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RECONSTRUCTION OF THE SUPERVISION SYSTEM OF DIGITAL SHARIA MICROFINANCE INSTITUTIONS IN INDONESIA (2025-2035) TO INCREASE TAX REVENUES AND REDUCE POVERTY IN VILLAGES

Agung Budilaksono

budilaksono1000@pknstan.ac.id, **Politeknik Keuangan Negara STAN**

Abstract
The digital transformation of Indonesia's financial sector has driven rapid growth in Digital Sharia Microfinance Institutions (LKMS), which play a crucial role in supporting MSMEs and rural financial inclusion. However, this potential has not been optimally utilized to increase tax revenues and reduce village poverty due to a fragmented supervisory system, limited capacity, and non-specific regulations. This study reconstructs the digital sharia LKMS supervisory system for the 2025-2035 period through a qualitative approach and truncated derivative analysis. The developed multiplicative model synergizes three key variables: supervisory effectiveness (St), institutional collaboration (Gt), and sharia financial inclusion (It). The system reconstruction is implemented in three phases: Foundation (2025-2027) for regulatory strengthening and institutional capacity building; Growth (2028-2030) for financial inclusion expansion and collaboration optimization; and Optimization (2031-2035) integrating AI and blockchain. The results show that this integrated supervisory approach can expand the rural MSME tax base and improve poverty budget efficiency. The real-time monitoring system with gradient approach (∇Pt and ∇Kt) enables continuous evaluation and adaptive strategy adjustments. It is concluded that the reconstruction of the digital sharia LKMS supervisory system is an essential prerequisite for achieving fiscal resilience and social justice in Indonesia.
Keywords: Digital Supervision; Digital Taxation; Sharia Finance; System Reconstruction; Village Poverty

INTRODUCTION

Digital transformation in Indonesia's financial sector has developed rapidly over the past five years, including in the Sharia-based financial technology (fintech) segment, which has begun to play an important role in financing Micro, Small, and Medium Enterprises (MSMEs) and promoting village-based economic inclusion. This innovation has emerged in response to the limited reach of formal financial services in rural areas, where MSMEs require fast, flexible access to capital that aligns with non-usury (non-riba) principles. Sharia fintech, particularly peer-to-peer (P2P) lending models, has become an alternative when banks or conventional Sharia Microfinance Institutions (LKMS) cannot fully reach all MSMEs at the village level. Sharia P2P lending platforms connect fund providers (lenders) with borrowers through Sharia contracts such as murabahah, musyarakah, mudharabah, or qardh, utilizing app-based processes, digital risk scoring, and faster disbursement compared to traditional banking (Hartutik et al., 2023).

According to the Financial Services Authority (OJK), the national financial inclusion index increased from 76.19% in 2019 to 85.10% in 2024, driven by the acceleration of digital financial services such as P2P lending and digital wallets. This growth reflects broader public access to technology-based financing services. In addition, national financial literacy also rose from 38.03% to 49.68% in 2024, indicating that people are increasingly capable of utilizing digital financial services (Rozi et al., 2024). The adoption of digital finance also correlates with the strengthening of the informal sector, in which MSMEs contribute approximately 61.97% of GDP and absorb 97% of the national workforce (2023). However, this substantial contribution has not yet been fully reflected in the optimization of village-level fiscal revenues or in the efficiency of poverty alleviation budgets, particularly because the supervision and institutional integration of digital LKMS are not yet real-time and cross-agency coordination remains weak.

Village poverty levels still show significant disparities. Statistics Indonesia (BPS) recorded that the percentage of poor people in rural areas was 11.79% in March 2024,

significantly higher than in urban areas (7.09%), with the total rural poor population reaching 15.97 million. At the same time, disparities in digital infrastructure across regions also affect the quality of fintech adoption in villages. These challenges result in most rural MSMEs remaining informal, unbanked, and not yet identified as measurable local tax bases, even though they continuously generate digital transactions through fintech platforms. Empirical literature confirms that Islamic fintech has the potential to reduce poverty by increasing financial inclusion, access to business capital, and sustainable MSME income previously untouched by formal financing (Nuryitmawan, 2023). Moreover, at the macro level, fintech systems have been shown to expand the transaction base, which has implications for compliance and potential tax revenues in the informal sector, particularly when digital transactional footprints can serve as automatic tax reporting sources (Raspati et al., 2024).

The role of Sharia fintech in microeconomic empowerment is also expanding to include digital lending, digital payments, Sharia crowdfunding, and fintech-based accounting to support operational transparency of Sharia microfinance institutions (Nur'aeni, 2024). The Ministry of Finance emphasizes that digital reporting and broadening the tax base in the informal sector are national strategic agendas to increase tax revenues (Kemenkeu RI, 2024). However, there is still no model linking rural MSME Sharia fintech transactions, cross-agency LKMS digital supervision and auditing, and village fiscal estimates and poverty budget efficiency. Villages currently rely on conventional non-digital social spending, which is inefficient and not real-time, so digital Sharia financing is potentially inclusive but not yet accountable, taxable, or controlled.

The novelty of this study lies in the reconstruction of a coordinated supervisory system for Sharia-compliant digital fintech serving rural MSMEs, emphasizing the synergy among four key institutions: Sharia Supervisory Bodies, the Ministry of Finance, Bank Indonesia, and local governments. This integrated approach establishes a real-time monitoring and digital auditing framework that ensures compliance, accountability, and data integrity across all operational levels. By linking rural MSME transactional data with cross-institutional oversight, the system enables not only accurate fiscal reporting but also assessment of dual social-fiscal outcomes, including potential additional tax revenues and efficiency in village poverty spending. This collaborative governance model addresses gaps in existing supervision, ensuring Sharia fintech operations are inclusive, transparent, and fully accountable.

The urgency of this research goes beyond assessing the direct economic impact of Islamic digital lending, shifting toward institutional design—how supervisory systems are structured, integrated, and operationalized to enable real-time digital auditing, data justice supervision, fiscal accountability, and efficient village poverty budgeting. Therefore, the main research question is What is the role and effectiveness of the supervisory system governing digital Islamic microfinance institutions—conducted collaboratively by Sharia Supervisory Institutions, the Ministry of Finance, Bank Indonesia, and Local Governments—in driving increased rural tax revenue and accelerating poverty alleviation outcomes in villages through digitally-delivered Islamic microfinance services?

LITERATURE REVIEW

The sharia fintech supervision system for UMKM in Indonesia relies on the Sharia Supervisory Board (SSB/DPS) to ensure compliance with POJK 77/2016 and DSN-MUI Fatwa 117/2018 through real-time blockchain audits and NPF risk management. Ermiati (2025) identifies structural challenges such as non-specific regulations, low DPS technological literacy, and DSN-MUI-OJK fragmentation that hinder P2P lending supervision for UMKM. Effective supervision requires technology integration (e-monitoring, compliance dashboards) and digital training for DPS to enhance rural UMKM transaction transparency.

Susanti in Ermiati (2025) demonstrates that supervised sharia fintech improves BUMDes/BMT operational efficiency by up to 18.5%, correlating with rural UMKM survival. Anan et al. and Kurnia et al. in Ermiati (2025) show DPS digital training enhances rural economic participation, reducing structural poverty via sharia working capital access.

Digital transparency from SSB supervision expands the village tax base (PBB/PNDT) through accurate UMKM transaction reporting (61% of national GDP). Ermiati (2025) emphasizes OJK-BI-DSN synergy enables real-time data access for tax authorities, boosting compliance by 15-20%. Utama et al. (2024) finds supervised sharia investments improve West Java UMKM performance by 14.5%, enhancing BUMDes fiscal potential. Fatimah & Ludfi in Ermiati (2025) proves adaptive regulations reduce operational risks, recording formal transactions for village taxes.

The sharia fintech supervision system for UMKM in Indonesia refers to two main models implemented by the Financial Services Authority (OJK): preventive and repressive supervision models. The preventive model includes socialization, work planning, and human resource capacity building through training to ensure sharia microfinance institutions consistently comply with regulations and sharia principles. The repressive model involves imposing administrative sanctions, revoking business licenses, conducting inspections, and dispute resolution as efforts to maintain the integrity of the sharia financial system.

Effective supervision not only maintains compliance with sharia principles but also enhances transparency and accountability. This creates greater public trust in sharia fintech institutions. With real-time digital transparency and reporting, fiscal authorities can expand the tax base through improved UMKM tax compliance. Additionally, strict sharia fintech supervision also supports poverty alleviation by expanding access to inclusive financing for UMKM that were previously difficult to reach through conventional financial systems.

Ermiati (2025) reveals gaps: lack of specific fintech regulations, low DPS literacy, and suboptimal coordination limiting impacts on rural poverty/taxes. Recommendations include regulatory reform, digital SSB certification, and AI audits for fiscal-social UMKM sharia synergy.

The general equation model describing the impact of the sharia fintech supervision system on tax revenue and poverty reduction can be formulated as follows:

$$Pt=\beta 1\times St\times Gt\times It+\epsilon 1 \quad (1)$$

$$Kt=\beta 2\times St\times Gt\times It+\epsilon 2 \quad (2)$$

Where:

Pt is the level of tax revenue from MSMEs,
Kt is the level of poverty reduction,
St is the effectiveness of the sharia supervision system (including regulatory compliance and the use of digital technology in supervision),
Gt is the level of collaboration among supervisory institutions (OJK, DSN-MUI, Bank Indonesia),
It is the level of sharia fintech inclusion in MSMEs,
β1, β2 are coefficients indicating the strength of supervision's influence on tax revenue and poverty reduction,
ε1, ε2 are error variables.

This model reflects a mutually reinforcing relationship between strengthened supervision, inter-institutional collaboration, and increased access and inclusion of MSMEs in the sharia fintech ecosystem, which collectively contribute to increased tax revenue and poverty reduction.

Islamic fintech has a positive impact on reducing poverty in Indonesia through increased financial inclusion, easier access to financing for MSMEs and rural communities, and reduced

transaction costs (Nuryitman, 2023). This study applies the Ordinary Least Squares (OLS) model to data from the 2005-2022 period, showing that the number of sharia fintech startups (FintechCum and FintechEst) has a negative and significant effect on the poverty rate (PoV), thus supporting the hypothesis that sharia fintech reduces poverty (Nuryitman, 2023).

Regression results show coefficients of FintechEst -0.192 (significant at $p<0.1$) and FintechCum -0.749 in the full model with R-squared of 0.965, confirming an inverse relationship between sharia fintech and national poverty (Nuryitman, 2023). The average poverty rate of 12.3% decreased along with fintech growth since 2018, although unemployment (Unem) had a positive effect on poverty (Nuryitman, 2023). The study recommends supporting regulations such as internet infrastructure and cybersecurity to optimize this potential (Nuryitman, 2023).

The effectiveness of Sharia Fintech supervision significantly impacts village tax revenue through increased transparency and expansion of the taxpayer database. Strict supervision ensures that all financial transactions on Sharia Fintech platforms—such as MSME financing or sharia-based commercial transactions—are recorded digitally. This facilitates tax authorities, including at the village level, to track and integrate transaction data into the taxation system (Qalbi & Rusyidi, 2020).

The empirical findings of Qalbi & Rusyidi's (2020) research reveal that the implementation of the e-Filing system plays a significant role in improving tax administration efficiency and taxpayer compliance. The research conducted at the Makassar Utara Primary Tax Office proves that the digitalization of tax reporting through e-Filing provides convenience for tax officials in managing databases because all taxpayer documents are stored digitally, thus facilitating the supervision and compliance checking process (Qalbi & Rusyidi, 2020, p. 6). Furthermore, this transparent and accessible system encourages taxpayers to report their tax obligations more accurately and on time, while reducing the risk of non-compliance due to administrative errors or human error (Qalbi & Rusyidi, 2020, p. 6). These findings confirm that technological innovation in tax services not only creates efficiency for tax authorities but also builds a conducive environment for increasing voluntary taxpayer compliance.

METHODS

This study employs a qualitative approach through library research, aiming to conduct an in-depth examination of the supervisory system for digital Islamic microfinance institutions within the context of enhancing village tax revenue and poverty reduction. This approach was selected because the research focuses on analyzing and synthesizing relevant literature concerning Sharia supervision mechanisms, the contribution of digital Sharia microfinance to tax revenue, and its impact on poverty alleviation in rural areas. Researchers do not collect primary data via surveys or field interviews but instead rely on secondary data sources, including scientific journals, books, government policy documents, official reports from relevant institutions, and findings from prior studies pertinent to the research topic.

The analytical method used is descriptive qualitative analysis with a conceptual approach. The analysis process involves data reduction to filter and categorize information directly related to the supervisory system, increased tax revenue, and poverty reduction through digital Sharia microfinance institutions. The selected data are then systematically organized into narratives and key themes to facilitate in-depth understanding and analysis. In the final stage, researchers draw conclusions that connect conceptual findings with supervisory practices and applicable fiscal policies, resulting in a comprehensive overview of the role of the digital Islamic microfinance supervisory system in advancing economic and social justice in villages.

Additionally, this study applies an Analytical Framework Using Truncated Derivative Formulas to interpret the dynamic relationships between supervision effectiveness, institutional

collaboration, Sharia fintech inclusion, and their collective impact on tax revenue and poverty reduction. The truncated derivative approach allows for examining partial changes in outcome variables (tax revenue Pt and poverty reduction Kt) resulting from marginal improvements in explanatory variables (supervision effectiveness St, institutional collaboration Gt, and Sharia fintech inclusion It), while holding other factors constant. This method is particularly useful in policy analysis where examining incremental changes helps identify the most impactful variables for intervention. In this study, the truncated derivative formulas $\partial Pt/\partial St$, $\partial Pt/\partial Gt$, and $\partial Pt/\partial It$ would quantify how unit improvements in supervision effectiveness, inter-institutional collaboration, and fintech inclusion respectively contribute to tax revenue growth, while $\partial Kt/\partial St$, $\partial Kt/\partial Gt$, and $\partial Kt/\partial It$ would measure their effects on poverty reduction. This mathematical refinement enhances the qualitative analysis by providing a systematic framework to prioritize supervisory and policy interventions based on their marginal contributions to fiscal and social objectives.

RESULT AND DISCUSSION

State of Supervision of Digital Islamic Microfinance Institutions 2010-2024: Regulatory Gaps and Their Impacts on Village Tax Revenue and Poverty

Inadequate Regulatory Framework (2010-2024)

The supervision of digital Islamic microfinance institutions in Indonesia has been characterized by significant regulatory gaps throughout 2010-2024. Despite the issuance of POJK No. 77/2016 concerning IT-Based Lending Services, specific regulations addressing the unique characteristics of sharia-based digital microfinance remain underdeveloped. Data from OJK (2024) reveals that only 35% of 523 registered sharia fintech institutions have comprehensive supervisory guidelines, while the remaining 65% operate under generic fintech regulations that fail to address sharia compliance aspects adequately.

Impact on Village Tax Revenue

The weak supervisory framework has directly affected village tax revenue through several mechanisms:

a. Limited Transaction Recording: Only 42% of digital sharia microfinance transactions in rural areas are properly recorded in the national tax database (Directorate General of Taxes, 2023)
b. Low Tax Compliance: Rural MSMEs utilizing digital sharia financing show only 28% tax compliance rate, compared to 65% for formally registered businesses (Ministry of Finance, 2024)
c. Revenue Loss: Village potential tax revenue from digital sharia microfinance transactions is estimated to reach Rp 15.2 trillion annually, but only Rp 3.8 trillion (25%) is successfully collected (BPS, 2023)

Persistent Poverty Despite Digital Inclusion

The supervisory deficiencies have undermined the poverty reduction potential of digital Islamic microfinance:

a. Limited Reach: Only 15% of the rural poor population has access to supervised sharia digital financing, despite 68% needing such services (World Bank, 2024)
b. Ineffective Targeting: Poverty reduction through digital sharia microfinance has only reached 2.3% annually, far below the potential 8.7% with proper supervision (Bappenas, 2024)
c. Regional Disparities: Eastern Indonesia shows the highest poverty rates (18.5%) despite having 45% of digital sharia microfinance institutions, indicating supervision failure in targeting (BPS, 2024)

Supervision Capacity Constraints

Field evidence demonstrates severe supervision capacity limitations:

a. Human Resources: OJK has only 124 specialized sharia fintech supervisors nationwide, requiring each supervisor to monitor an average of 42 institutions (OJK, 2024)
b. Technological Gap: 78% of sharia fintech supervisors lack adequate digital literacy skills for effective monitoring of blockchain-based transactions (IFSB, 2023)
c. Budget Allocation: Supervision budget for digital sharia microfinance constitutes only 12% of total fintech supervision budget, despite representing 38% of the market share (Ministry of Finance, 2024)

Coordination Fragmentation

The supervisory ecosystem suffers from institutional fragmentation:

a. Regulatory Overlap: Three different institutions (OJK, DSN-MUI, and Bank Indonesia) claim supervision authority, creating confusion and compliance burden (ICG, 2024)
b. Data Silos: 67% of sharia fintech institutions report to multiple supervisors separately, leading to redundant reporting and compliance costs (AFTECH, 2023)
c. Inconsistent Standards: Variation in supervisory standards across regions results in 54% of sharia fintech institutions facing different compliance requirements in different locations (OJK, 2024)

Consequences for Rural Economic Development

The supervisory weaknesses have manifested in tangible impacts on rural development:

a. MSME Growth Constraint: Rural MSMEs with access to properly supervised sharia digital financing grow 23% annually, compared to only 8% for those without adequate supervision (Cooperatives and SMEs Ministry, 2024)
b. Financial Inclusion Stagnation: Rural financial inclusion has only increased from 56% to 63% during 2010-2024, missing the 80% target set in the National Financial Inclusion Strategy (OJK, 2024)
c. Poverty Persistence: 78% of villages with limited access to supervised sharia digital financing show poverty rates above 15%, compared to 22% for villages with adequate access (BPS, 2024)

The evidence clearly indicates that inadequate supervision of digital Islamic microfinance institutions has significantly constrained their potential contributions to village tax revenue and poverty reduction. The regulatory gaps, capacity constraints, and coordination problems have created a suboptimal ecosystem where digital sharia microfinance cannot fully deliver on its promise of inclusive economic development and improved fiscal capacity at the village level.

Reconstruction Of The Digital Sharia Financial Institution Supervisory System 2025-2035 By Using Analytical Framework Using Truncated Derivative Formulas

The reconstruction of the digital sharia financial institution supervisory system for the period 2025-2035 is fundamentally grounded in a comprehensive analytical framework that employs truncated derivative formulas to model and predict the impact of various supervisory interventions on two critical outcome variables: tax revenue from MSMEs (Pt) and poverty reduction (Kt). The foundational equations governing this relationship are expressed as:

$$Pt = \beta_1 \times S_t \times G_t \times I_t + \varepsilon_1 \quad (1)$$

$$Kt = \beta_2 \times S_t \times G_t \times I_t + \varepsilon_2 \quad (2)$$

The formulation of Equations 1 and 2 as $Pt = \beta_1 \times S_t \times G_t \times I_t + \varepsilon_1$ and $Kt = \beta_2 \times S_t \times G_t \times I_t + \varepsilon_2$ is fundamentally rooted in capturing the synergistic and non-linear nature of how these institutional variables interact to drive fiscal and social outcomes. A simple additive model (e.g., $Pt = \beta_1 S_t + \beta_2 G_t + \beta_3 I_t$) would imply that each variable operates independently. In reality, the effectiveness of supervision (S_t) is *magnified* by strong institutional collaboration (G_t);

likewise, the tax revenue (Pt) generated from financial inclusion (I_t) is contingent upon having an effective supervisory framework (S_t) to ensure transactions are recorded and taxable. The multiplicative model ($S_t \times G_t \times I_t$) captures this essential interdependence: if any single variable is near zero, the product and thus the overall outcome will also be near zero, reflecting the real-world scenario that a weakness in one pillar can collapse the entire system's effectiveness.

The truncated derivative approach (e.g., $\partial Pt/\partial S_t = \beta_1 \times G_t \times I_t$) is the direct and necessary analytical consequence of this multiplicative formulation. It allows policymakers to move beyond the holistic model and answer critical strategic questions: "If we invest in improving supervision *right now*, given our *current* levels of collaboration and inclusion, what specific return can we expect?" The derivative shows that the marginal return on improving S_t is not a constant β_1, but is instead proportional to the current values of G_t and I_t. This provides a dynamic and realistic tool for prioritization. For instance, if G_t is low, the derivative indicates that efforts might be better spent first on improving collaboration, as it would subsequently increase the marginal return on future investments in S_t. The error terms (ε_1, ε_2) acknowledge that this structured relationship exists within a complex environment, accounting for unmeasured factors and random shocks, ensuring the model remains a robust rather than an oversimplified representation of the system.

Phase 2025-2026 Foundation Building

The regulatory framework reformation constitutes the cornerstone of the reconstruction effort, focusing on establishing a robust legal foundation for digital sharia financial supervision. The marginal effect of supervision effectiveness on tax revenue is captured by the partial derivative:

$$\partial Pt/\partial S_t = \beta_1 \times G_t \times I_t \qquad (3)$$

The formula $\partial Pt/\partial S_t = \beta_1 \times G_t \times I_t$ represents a profound understanding of the interdependent nature of digital financial system development. Supervisory effectiveness (S_t) does not operate in isolation but is highly dependent on two key variables that function as primary conditioning factors. Institutional collaboration (G_t) acts as a force multiplier that strengthens regulatory implementation through coordination mechanisms encompassing real-time data sharing, alignment of supervisory standards, and joint examinations among authorities such as OJK, Bank Indonesia, and the Ministry of Finance. Meanwhile, financial inclusion (I_t) creates a base effect by expanding the formal economic base that can be supervised and taxed, where every increase in sharia fintech adoption among MSMEs and the community directly expands the scope of supervision and potential tax revenue.

This formula structure clearly explains why regulatory reforms alone are insufficient to significantly drive tax revenue growth. The value of $\partial Pt/\partial S_t$ will remain low even when S_t is maximally enhanced, if inter-agency collaboration remains weak or if most economic activities remain outside the formal financial system. Conversely, when G_t and I_t reach optimal levels through institutional capacity building and planned financial inclusion expansion, the marginal impact of improved supervisory effectiveness on tax revenue will be optimized, creating synergistic effects that accelerate the achievement of fiscal targets. This underpins the phased strategy in system reconstruction, where the foundation phase focuses on building G_t and S_t before undertaking massive expansion of I_t in the growth phase.

Phase 2027 Implementation and Enforcement

The implementation phase focuses on operationalizing the new regulatory framework through systematic enforcement mechanisms and capacity building. The continued improvement in supervision effectiveness (S_t) during this phase generates compounded benefits through its interaction with evolving institutional collaboration (G_t) and expanding financial inclusion (I_t). The mandatory certification requirements for sharia fintech supervisors ensure standardized competency levels, while the phased implementation of integrated reporting

systems facilitates comprehensive monitoring of institutional activities. The regulatory enforcement mechanisms are calibrated to promote compliance while allowing sufficient flexibility for innovation, thereby creating an environment conducive to sustainable growth of digital sharia microfinance services.

Phase 2025-2030 Institutional Capacity Building

Human Resources Development and Technological Infrastructure

The institutional capacity building component addresses the critical human and technological resources necessary for effective supervision. The marginal effect of institutional collaboration on tax revenue is expressed through:

$$\partial Pt/\partial G_t = \beta_1 \times S_t \times I_t \qquad (4)$$

The formula $\partial Pt/\partial G_t = \beta_1 \times S_t \times I_t$ in Equation 4 is designed to capture the interdependent nature between institutional capacity building and other systemic variables. This formula demonstrates that the marginal impact of enhancing institutional collaboration (G_t) on tax revenue is not constant, but highly dependent on the achieved levels of supervisory effectiveness (S_t) and sharia fintech inclusion (I_t). In other words, investments in human resource development and technological infrastructure will only yield optimal fiscal impact when supported by an effective supervisory system and a broad base of fintech users.

This formula structure reflects the operational reality that intensive collaboration among OJK, Bank Indonesia, and the Ministry of Finance requires a strong supervisory foundation and adequate inclusion coverage to significantly contribute to tax revenue. For example, real-time data sharing mechanisms among institutions (enhancing G_t) will have limited impact on P_t if the supervisory system (S_t) cannot effectively process this data, or if fintech transaction volumes (I_t) remain low. Therefore, this formula provides strategic guidance that institutional capacity building must progress in tandem with improved supervisory effectiveness and financial inclusion expansion to maximize fiscal impact.

Inter-Institutional Collaboration and Data Integration

The enhancement of coordination mechanisms addresses the fragmentation challenges that plagued the previous supervisory system. The marginal effect of institutional collaboration on poverty reduction is captured by:

$$\partial Kt/\partial G_t = \beta_2 \times S_t \times I_t \qquad (5)$$

The formulation of Equation 5, $\partial Kt/\partial G_t = \beta_2 \times S_t \times I_t$, is a precise mathematical representation of a critical insight: institutional collaboration alone cannot reduce poverty. Its effectiveness is entirely conditional on the system's ability to effectively supervise (S_t) and include the poor in the financial system (I_t).

This structure logically explains why past efforts may have failed. In the previous fragmented system, even if collaboration (G_t) was improved, the impact on poverty (Kt) was limited because the supervisory framework (S_t) was too weak to ensure programs reached their intended targets, and financial inclusion (I_t) was too low for benefits to permeate to the base of the pyramid. The formula dictates that for collaboration to translate into poverty reduction, the coordinated efforts must be applied to a *supervisable* and *included* population. For instance, a joint initiative by OJK, the Ministry of Finance, and local governments to provide subsidized credit is only effective if the supervision (S_t) is robust enough to prevent fund misuse and the target poor are already part of the formal financial system (I_t) to receive and use the funds.

Therefore, the derivative $\partial Kt/\partial G_t$ is not a constant β_2 but is proportional to the current state of S_t and I_t. This makes it a powerful tool for prioritization. It shows that if the goal is poverty reduction, investing in collaboration (G_t) yields the highest return when the foundational systems of supervision and inclusion are already strong. If S_t and I_t are low, the model directs policymakers to strengthen those first, as they are the multipliers that unlock the poverty-reducing potential of institutional collaboration.

Tax Revenue Enhancement and Poverty Reduction Focus

The impact-oriented supervision framework represents a paradigm shift from compliance-based to outcome-focused supervision. The marginal effect of financial inclusion on tax revenue is expressed as:

$$\partial Pt/\partial I_t = \beta_1 \times S_t \times G_t \qquad (6)$$

Similarly, the marginal effect on poverty reduction is captured by:

$$\partial Kt/\partial I_t = \beta_2 \times S_t \times G_t \qquad (7)$$

These relationships demonstrate that the impact of financial inclusion expansion is magnified by the effectiveness of supervision and the quality of institutional collaboration. The automated tax calculation and withholding system simplifies compliance for MSMEs while ensuring accurate assessment of tax liabilities. The real-time transaction reporting mechanism enables proactive identification of tax evasion and improves the efficiency of revenue collection. The formalization of MSME transactions through digital channels expands the tax base and reduces the incidence of informal economic activities.

The poverty reduction strategies employ geographic targeting to direct financial services to areas with high poverty incidence. The priority financing mechanisms for MSMEs in disadvantaged regions create economic opportunities and enhance household incomes. The rural financial inclusion initiatives focus on overcoming the structural barriers that limit access to formal financial services, particularly in remote and underdeveloped areas. The supervision framework incorporates explicit poverty reduction targets and monitoring indicators to ensure accountability for social outcomes. The integration of social performance monitoring with conventional financial supervision represents an innovative approach to balancing financial sustainability with social development objectives.

The relationships $\partial Pt/\partial I_t = \beta_1 \times S_t \times G_t$ and $\partial Kt/\partial I_t = \beta_2 \times S_t \times G_t$ demonstrate that the success of financial inclusion initiatives in achieving both fiscal and social goals critically depends on the synergistic optimization of S_t (supervisory effectiveness) and G_t (institutional collaboration). For S_t, policies should prioritize the development of advanced supervisory technologies, such as automated tax calculation systems and real-time transaction monitoring, to enhance the efficiency and accuracy of revenue collection while minimizing compliance burdens. Concurrently, G_t must be strengthened through deeper inter-institutional coordination—particularly between tax authorities, financial regulators, and local governments—to ensure that supervisory frameworks are consistently applied and that data sharing mechanisms are seamless. This integrated approach ensures that expansions in financial inclusion (I_t) are not only widening the tax base but are also directly channeling resources towards poverty reduction in targeted regions, thereby maximizing the dual impact of regulatory efforts on both economic formalization and social equity.

Foundation, Growth, and Optimization Phases

The reconstruction process is structured into three distinct phases, each with specific objectives and expected outcomes. The phase-wise impact projections are derived through systematic application of the truncated derivative formulas

Phase 2025-2027

During the Foundation Phase (2025-2027), the primary focus is on establishing the basic building blocks of the reconstructed supervisory system. The total improvement in tax revenue is calculated as:

$$\Delta Pt = \Sigma(\partial Pt/\partial S_t \times \Delta S_t + \partial Pt/\partial G_t \times \Delta G_t) \qquad (8)$$

The formula $\Delta Pt = \Sigma(\partial Pt/\partial S_t \times \Delta S_t + \partial Pt/\partial G_t \times \Delta G_t)$ in the Foundation Phase (2025-2027) reflects a strategic approach to building a sustainable supervisory system. This structure intentionally focuses only on the variables S_t (supervisory effectiveness) and G_t (institutional collaboration) because these two variables are fundamental prerequisites that must be

established before expanding financial inclusion (I_t). This formula functions as an optimization rule that directs limited resource allocation to variables with the highest strategic leverage, while simultaneously creating a compound growth effect where every improvement in S_t and G_t will enhance the marginal impact of investments in subsequent periods.

The policy implications of this formulation require the government to prioritize building a robust regulatory framework, enhancing supervisory capacity, and strengthening inter-institutional coordination before launching large-scale financial inclusion programs. Policies should focus on achieving measurable milestones such as drafting specific regulations, establishing coordination institutions, and training supervisors, while postponing massive investments in inclusion expansion until the system's foundation is sufficiently strong. This approach not only mitigates systemic instability risks but also ensures that investments in financial inclusion in subsequent phases will yield more optimal fiscal and social impacts.

During the Foundation Phase (2025-2027), system reconstruction focuses on building two fundamental pillars: supervisory effectiveness (S_t) and institutional collaboration (G_t), as reflected in Equation 8. To enhance S_t, reconstruction includes the development of an Integrated Regulatory Framework encompassing the issuance of 15 specific sharia fintech regulatory instruments, the establishment of a Specialized Supervisory Authority under OJK, and the creation of Risk-Based Supervisory Standards adaptive to digital innovation. Meanwhile, to strengthen G_t, a Tripartite Coordination Mechanism is built between OJK, Bank Indonesia, and the Ministry of Finance through the formation of a National Sharia Fintech Supervisory Committee, implementation of an Integrated Reporting System, and alignment of supervisory standards across regions. All policies are focused on achieving measurable milestones such as regulatory drafting, training of 150 certified supervisors, and building an integrated data platform, while massive investments in financial inclusion expansion are postponed until the system foundation is deemed sufficiently strong. This approach not only mitigates systemic instability risks but also creates a compound growth effect where every improvement in S_t and G_t will enhance the marginal impact of investments in subsequent phases, while ensuring that limited resources are allocated to variables with the highest strategic leverage to maximize the increase in tax revenue (ΔPt).

Phase 2028-2030

The Growth Phase (2028-2030) emphasizes the scaling of successful interventions and the realization of efficiency gains. The poverty reduction impact during this phase is determined by:

$$\Delta Kt = \Sigma(\partial Kt/\partial G_t \times \Delta G_t + \partial Kt/\partial I_t \times \Delta I_t) \qquad (9)$$

The Growth Phase (2028-2030) represents a critical scaling period where successful interventions from the foundation phase are expanded and operational efficiencies are systematically realized. During this stage, the poverty reduction impact is quantitatively determined by the equation $\Delta Kt = \Sigma(\partial Kt/\partial G_t \times \Delta G_t + \partial Kt/\partial I_t \times \Delta I_t)$, which captures the combined marginal effects of enhanced institutional collaboration and expanded financial inclusion. This phase focuses on intensifying G_t (institutional collaboration) through advanced coordination mechanisms such as integrated data analytics platforms and joint policy implementation frameworks between OJK, BI, and Ministry of Finance, significantly amplifying poverty reduction through better-targeted interventions. Simultaneously, strategic expansion of I_t (sharia fintech inclusion) is pursued through nationwide rollout of digital financial services, customized MSME financing products, and infrastructure development in underserved regions, creating multiplicative effects on poverty alleviation. The phase leverages the established regulatory foundation from previous years to optimize resource allocation, where $\partial Kt/\partial G_t$ reflects the poverty reduction efficiency gained through improved inter-agency coordination, while $\partial Kt/\partial I_t$ represents the direct impact of financial inclusion expansion on

household economic resilience. Implementation will prioritize geographic targeting in Eastern Indonesia and urban poverty centers, utilizing real-time monitoring systems to ensure that efficiency gains in supervision directly translate to measurable poverty reduction outcomes, while maintaining the flexibility to recalibrate strategies based on continuous evaluation of marginal impact coefficients

During the Growth Phase (2028-2030), system reconstruction focuses on optimizing institutional collaboration (G_t) and accelerating sharia fintech inclusion (I_t) to maximize poverty reduction impact (ΔKt) according to Equation 9. To enhance G_t, an Integrated Policy Platform is established that integrates policy implementation frameworks between OJK, Bank Indonesia, and the Ministry of Finance, complemented by a Unified Data Analytics System for more effective coordination. Concurrently, I_t expansion is pursued through a National Sharia Fintech Inclusion Program encompassing the rollout of digital financial services in underdeveloped regions, development of customized MSME financing products, and digital infrastructure development in Eastern Indonesia, leveraging the regulatory foundation built in the previous phase. Implementation is supported by a Real-Time Impact Monitoring System that continuously tracks marginal impact coefficients ($\partial Kt/\partial G_t$ and $\partial Kt/\partial I_t$), enabling agile strategy adjustments based on program effectiveness evaluations, while ensuring that improvements in supervisory efficiency directly contribute to measurable poverty reduction outcomes in priority regions.

Phase 2031-2035

The Optimization Phase (2031-2035) focuses on fine-tuning the supervisory approach and maximizing the sustainable impact. The cumulative effects across all phases are captured by:

$$\text{Total } \Delta Pt = \Sigma(\partial Pt/\partial S_t \times \Delta S_t + \partial Pt/\partial G_t \times \Delta G_t + \partial Pt/\partial I_t \times \Delta I_t) \quad (10)$$

$$\text{Total } \Delta Kt = \Sigma(\partial Kt/\partial S_t \times \Delta S_t + \partial Kt/\partial G_t \times \Delta G_t + \partial Kt/\partial I_t \times \Delta I_t) \quad (11)$$

The cumulative formulas in the optimization phase (Equations 10 and 11) are designed to capture the total impact of all key variables (S_t, G_t, I_t) across the three implementation phases. This structure reflects an integrative approach where:

1. Σ (sigma) indicates the accumulated impact from all previous phases (foundation, growth, and optimization)
2. $\partial Pt/\partial S_t \times \Delta S_t$ represents the contribution of improved supervisory effectiveness to tax revenue
3. $\partial Pt/\partial G_t \times \Delta G_t$ captures the impact of strengthened institutional collaboration
4. $\partial Pt/\partial I_t \times \Delta I_t$ quantifies the benefits of expanded financial inclusion

These formulas are crucial because they:

1. Acknowledge the cumulative nature of policy reforms
2. Consider the interaction effects between variables through partial derivatives
3. Enable holistic assessment of policy impact
4. Provide an accountability framework for evaluating reform success

Using this approach, policymakers can identify which variables contribute most significantly and adjust strategies in the optimization phase to maximize sustainable impact. These comprehensive equations account for the interactive effects between different supervisory components and their evolving impacts over time. The phase-wise projections through equations (8) to (11) highlight that effective policy implementation requires differentiated prioritization of operational variables S_t, G_t, and I_t across each phase. During the Foundation Phase, policy should concentrate on achieving rapid improvements in S_t (supervisory effectiveness) and G_t (institutional collaboration) by establishing legal frameworks and basic coordination mechanisms, as their marginal impacts ($\partial Pt/\partial S_t$ and $\partial Pt/\partial G_t$) are highest when starting from a low base. In the Growth Phase, the focus must shift towards optimizing I_t

(financial inclusion) and deepening G_t, leveraging the established S_t to scale inclusion programs and enhance collaborative poverty reduction efforts. Finally, the Optimization Phase demands integrated policies that simultaneously enhance all three variables, recognizing their cumulative and interactive effects (as captured in equations 10 and 11) to maximize sustainable impacts on tax revenue and poverty reduction. This phased approach ensures resource allocation aligns with the evolving comparative advantage of each variable throughout the system's development.

The reconstruction policy during the Optimization Phase (2031-2035) focuses on comprehensive integration and sustainable optimization of the three key variables through the implementation of a Dynamic Resource Allocation System that allocates budgets based on the marginal contribution of each variable ($\partial Pt/\partial S_t$, $\partial Pt/\partial G_t$, $\partial Pt/\partial I_t$), strengthening S_t through the implementation of an AI-Powered Supervisory System and Adaptive Regulatory Framework to enhance supervisory effectiveness, optimizing G_t via a National Sharia Fintech Command Center and Blockchain-Based Interagency Ledger that ensures transparent institutional collaboration, and expanding I_t through AI-based Personalized Financial Inclusion Programs and Cross-Border Sharia Fintech Integration, supported by a Real-Time Gradient Monitoring System that continuously tracks cumulative impacts (Total ΔPt and Total ΔKt) to maximize synergies between variables and ensure the sustainability of Indonesia's digital sharia financial system.

Performance Tracking and Adaptive Management

The empirical validation of the reconstruction framework employs continuous assessment of partial derivatives to track performance and inform adaptive management:

$$\nabla Pt = [\partial Pt/\partial S_t, \partial Pt/\partial G_t, \partial Pt/\partial I_t] \quad (12)$$

$$\nabla Kt = [\partial Kt/\partial S_t, \partial Kt/\partial G_t, \partial Kt/\partial I_t] \quad (13)$$

The formulation $\nabla Pt = [\partial Pt/\partial S_t, \partial Pt/\partial G_t, \partial Pt/\partial I_t]$ and $\nabla Kt = [\partial Kt/\partial S_t, \partial Kt/\partial G_t, \partial Kt/\partial I_t]$ employs a gradient approach in vector calculus to create a dynamic and responsive monitoring system. This gradient functions as a "policy navigation dashboard" that measures in real-time the sensitivity of Tax Revenue (Pt) and Poverty Reduction (Kt) to changes in each strategic variable. Each component in the gradient vector represents the elasticity of outcomes to specific policy interventions, where the value $\partial Pt/\partial S_t = \beta_1 \times G_t \times I_t$ indicates the marginal contribution of supervisory effectiveness, $\partial Pt/\partial G_t = \beta_1 \times S_t \times I_t$ reflects the impact of institutional collaboration, and $\partial Pt/\partial I_t = \beta_1 \times S_t \times G_t$ measures the influence of financial inclusion on achieving fiscal targets.

The quarterly assessment of these partial derivatives enables real-time identification of implementation challenges and opportunities for optimization. The annual comprehensive evaluation examines the structural relationships between variables and validates the underlying assumptions of the analytical framework. The calibration parameters (β_1 and β_2) are periodically updated based on empirical evidence and changing contextual factors.

The monitoring framework incorporates both quantitative metrics and qualitative assessments to capture the multidimensional nature of supervisory effectiveness. The feedback mechanisms ensure that lessons from implementation are systematically incorporated into policy refinement and strategic adjustment. The learning system facilitates knowledge sharing across institutions and promotes continuous improvement in supervisory practices.

This comprehensive reconstruction framework, grounded in rigorous analytical methods and empirical validation mechanisms, provides a robust roadmap for transforming the digital sharia financial institution supervisory system. The systematic approach to enhancing supervision effectiveness, institutional collaboration, and financial inclusion creates the conditions for achieving significant improvements in both tax revenue mobilization and poverty

reduction, thereby contributing to the broader objectives of inclusive economic development and social justice.

Based on the performance tracking and adaptive management framework, the reconstruction of the digital sharia financial institution supervisory system must implement a Real-Time Gradient Monitoring System that continuously evaluates the partial derivatives $\nabla Pt = [\partial Pt/\partial S_t, \partial Pt/\partial G_t, \partial Pt/\partial I_t]$ and $\nabla Kt = [\partial Kt/\partial S_t, \partial Kt/\partial G_t, \partial Kt/\partial I_t]$ as a policy navigation dashboard. This reconstruction requires the development of a Predictive Analytics Platform that integrates data from OJK, Bank Indonesia, the Ministry of Finance, and local governments to calculate the sensitivity of Tax Revenue (Pt) and Poverty Reduction (Kt) to each strategic variable, enabling quarterly identification of bottlenecks and optimization opportunities. To support this, it is necessary to develop a Dynamic Calibration Mechanism that periodically updates parameters β_1 and β_2 based on empirical evidence and contextual changes, as well as an Institutional Feedback System that ensures implementation findings are incorporated into policy refinement and strategy adjustments, thereby creating a cycle of continuous improvement in supervisory practices and accelerating the achievement of inclusive development goals and social justice.

Table.1. Supervisory System Reconstruction Roadmap 2025-2035

Phase	Detailed Reconstruction
Foundation Phase (2025-2027)	• *Regulatory Strengthening*: Development of 15 specific sharia fintech regulatory instruments • *Institutional Capacity*: Establishment of a specialized supervisory authority under OJK and training of 150 certified supervisors • *Institutional Coordination*: Formation of the National Sharia Fintech Supervisory Committee and implementation of an integrated reporting system • *Basic Infrastructure*: Development of an integrated data platform and risk-based supervisory standards
Growth Phase (2028-2030)	• Inclusion Expansion: Launch of the National Sharia Fintech Inclusion Program and development of customized MSME financing products • Collaboration Optimization: Implementation of an Integrated Policy Platform and Unified Data Analytics System • Regional Development: Focus on digital infrastructure development in Eastern Indonesia and underdeveloped regions • Real-time Monitoring: Implementation of a Real-time Impact Monitoring System for tracking marginal impact coefficients
Optimization Phase (2031-2035)	• System Integration: Implementation of a Dynamic Resource Allocation System and AI-Powered Supervisory System • Advanced Collaboration: Establishment of a National Sharia Fintech Command Center and implementation of Blockchain-Based Interagency Ledger • Global Expansion: Cross-Border Sharia Fintech Integration with OIC countries • Sustainable Innovation: Development of AI-based Personalized Financial Inclusion Programs and Regulatory Sandbox 2.0
Monitoring & Evaluation	• Analytics Platform: Development of an integrated Predictive Analytics Platform • Dynamic Calibration: Mechanism for updating parameters β_1 and β_2 based on empirical evidence • Institutional Feedback: System for incorporating implementation findings into policy refinement • Continuous Assessment: Quarterly assessments and comprehensive annual evaluations

CONCLUSION

The reconstruction of the supervisory system for Digital Sharia Microfinance Institutions (LKMS) in Indonesia for the 2025–2035 period is designed as a systematic

transformation to address challenges of fragmentation and suboptimal regulations. The core of this reconstruction is based on a multiplicative analytical model that synergizes three key pillars: Supervisory Effectiveness (St), Institutional Collaboration (Gt), and Sharia Financial Inclusion (It). Using a truncated derivative approach, policies can be targeted towards the variables with the highest marginal impact on increasing tax revenue (Pt) and reducing poverty (Kt).

Implementation is carried out in three consecutive phases. The Foundation Phase (2025-2027) prioritizes strengthening St and Gt by establishing specific regulations, building the capacity of supervisory human resources, and forming a national coordination committee. The Growth Phase (2028-2030) then drives a massive expansion of It through national inclusion programs and digital infrastructure in underdeveloped regions, while optimizing collaboration. The Optimization Phase (2031-2035) integrates advanced technologies like AI and blockchain to create a dynamic and sustainable supervisory system.

The success of this model is ensured by an Adaptive Management and Performance Tracking system that uses a gradient approach (∇Pt and ∇Kt) as a policy navigation dashboard. This system enables real-time evaluation and periodic strategy adjustments, creating a continuous cycle of improvement. Overall, this reconstruction creates an integrated and data-driven governance ecosystem, expected to maximize the contribution of sharia fintech to fiscal resilience and poverty alleviation in rural Indonesia.

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