), and sukuk (Islamic bonds). This development aligns with the country's goal of becoming a global hub for Islamic finance, leveraging its position as the nation with the largest Muslim population in the world.

However, despite its promising growth, the Islamic financial system in Indonesia also faces complex challenges, particularly in financial security. As digital transformation accelerates within the financial sector, technological risks, fraud, cyber threats, and data protection issues have become increasingly prominent. These challenges threaten not only financial stability and institutional trust but also the ability of Islamic finance to uphold Sharia principles in a digital environment (Farhan et al., 2024).

Literature Review

Concept of Islamic Finance Islamic finance

Operates in accordance with Sharia principles, avoiding riba (interest), gharar (uncertainty), and haram (prohibited) activities . the application of these principles in Indonesia, the country with the largest Muslim population, creates a pressing need for effective security systems to protect assets and user information. Information Security Information security is a crucial aspect in the operations of financial institutions. state that information security encompasses the protection of data from unauthorized access, misuse, and damage. In the context of Islamic financial institutions, security systems must integrate Sharia values to foster trust among customers (Aisyah et al., 2024).

Security System Design Effective

Security system design involves several components, including authentication, authorization, and auditing , emphasizes that a good design must consider the risks and threats it may face. In Islamic financial institutions, this approach should be tailored to specific needs and challenges encountered. Security Challenges in Islamic Financial Institutions note that Islamic financial institutions in Indonesia face challenges such as cyberattacks, lack of security awareness among employees, and ever-changing regulations. Therefore, it is essential to have an adaptive and responsive security system to address these challenges. Regulations and Security Standards The Indonesian government, through the Financial Services Authority (OJK), has established regulations aimed at enhancing security in Islamic financial institutionshighlights that compliance with international security standards is also critical to maintaining the integrity of the financial system (Wardi et al., 2024).

Case Studies and Implementation

Several case studies indicate that Islamic financial institutions implementing comprehensive security systems have successfully reduced data breach incidents and cyberattacks. Relevant examples include the adoption of blockchain technology to enhance transaction security (Firmansyah, 2023).

Method

Approach Research:

Combination approach qualitative and quantitative used For understand need system sharia security.

1. Primary Data:

a) Survey done of 65 respondents consisting of from practitioner Islamic finance, regulators, and academics.

b) Interview deep with 5 experts technology Islamic financial (fintech).

2. Data

Processing: Data is analyzed use method Analytic Hierarchy Process (AHP) for determine priority element security.

Results and Discussion

1. Identification Element System Security Islamic Finance

From the analysis of surveys and interviews, three key elements have been identified as crucial for enhancing the security, compliance, and operational risk management of financial institutions, particularly in Islamic banking.

The first element, Protection Technology, involves the integration of blockchain and data encryption to ensure the security of transactions. Blockchain technology provides a decentralized and tamper-resistant system, enhancing transparency and preventing fraud. Meanwhile, data encryption safeguards sensitive financial information from cyber threats, ensuring that transactions remain confidential and secure (Maulana, 2022).

The second element, Compliance, focuses on the implementation of an automated Sharia audit system to verify adherence to Islamic financial principles. This system helps institutions maintain compliance by continuously monitoring transactions and contracts, ensuring that all financial activities align with Sharia law. By automating the audit process, the system reduces human error, enhances efficiency, and strengthens regulatory oversight (Wati & Yazid, 2023).

The third element, Operational Risk Management, involves the mitigation of potential risks that may arise from both internal and external threats. This includes implementing risk assessment frameworks, developing contingency plans, and adopting proactive measures to address financial, technological, and regulatory risks. By having a structured risk management process, financial institutions can anticipate potential threats and safeguard their stability and reputation.

Overall, the integration of these three elements—protection technology, compliance, and operational risk management—plays a vital role in ensuring a secure, transparent, and Sharia-compliant financial system (Judijanto, Tubagus, et al., 2024).

2. Priority Element Security (AHP)

The results of the **Analytical Hierarchy Process (AHP) analysis** indicate the priority weight of three key elements in ensuring the security, compliance, and risk management of financial institutions. The weight distribution is as follows:

1. **Protection Technology (0.50)** – This element holds the highest priority, with a weight of **50%**, indicating that integrating blockchain and data encryption is the most critical factor in securing transactions. The emphasis on protection technology suggests that safeguarding financial data from cyber threats and fraud is a top concern in the system's development and implementation.
2. **Operational Risk Management (0.30)** – With a weight of **30%**, operational risk management is the second most important element. This highlights the need for effective risk mitigation strategies to address both internal and external threats. Ensuring stability through proper risk assessment, contingency planning, and proactive measures is essential to maintaining the institution's resilience.
3. **Sharia Compliance (0.20)** – This element has a weight of **20%**, reflecting its importance in ensuring that all financial transactions align with Islamic principles. While compliance is a crucial aspect of Islamic financial institutions, the lower weight suggests that technology and risk management are prioritized to support and enhance compliance rather than being the primary focus.

Overall, the AHP analysis demonstrates that while **Sharia compliance remains essential**, **protection technology and operational risk management take precedence** in securing and stabilizing financial operations. This prioritization ensures a **robust, secure, and**

compliant financial system that aligns with both technological advancements and Islamic financial principles.

System Design Security

1. Architecture System Security Islamic Finance

The system is designed with four main components to ensure security, transparency, compliance, and risk management in financial transactions. These components include:

1. **Blockchain-Based Transaction Ledger** – This component serves as a decentralized digital ledger that records every transaction with **high transparency and security**. By utilizing blockchain technology, all transactions become **immutable and traceable**, reducing the risk of fraud and unauthorized alterations.
2. **Sharia Compliance Checker** – This is an **AI-powered algorithm** designed to verify whether each transaction adheres to **Sharia principles** and the applicable **fatwas**. The system automatically cross-checks transactions against predefined Islamic financial rules, ensuring compliance and reducing the need for manual verification.
3. **Risk Management Module** – An **AI-driven tool** that continuously monitors and assesses **operational risks** in real time. This module helps detect potential threats, anomalies, or compliance issues, allowing institutions to take **proactive measures** to mitigate financial, regulatory, and cybersecurity risks.
4. **Customer Data Encryption** – To protect **user privacy**, the system incorporates advanced **data encryption technology**, ensuring that sensitive customer information remains **secure and confidential**. Encryption prevents unauthorized access and safeguards financial data from cyber threats.

By integrating these **four key components**, the system enhances **security, compliance, risk management, and data privacy**, making it a **robust and reliable solution** for modern financial institutions, especially those operating under **Islamic finance principles**.

2. System Design Image

Following is illustration design system security proposed Islamic finance:

plaintext

Copy code

[User/ Customer] --> [Customer Data Encryption]

--> [Blockchain-Based Ledger] --> [Shariah Compliance Checker]

--> [Risk Management Module]

(Image will be produced in a way graphic)

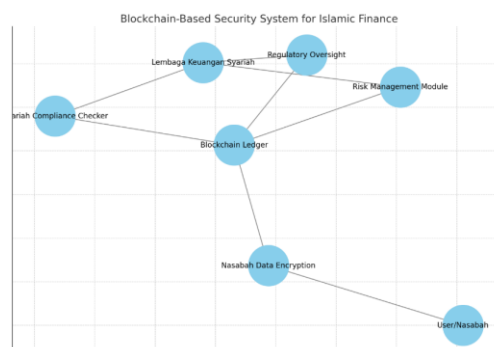


Figure 2. Blockchain-Based Security

The image above show design system security finance blockchain based for institution Islamic finance . Here explanation flow and its components :

The system is designed with a comprehensive structure to ensure secure, transparent, and Sharia-compliant financial transactions. Each component plays a crucial role in maintaining the integrity, reliability, and efficiency of financial operations, particularly in Islamic financial institutions. Below is a detailed explanation of the key components and their functions:

1. User/Customer

Customers are the primary users of the system, accessing it to perform various financial transactions and services such as deposits, withdrawals, fund transfers, and investment activities. The system is designed to provide a seamless, user-friendly experience while ensuring that customers can conduct their financial activities securely and in compliance with Islamic finance principles (Meidiandra et al., 2023).

2. Customer Data Encryption

Before customers can access the main system, their data undergoes encryption to guarantee privacy and security. This encryption process ensures that sensitive personal and financial information is protected from unauthorized access, cyber threats, and potential data breaches. By implementing advanced cryptographic techniques, the system maintains the confidentiality of customer data, preventing malicious actors from exploiting vulnerabilities.

3. Blockchain Ledger

All financial transactions conducted within the system are recorded on a blockchain-based ledger. This ensures high levels of transparency, reliability, and protection against data manipulation. The decentralized nature of blockchain technology makes it virtually impossible to alter, delete, or falsify transaction records, thereby enhancing trust in the system. Every transaction is time-stamped and permanently stored, allowing both customers and financial institutions to verify their transaction history with absolute certainty. This feature significantly reduces the risk of fraud and promotes ethical financial practices in accordance with Islamic finance principles.

4. Sharia Compliance Checker

A critical component of the system is the Sharia Compliance Checker, which is an automated module that verifies whether every financial transaction adheres to Islamic financial principles. This module cross-references each transaction with established Sharia guidelines and fatwas to ensure that all financial activities remain free from *riba* (interest), *gharar* (excessive uncertainty), and *maysir* (gambling-like speculation). By integrating this compliance mechanism, the system guarantees that financial institutions can operate with full confidence in their adherence to Islamic ethical standards. This also simplifies the compliance process by reducing the reliance on manual audits, thus increasing efficiency (Prasetya & Rohmah, 2023).

5. Risk Management Module

The Risk Management Module is designed to identify, monitor, and mitigate risks associated with financial transactions and operational activities. Using artificial intelligence (AI) and machine learning, this module continuously analyzes transaction patterns, detects anomalies, and flags potential threats such as fraudulent activities, cyberattacks, and regulatory violations. The system also provides real-time alerts and predictive risk assessments, enabling financial institutions to take proactive measures in addressing potential risks before they escalate. By implementing a robust risk management framework, the system enhances overall stability, security, and operational resilience.

6. Islamic Financial Institutions

Islamic financial institutions act as the primary executors of transactions and services within the system. They utilize various security and compliance modules to ensure that financial operations remain secure, efficient, and compliant with Islamic finance principles. These institutions benefit from the blockchain ledger's transparency, the Sharia Compliance Checker's automated verification, and the Risk Management Module's continuous oversight. By integrating these technologies, Islamic financial institutions can offer customers innovative financial products and services while maintaining a strong commitment to ethical and Sharia-compliant business practices (Wang et al., 2024).

7. Regulatory Oversight

Regulatory authorities play a crucial role in ensuring that all transactions within the system comply with both governmental and Sharia financial regulations. They oversee financial activities recorded on the blockchain ledger, ensuring that institutions adhere to legal, ethical, and financial guidelines. By leveraging blockchain technology, regulators can conduct efficient audits, track financial activities in real time, and enforce compliance standards with greater transparency. This oversight helps build public trust in the system and strengthens the credibility of Islamic financial institutions.

System This designed For support security , efficiency and trust public to institution Islamic finance

The system is designed with several key advantages that enhance security, transparency, efficiency, and compliance with Islamic financial principles. By integrating advanced technologies such as blockchain and data encryption, the system ensures that transactions are secure, tamper-proof, and compliant with Sharia regulations. The following are the major strengths of the system:

1. Transparency

One of the most significant advantages of this system is its high level of transparency. All financial transactions are recorded on a blockchain ledger, ensuring that every transaction is accurate, traceable, and immutable. Unlike traditional financial systems, where transaction records can be altered or manipulated, blockchain technology prevents unauthorized modifications, making the system highly reliable and trustworthy.

Furthermore, while all transactions are securely stored on the blockchain, access to transaction records is limited to authorized auditors and regulators. This selective access ensures that financial institutions and regulatory bodies can monitor, verify, and audit transactions while maintaining customer privacy and data security. The transparency provided by blockchain technology reduces the risk of financial fraud, corruption, and unethical practices, thereby fostering greater trust in Islamic financial institutions.

2. Sharia Compliance

Another key advantage of the system is its automated Sharia compliance verification. Unlike traditional Islamic financial institutions that rely on manual audits and human intervention to ensure Sharia compliance, this system integrates an AI-powered Sharia Compliance Checker that automatically verifies each transaction against predefined Islamic financial principles and fatwas.

The system ensures that all transactions remain free from *riba* (interest), *gharar* (excessive uncertainty), and *maysir* (gambling-like speculation). If a transaction does not comply with Islamic financial regulations, the system flags it immediately, preventing unauthorized or non-compliant activities. This automation significantly reduces human error, enhances operational efficiency, and strengthens adherence to Islamic financial ethics.

By ensuring strict compliance with Islamic finance rules, the system enhances credibility and trustworthiness, attracting customers who prioritize ethical and Sharia-compliant financial services. This feature also helps Islamic financial institutions meet regulatory requirements while improving their operational efficiency (Matondang et al., 2024).

3. High Security

Security is a fundamental aspect of this system, achieved through the integration of data encryption and blockchain technology.

- **Data Encryption for Customer Privacy:** Before customer data enters the main system, it is encrypted using advanced cryptographic techniques. This encryption process ensures that personal and financial information remains confidential and protected from cyber threats such as hacking, identity theft, and unauthorized access. Only authorized parties with decryption keys can access sensitive data, thereby maintaining customer privacy and security.
- **Blockchain Technology to Prevent Manipulation:** Unlike traditional databases, where transaction records can be modified or deleted, blockchain ensures that once a transaction is recorded, it cannot be altered or tampered with. Each transaction is securely stored in a distributed ledger, making it highly resistant to fraud, data breaches, and cyberattacks.

This dual-layer security approach—data encryption for privacy and blockchain for tamper-proof records—creates a robust and resilient financial system that safeguards customer data and financial transactions from both internal and external threats.

4. System Designed for Security, Efficiency, and Public Trust

The overall architecture of this system is carefully designed to support three core principles:

1. **Security:**
 - 1) By combining data encryption, blockchain technology, and automated risk management, the system protects financial transactions, prevents fraud, and ensures regulatory compliance.
 - 2) The automated monitoring and AI-powered risk detection further enhance security, identifying and mitigating threats before they can cause harm.
2. **Efficiency:**
 - 1) The automation of Sharia compliance checks and risk assessments significantly reduces manual work, eliminates human error, and speeds up transaction processing.
 - 2) Blockchain technology ensures that transactions are recorded and verified instantly, improving the efficiency of financial operations.
3. **Public Trust in Islamic Financial Institutions:**
 - 1) Transparency in financial transactions, combined with high security and automated compliance verification, fosters public confidence in Islamic financial institutions.
 - 2) Customers and stakeholders can trust that their transactions are protected, ethical, and compliant with Sharia principles.

The strong regulatory oversight ensures that financial institutions operate with integrity and accountability, further enhancing trust (Ihsan, 2022).

Conclusion

System design security effective Islamic finance must integrate modern technologies such as blockchain, management risk AI- based , and modules sharia compliance . Implementation system This will help institution Islamic finance in Indonesia is increasing trust customers and support sustainable growth .

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