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The blockchain-based sharia accounting system: strengthening compliance of islamic rural banks in Indonesia

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ABSTRACT

This research discusses the implementation of blockchain technology in Sharia accounting systems to strengthen compliance with Sharia principles, enhance transparency, and strengthen the resilience of institutions at Islamic Rural Banks (BPRS) in Indonesia. The increasing cases of bankruptcy in BPRS due to weak governance and fraudulent practices highlight the need for secure, transparent, and accountable financial infrastructure. Blockchain, with its characteristics of immutability and cryptographic verification, provides a mechanism for recording financial transactions permanently, transparently, and in compliance with Sharia principles, free from elements of riba, gharar, and maysir. This study uses a Hybrid Spiral-Agile approach integrated with the V-Validation model and the Sharia Compliance Loop to develop a blockchain-based accounting system that automates Sharia contracts such as Murabahah, Ijarah, and Mudharabah through smart contracts, enhancing auditability and maintaining data integrity. The research findings indicate that the application of blockchain can speed up the audit process, reduce human errors, and minimize the potential for fraud. Thus, blockchain functions not only as a financial technology innovation but also as a digital trust infrastructure that strengthens ethical governance, transparency, and sustainability in the Sharia finance ecosystem in Indonesia.

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1. INTRODUCTION

Based on the compiled cases of BPRS closures/license revocations in 2022–2025, there were 11 incidents over four years, with the highest number in 2024 (4 cases), followed by 2022 (3), 2025 (2), and 2023 (2). Most revocations were driven by solvency and liquidity problems—mainly the inability to meet or improve capital adequacy and liquidity ratios. Risk also escalated in several cases, shown by failed recovery efforts despite special recovery status and one case entering liquidation, suggesting the issues had moved beyond temporary stress to recovery failure. From a “crisis of confidence” perspective, repeated cases in a short period and reasons linked to the ability to repay obligations (liquidity) can weaken public trust in the BPRS segment. From a “bankruptcy risk”

perspective, weak capital, liquidity pressure, poor asset quality (high non-performing loans), and unsuccessful recovery measures describe a clear path from financial distress to license revocation. From a governance perspective, the dominant triggers point to weak risk governance and prudential compliance, especially in liquidity and capital management, credit risk controls, and the effectiveness of remedial actions under special supervision (Patricia Yasintha Desi Abigail, 2025; Selvi Mayasari, 2024; Zulhilmi Yahya, 2025). Indonesia's Sharia banking sector, especially Islamic Rural Banks (BPRS), has faced serious challenges, including frequent liquidations and bankruptcies due to weak governance, fraud, and low transparency in financial reporting (Verda Nano Setiawan, 2025). OJK data shows that many Islamic microfinance institutions lost their licenses for failing to meet Sharia compliance and prudential standards, which has caused a crisis in public trust. This highlights the need for a secure and transparent Sharia accounting system to restore BPRS integrity and sustainability. Previous studies suggest that blockchain can improve transparency and accountability. Jameaba (2020) calls blockchain a trust protocol that reduces reliance on intermediaries and manipulation risk, while Antova & Tayachi (2019) say smart contracts can automatically verify and enforce terms to support Sharia compliance and reduce gharar. However, research on using blockchain in Sharia accounting for Indonesian BPRS is limited, especially given their resource constraints and local regulations.

The most specific research gap lies in the absence of an end-to-end mechanism that closes Sharia compliance from contract execution to reporting: contract verification and contract-to-journal mapping are not consistently enforced before posting; DPS approvals are not embedded as transaction-level system controls; audit trails and compliance evidence are not tamper-resistant; and reconciliation across contract documents, sub-ledgers, and reporting remains manual and ex-post. Blockchain is more suitable than merely strengthening a conventional AIS and internal controls because it provides immutable, append-only adjustments that strengthen evidence integrity, enforces Sharia validation and approvals as pre-recording controls, and enables a shared source of truth with rule-version traceability from normative requirements to system implementation and compliance outcomes. This gap highlights the need for a model specifically designed for BPRS, considering their scale and governance needs, rather than adopting methods used by large commercial banks. This study explores how blockchain can enhance Sharia compliance in BPRS accounting systems and improve transparency, accountability, and resilience against bankruptcy risk. It adds to the limited research on blockchain in Islamic accounting and aims to provide policy recommendations for OJK and DSN-MUI to support secure, transparent, and Sharia-compliant digital transformation. While blockchain research in Islamic finance is growing, its application in BPRS Sharia accounting in Indonesia—especially with limited resources and local regulations—remains underexplored, as most studies focus on manual system weaknesses instead of blockchain's benefits.

The main research question is: How can blockchain technology strengthen Sharia compliance in BPRS accounting systems in Indonesia? This aims to explore blockchain's potential to improve Sharia compliance in Indonesia's Islamic rural banks, considering their unique challenges and regulatory context.

Literature Review, Blockchain in Sharia accounting systems is becoming more important as Islamic financial institutions demand greater transparency and compliance. Tapscott and Tapscott (2018) note that blockchain works as a trust protocol that can reduce intermediaries, improve efficiency, and lower the risk of data manipulation (Beverungen et al., 2019). In Islamic finance, blockchain can also support Sharia compliance through smart contracts that automatically verify and execute agreements according to Islamic law (Antova & Tayachi, 2019; Cahyani & Baidhowi, 2025). Fahdil et al. (2024) further show that blockchain-based accounting strengthens the integrity of financial reports through immutable records and tamper-resistant audit trails.

In Indonesia, Jadida et al. (2025) found that most BPRS still use manual records that are prone to errors and weak accountability, so blockchain could help strengthen public trust. Achebe et al. (2024) argue that many BPRS bankruptcies are driven by poor governance and weak internal supervision, which blockchain may reduce through earlier fraud detection. Asiabar et al. (2025) also show that blockchain provides a continuous, unchangeable audit trail, making data manipulation easier to detect and supporting accountability (Achebe et al., 2024). Overall, integrating blockchain into Sharia accounting can reduce fraud, improve accountability, and strengthen trust in the financial system (Asy'arie et al., 2025)

2. RESEARCH METHOD

This research uses a qualitative-descriptive design with a Design Science Research (DSR) approach to develop a blockchain-based Sharia accounting system for BPRS. The DSR approach is chosen for its ability to create practical solutions to real-world issues (Gregor & Hevner, 2013; Peffers et al., 2007). The aim is to build a framework that improves Sharia compliance, transparency, and resilience in BPRS.

The study follows the Hybrid Spiral-Agile development model, combining the iterative Spiral Model (Barry W. Boehm, 1988) with Agile methodology (Beck et al., 2001). This model supports continuous improvement through planning, testing, and validation to meet regulatory and Sharia requirements (Kumar & Saha, 2025; Noreika, 2024). The Sharia Compliance Loop, at the core of the system, automatically validates Sharia contracts like Murabahah, Ijarah, and Mudharabah, ensuring compliance with Islamic principles (Soualhi & Saleh, 2024). This addresses the first research question on strengthening Sharia compliance. This study formalizes Sharia rules into system requirements and smart-contract logic, focusing on contract validity (akad), the avoidance of riba, gharar, and maysir, as well as specific rules for Murabahah (asset-backing), Mudharabah (profit-loss sharing), and Ijarah (leasing). It also ensures that late payment penalties follow Sharia governance and do not become bank income. These rules are derived from DSN-MUI fatwas, AAOIFI standards, Indonesian Sharia accounting standards (PSAK), and OJK regulations concerning BPRS prudential compliance and Sharia oversight. To ensure end-to-end compliance, the research establishes a "Requirements–Code–Evidence" traceability chain. Each Sharia rule is assigned a unique ID mapped to its normative source and translated into explicit smart-contract checks. A traceability matrix links these IDs to code modules, validation scripts, and runtime evidence, such as transaction logs. Compliance results are recorded as machine-verifiable proofs on the blockchain to preserve integrity. Any changes to rules or code require version control and documented sign-off from internal compliance and the Sharia Supervisory Board (DPS), creating an immutable audit trail for every transaction.

The V-Validation Model ensures the system's reliability, aligning it with Sharia audit standards (Al-Btoush & Al-Hourani, 2024). This answers the second research question on improving transparency and resilience. Secondary data comes from document analysis, including a CNBC Indonesia article on the 2025 closure and bankruptcy of 21 banks (Verda Nano Setiawan, 2025), which highlights governance challenges in BPRS. Data was also collected through regulatory reviews and interviews with BPRS practitioners, Sharia auditors, and OJK representatives. Thematic coding was used to analyze the data and identify blockchain adoption challenges and opportunities (Khair et al., 2024). Finally, the model was evaluated based on three performance indicators: (1) audit efficiency with real-time data, (2) internal control via smart contracts, and (3) data integrity through blockchain immutability (Godfrey-Welch et al., 2018). These indicators assess the model's impact on transparency and resilience.

3. RESULTS AND DISCUSSIONS

Mandatory Sharia compliance parameters include clear identification of the contracting parties, a lawful and measurable contract subject matter, a defined contract type, price/ujrah/capital, a definite payment/delivery schedule, tenor, settlement mechanisms, and supporting evidence and authorization. More specifically, Murabahah (Faizin & Djayusman, 2023) requires transparent disclosure of cost and margin and proof of ownership/possession before sale; Ijarah requires a clearly identified leased asset, a fixed ujrah and lease period, and defined allocation of responsibilities; Mudharabah(Mohd Tarmizi et al., 2024) requires clearly defined capital, an upfront profit-sharing ratio (nisbah), a realized-profit basis for distribution, and explicit loss-allocation rules. The system prevents gharar/riba clauses by using standardized contract templates with locked core clauses, automated parameter validation (rule engine), traceable amendments only through a controlled amendment module, DPS approval as a blocking control, COA-based guardrails (e.g., ta'zir is not recognized as revenue), and rule versioning to prevent compliance "drift."

Many BPRS in Indonesia struggle with high bankruptcy rates due to weak governance, fraud, poor transaction management, and limited transparency. Blockchain can help by permanently and transparently recording transactions, reducing manipulation, and improving accountability (Suyanto et al., 2024). Its immutable and cryptographic features ensure secure, auditable, Sharia-compliant records, preventing riba, gharar, and maysir (Vijayakumar & Alani, 2023), which is crucial for building trust with customers and regulators. Blockchain can automate Sharia compliance checks through smart contracts, ensuring transactions avoid riba, gharar, and maysir. Contracts such as Murabahah, Ijarah, and Mudharabah can be processed automatically while staying within Sharia guidelines, reducing human error and helping ensure every transaction follows Sharia principles (Abdullah et al., 2023; Cahyani & Baidhowi, 2025). Blockchain also makes verification, recording, and reporting more efficient by reducing manual work, and its cryptographic protection strengthens data security and confidentiality—an important need for BPRS (Alhat, 2024; Tapscott & Tapscott, 2018). The following is a Blockchain flow diagram in the Sharia Accounting System:

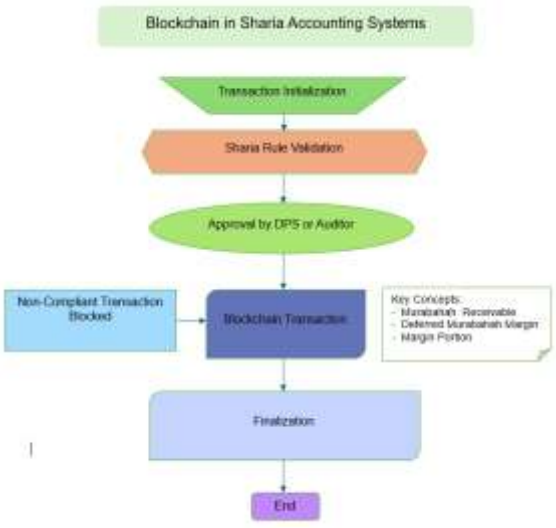

Figure 1. The Blockchain in Sharia Accounting Systems flowchart

The Blockchain in Sharia Accounting Systems flowchart (Figure 1) illustrates how financial transactions can be managed in a Sharia-compliant manner using blockchain. The process begins when a transaction (e.g., Murabahah, Ijarah, Mudharabah) is

received and validated against Sharia rules to ensure it avoids riba, gharar, and maysir, and aligns with Islamic finance principles. It then requires approval from the DPS or an auditor. If validation or approval fails, the transaction is blocked. Approved transactions are recorded on the blockchain, creating an immutable, auditable trail, and are sealed permanently, ensuring transparency, verifiability, and tamper resistance for future audits.

To maintain Sharia compliance throughout the transaction lifecycle, the system employs an Exception and Adjustment Handling Layer to manage cancellations, corrections, and restructuring. Since blockchain is immutable, the system does not overwrite past records; instead, it generates new adjustment entries that are cryptographically linked to the original contract and automatically validated against Sharia and accounting rules. For cancellations (fasakh) and journal corrections, the system posts linked entries that reverse financial effects or reclassify amounts per PSAK Syariah, requiring documented evidence and approval from the Sharia Supervisory Board (DPS). The system further ensures that withdrawals follow specific akad rules, treating Mudharabah as early termination and Wadiah as repayable-at-par. During restructuring, the system blocks riba by prohibiting debt capitalization or increases due to the time value of money. Additionally, penalties (ta'zir) are recorded as charitable liabilities rather than bank income, while compensation (ta'widh) is limited to verified costs. Ultimately, all exception actions are approval-gated and traceable, providing an immutable audit trail that ensures full transparency and compliance.

```php
<?php
declare(strict_types=1);
require_once __DIR__ . '/db.php';
header('Content-Type: application/json; charset=utf-8');
$input = json_decode((string)file_get_contents('php://input'), true);
if (!is_array($input)) {
  http_response_code(400);
  echo json_encode(['ok'=>false, 'error'=>'Request body must be valid
JSON.']);
  exit;
}
$tx = [
  'akad_type' => $input['akad_type'] ?? null,
  'event_type' => $input['event_type'] ?? null,
  'principal' => $input['principal'] ?? 0,
  'margin' => $input['margin'] ?? 0,
  'profit_share_ratio' => $input['profit_share_ratio'] ?? null,
  'currency' => $input['currency'] ?? 'IDR',
  'contract_ref' => $input['contract_ref'] ?? null,
  'customer_ref' => $input['customer_ref'] ?? null,
  'asset_ref' => $input['asset_ref'] ?? null,
  'metadata' => $input['metadata'] ?? null,
  'created_by' => (int)($input['created_by'] ?? 0),
];

// Insert into transactions table
$stmt = pdo()->prepare(
  "INSERT INTO transactions (akad_type, event_type, principal, margin,
profit_share_ratio, currency, contract_ref, customer_ref, asset_ref,
metadata_json, created_by)
   VALUES (:a, :e, :p, :m, :r, :c, :ctr, :cr, :ar, :mj, :u)"
);
```

Figure 2. Transaction Initialization

Figure 2. The explanation of the code and the processes for Blockchain in Sharia Accounting Systems. The starting point where a new financial transaction is received and recorded in the system. It captures essential transaction details such as akad type

(contract type), event type (e.g., disburse, payment), principal amount, margin, and metadata related to the transaction. This step prepares the transaction for subsequent validation and processing.

```php
<?php
declare(strict_types=1);
final class ShariaRules
{
  public static function validate(array $tx): array
  {
    $errors = [];
    $akad = $tx['akad_type'] ?? '';
    $event = $tx['event_type'] ?? '';

// Check for basic Syariah rules
    if ($akad === 'MURABAHAH' && $tx['margin'] <= 0) {
      $errors[] = 'Murabahah margin must be greater than zero.';
    }
    // Ensure the transaction is compliant with Sharia finance principles
    if (in_array($akad, ['MUDHARABAH', 'MUSYARAKAH'], true) &&
$tx['profit_share_ratio'] === null) {
      $errors[] = 'Profit sharing ratio is required for Mudharabah/Musyarkah.';
    }
    // Example for interest control (anti-riba)
    if (isset($tx['metadata']['interest_rate'])) {
      $errors[] = 'Interest rate cannot be included in the transaction (anti-riba
rule) ';
```

Figure 3. Sharia Rule Validation

Figure 3 shows that, after a transaction is initialized, the system checks if the transaction adheres to Sharia-compliant rules. This includes verifying that the transaction follows the principles of Islamic finance, such as avoiding riba (interest), gharar (uncertainty), and maysir (gambling). For instance, it checks that the margin is valid for Murabahah transactions and the profit-sharing ratio is present for Mudharabah/Musyarakah contracts.

```php
<?php
declare(strict_types=1);
require_once __DIR__ . '/db.php';
header('Content-Type: application/json; charset=utf-8');
$input = json_decode((string)file_get_contents('php://input'), true);
if (!is_array($input)) {
  http_response_code(400);
  echo json_encode(['ok'=>false, 'error'=>'Request body must be valid JSON.']);
  exit;
}
```

```php
$stmt->execute([
  ':t' => $txId,
  ':u' => $approverId,
  ':r' => $role,
  ':s' => $status
]);
echo json_encode(['ok' => true]);
```

Figure 4 Approval by DPS or Auditor

Figure 4 shows that after a transaction is confirmed as Sharia-compliant, it must be approved by the DPS (Sharia Supervisory Board) or an auditor. This step ensures the transaction follows Sharia principles and regulatory rules; if approval is not granted, the transaction is blocked. DPS review is a key control in Islamic finance because it protects

institutional integrity and prevents non-compliant practices, and unapproved transactions are stopped under DPS authority (Carberry et al., 2023).

```php
<?php
declare(strict_types=1);
require_once __DIR__ . '/db.php';
final class BlockNonCompliantTransaction
{
  public static function blockTransaction(int $txId)
  {
    // Block the transaction if it does not meet the required criteria
    $stmt = pdo()->prepare(
      "UPDATE transactions SET status = 'BLOCKED' WHERE id = :tx_id"
    );
    $stmt->execute([':tx_id' => $txId]);
    echo json_encode(['ok' => true, 'status' => 'Transaction blocked']);
  }
}
```

Figure 5. Non-Compliant Transaction Blocked

Figure 5 describes a PHP function, blockTransaction, that blocks non-compliant transactions in a Sharia-compliant system. It updates the transaction's status to **"**BLOCKED" in the database when Sharia rules or DPS approval are not met, then returns a JSON message confirming the block. This helps ensure only compliant transactions are processed, supporting integrity, transparency, and accountability. Maintaining Sharia principles—such as honesty, fairness, and avoiding riba and gharar—is essential for trust, and Islamic accounting aims to reflect these values in financial reporting (Mahyudin et al., 2025; Ulfitri & Firdaus, 2024).

```php
<?php
declare(strict_types=1);
require_once __DIR__ . '/db.php';
final class BlockchainTransaction
{
  public static function recordTransaction(array $tx)
  {
    // Generate a blockchain hash for the transaction
    $txHash = hash('sha256', json_encode($tx));
    // Record in blockchain ledger (simplified simulation)
    $stmt = pdo()->prepare(
      "INSERT INTO blockchain_ledger (tx_hash, tx_data) VALUES (:h, :d)"
    );
    $stmt->execute([
      ':h' => $txHash,
      ':d' => json_encode($tx)
    ]);
  }
}
```

Figure 6. Blockchain Transaction

Figure 6 shows that blockchain changes transaction recording by permanently storing every approved and validated transaction in an immutable, tamper-proof ledger. This creates a trusted audit trail that improves security and increases transparency for all network participants (Alagha & Özçelik, 2025).

```php
<?php
declare(strict_types=1);
require_once __DIR__ . '/db.php';
final class TransactionFinalization
{
  public static function finalizeTransaction(int $txId)
  {
    // Finalize the transaction by marking it as completed in the system
    $stmt = pdo()->prepare(
      "UPDATE transactions SET status = 'FINALIZED' WHERE id = :tx_id"
    );
    $stmt->execute([':tx_id' => $txId]);
    echo json_encode(['ok' => true, 'status' => 'Transaction finalized']);
```

Figure 7. Finalization

Figure 7 shows that once a transaction is added to the blockchain, it is finalized and cannot be changed, which protects data integrity and keeps the record permanent and tamper-resistant. This finality is achieved through cryptographic hashing and consensus: each transaction is linked to the previous one by a unique hash, so unauthorized changes become detectable, and transactions are only recorded after multiple nodes approve their validity (Behara & Khandrika, 2020; Mohialden & Hussien, 2024).

```php
declare(strict_types=1);
require_once __DIR__ . '/db.php';
require_once __DIR__ . '/ShariaRules.php';
header('Content-Type: application/json; charset=utf-8');
// Input data: Transaction ID to be processed
$input = json_decode((string)file_get_contents('php://input'), true);
if (!is_array($input)) {
    http_response_code(400);
    echo json_encode(['ok' => false, 'error' => 'Request body must be valid JSON.']);
    exit;
}
$txId = (int)($input['tx_id'] ?? 0);
// Step 1: Validate Sharia compliance
$stmt = pdo()->prepare("SELECT * FROM transactions WHERE id = :tx_id LIMIT 1");
$stmt->execute([':tx_id' => $txId]);
$transaction = $stmt->fetch();
if (!$transaction) {
    http_response_code(404);
    echo json_encode(['ok' => false, 'error' => 'Transaction not found.']);
    exit;
}
// Perform Sharia compliance check
$errors = ShariaRules::validate($transaction);
if (!empty($errors)) {
    // Block the transaction if it fails the Sharia compliance check
    blockTransaction($txId, 'Sharia compliance failed', $errors);
    echo json_encode(['ok' => false, 'error' => 'Transaction failed Sharia compliance
validation.']);
    exit;
}
// Step 2: Check DPS approval
$stmt = pdo()->prepare("SELECT * FROM approvals WHERE tx_id = :tx_id AND role = 'DPS' LIMIT
1");
$stmt->execute([':tx_id' => $txId]);
$dpsApproval = $stmt->fetch();
if (!$dpsApproval || $dpsApproval['status'] !== 'APPROVED') {
    // Block the transaction if DPS approval is not granted
    blockTransaction($txId, 'DPS approval failed', 'DPS approval not granted or rejected.');
    echo json_encode(['ok' => false, 'error' => 'DPS approval failed.']);
    exit;
}
```

```php
// If the transaction passes both checks, proceed with processing (not blocked)
// Process the transaction further (blockchain recording, finalization, etc.)
// Function to block a transaction
function blockTransaction(int $txId, string $reason, string $note)
{
    // Mark the transaction as blocked in the database
    $stmt = pdo()->prepare(
        "UPDATE transactions SET status = 'BLOCKED', note = :note WHERE id = :tx_id"
    );
    $stmt->execute([':tx_id' => $txId, ':note' => $note]);
    // Log the blocking reason (optional)
    $stmt = pdo()->prepare(
        "INSERT INTO transaction_logs (tx_id, action, reason, created_at)
         VALUES (:tx_id, 'BLOCKED', :reason, NOW())"
    );
    $stmt->execute([':tx_id' => $txId, ':reason' => $reason]);
}
```

Figure 8. Non-Compliant Transaction Blocked

Figure 8 shows that any transaction that fails Sharia validation or DPS/auditor approval is blocked and cannot be processed or recorded. This two-step control-checking compliance with riba, gharar, and maysir rules, then confirming approval by DPS - ensures only Sharia-compliant transactions enter the blockchain, protecting integrity, transparency, and ethical governance (Fitri, 2023; Muneeza & Mustapha, 2019).

```php
<?php
declare(strict_types=1);
final class BlockchainIntegrity
{
  public static function verifyBlockchain()
  {
// Simple check for integrity by comparing hashes
    $stmt = pdo()->query("SELECT * FROM blockchain_ledger ORDER BY id ASC");
    $previousHash = '';
    while ($row = $stmt->fetch()) {
      if ($previousHash && $previousHash !== $row['tx_hash']) {
        return json_encode(['ok' => false, 'error' => 'Blockchain integrity compromised']);
      }
      $previousHash = $row['tx_hash'];
    }
    echo json_encode(['ok' => true, 'message' => 'Blockchain integrity is intact']);
  }
```

Figure 9. Blockchain Integrity Verification

Figure 9 illustrates that after a transaction is added to the blockchain, it is essential to verify that the blockchain has not been tampered with. This step checks the integrity of the blockchain by comparing the hash of each block and ensuring that the previous hash matches the current one, ensuring that the chain is intact and secure.

This accounting syariah system ensures that Sharia-compliant financial transactions are transparent, auditable, and immutable using blockchain technology(Aisah et al., 2025). It integrates governance from the DPS (Sharia Supervisory Board) to ensure compliance, providing a secure, tamper-proof, and fully auditable ledger. Asy'arie et al (2025) Blockchain's immutable ledger ensures that all transactions are permanently recorded, making it nearly impossible to alter or delete entries, thus fostering trust among stakeholders. The involvement of the Sharia Supervisory Board (DPS) in overseeing blockchain implementations ensures that all financial activities remain compliant with Islamic law (Hidayat et al., 2023).

4. CONCLUSION

Implementing blockchain in BPRS Sharia accounting is most effective when it is positioned as a strengthening tool for internal control and auditability—not as a replacement for regulation—by ensuring immutable records, automated Sharia validation, and traceable DPS/auditor approvals. The most realistic support from OJK is a supervised pilot/sandbox pathway, accompanied by guidance on compliance mapping, evidence standards, and supervisory reporting templates. Meanwhile, the most realistic support from DSN–MUI is normative clarification and standardized Sharia control points

for digital implementation (e.g., ta'zir/ta'widh treatment, restructuring constraints, contract cancellation, and the acceptability of electronic evidence), enabling DPS to apply consistent governance. With a phased implementation—scoping, rule formalization, DPS approval, DSN–MUI clarification, OJK-supervised pilot, testing, reporting, and independent validation—this approach is most likely to improve Sharia compliance, transparency, and public trust in an operationally practical and audit-ready manner. To thoroughly test the system's effectiveness, the highest-priority experiments should follow a phased strategy. First, longitudinal case studies at one or more BPRS/operational channels should be prioritized to measure tangible impacts over time (e.g., changes in the rate of Sharia-compliant exceptions, frequency of journal corrections, reconciliation delays, and SSB approval times), as these can capture process and governance effects not visible in short-term trials. Finally, conduct formal smart contract verification (or at least property-based testing and specification checking) on critical controls—especially ta'zir recording, restructuring restrictions, and contract status transitions—to mitigate the risk of logic errors that could trigger systemic Sharia-compliant non-compliance.

Implementing blockchain in BPRS Sharia accounting systems can improve transparency and data security. Transactions are recorded in a permanent, auditable way, helping ensure integrity and compliance with Islamic finance principles (avoiding riba, gharar, and maysir). It can also support faster Sharia compliance through automated validation and DPS approval.

In practice, using blockchain in BPRS can increase transparency and public trust by ensuring Sharia-compliant transactions. It can reduce fraud risk, make audits and verification easier, speed up DPS approvals, improve data management, and support regulatory compliance. Future research could develop smarter Sharia-compliant contracts that automate Murabahah, Mudharabah, and Ijarah while staying fully aligned with Sharia rules. It could also examine how these contracts can calculate and update margins, profit-sharing, and penalties in real time.

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