

Reimagining Takaful through AI and Blockchain

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The Takaful industry, grounded in mutual assistance, shared responsibility, and ethical finance, stands at a transformative crossroads. Driven by artificial intelligence (AI) and blockchain, a new model of takaful, often referred to as TakafulTech, is emerging to enhance transparency, efficiency, and community governance. These technologies automate insurance processes while reinforcing Takaful's original social and ethical mission through innovation and inclusivity.

From Cooperative Roots to Digital Trust

Historically, Takaful has been based on *tabarru'* (mutual donation), with participants pooling funds to support one another against losses. However, traditional models have often faced operational inefficiencies, paper-based claims, and mistrust in fund management. Blockchain technology, which records transactions securely, transparently, and immutably, enables more effective application of Sharia governance within digital systems. By recording every policy, contribution, and claim in an unchangeable ledger, blockchain helps prevent [fraud, mismanagement, and retroactive manipulation](#).

Blockchain's immutable ledger creates a [shared source of truth](#) accessible to stakeholders and regulators. This transparency means participants no longer rely solely on the operator's disclosures; instead, [they can independently verify the flow of funds](#) and the legitimacy of claims. Research shows that when smart contracts govern transactions, claims are processed automatically when predefined conditions are met, significantly reducing human bias, [administrative costs, and delays](#).

Automating Mutual Assistance with Smart Contracts

Smart contracts are a key innovation of blockchain in Takaful. These digital agreements automatically trigger payments when predefined conditions are met, without manual intervention. A common application is [parametric insurance](#), where payouts are triggered by [measurable and objective indicators](#) such as rainfall levels, temperature thresholds, or flight delays.

Similar mechanisms could be applied in Takaful to provide fast and transparent financial support after defined risks. For example, in family Takaful, if a participant's death is confirmed through an official database, the smart contract could automatically release the *tabarru'* amount to

beneficiaries without delay. This automation reflects Takaful's *ta'awun* (mutual support) principle by ensuring speed, fairness, and Sharia compliance.

Moreover, such contracts make inter-operator collaboration seamless. When all transactions are time-stamped and hash-verified across multiple institutions, shared networks can easily detect duplicate or [fraudulent claims](#), guarding the [fund's integrity](#). This interconnected system paves the way for a *global Takaful blockchain consortium*, where operators across jurisdictions cooperate securely under common Sharia and operational standards.

Transparency, Identity, and Security

Blockchain does more than secure transactions, it redefines digital identity management. In Takaful ecosystems, unique blockchain-based digital IDs prevent impersonation during claims or fund contributions. This feature, known as *decentralized identity (DID)*, ensures that only legitimate participants can initiate or authorize actions through cryptographic verification. For regulators and Sharia supervisors, this serves as a powerful assurance mechanism against insider manipulation or false identity [claims](#).

By combining AI-driven data analysis and blockchain identity verification, operators can establish rapid *Know-Your-Customer (KYC)* and *Anti-Money Laundering (AML)* compliance systems. This convergence simplifies governance, protects participant funds, and fosters international confidence in Takaful's ethical model, an advantage especially significant for cross-border operations in regions like the GCC and Southeast Asia.

Artificial Intelligence and Predictive Risk Modelling

While blockchain guarantees transparency in the operational fabric, AI revolutionizes the analytical front. In the conventional insurance sector, artificial intelligence is already being used to assess driving behavior and tailor pricing based on real-world data. [For example, programs like Progressive's Snapshot and Allstate's Drivewise use telematics data and AI to analyze metrics such as speed, braking patterns, and mileage.](#) These insights allow insurers to offer usage-based insurance with personalized premiums that reward safer driving and more accurate risk assessment. Other AI applications include [dynamic risk scoring and automated claims processing](#), where machine learning models streamline underwriting and speed up claim resolutions.

This shift from broad, one-size-fits-all pricing to behavior-based fairness aligns with Takaful's ethical emphasis on justice, transparency, and proportionality. In traditional Takaful, assessing risk and pricing contributions are labor-intensive and depend on human actuaries' judgment. AI introduces dynamic algorithms that learn from vast datasets, ranging from participant demography to regional catastrophe trends, to more accurately predict risk exposure and fair contribution levels.

AI-powered underwriting enables Takaful operators to move beyond static assumptions toward personalized, data-driven coverage. As a result, a young family in Jakarta and a small business in Riyadh can receive pricing tailored to their behavior, lifestyle, and claims history, promoting fairness in financial relationships. AI-driven chatbots and virtual assistants further enhance inclusion by overcoming digital literacy barriers and providing multilingual support around the clock. In addition, AI-based sentiment and behavioral analytics help detect fraud and duplicate claims, strengthening *amanah* (trust) within the takaful-fund. By identifying risk clusters, AI also supports better pool diversification, improving fund resilience [economic shocks](#).

Decentralized Autonomous Organizations: Community Governance in Action

A key innovation in digital Takaful is the integration of Decentralized Autonomous Organizations (DAOs) into Takaful-fund management. Through blockchain tokens, participants can hold ownership and voting rights, enabling them to vote on matters such as operator selection and surplus distribution. This creates a digital form of *shūrā* (consultative decision-making), restores power to participants, where decisions are transparently recorded and automatically enforced through smart contracts.

This democratization redefines the participant-operator relationship. Instead of centralized management, Takaful operations can evolve into self-governing digital communities, where stakeholders directly oversee ethical and operational standards. It transforms contributors from passive donors into active governors of the fund, aligning perfectly with Sharia's participatory principles.

Ethical Imperatives and Sharia Governance

Reimagining Takaful through these technologies strengthens, not dilutes, its ethical grounding. Blockchain enhances transparency, while AI supports the process through data precision. Importantly, these innovations demand robust Sharia supervisory frameworks capable of auditing algorithmic integrity and code-based compliance. Sharia boards must evolve from reviewing policy documents to assessing lines of smart contract code and AI models' datasets, ensuring that automation does not compromise fairness.

Such governance transformation necessitates cross-disciplinary literacy. Sharia scholars, data scientists, and blockchain engineers must collaborate continuously to develop AAOIFI-aligned standards for digital Takaful, ensuring that [technological sophistication](#) aligns with divine ethics, not replaces them.

AI, Blockchain and financial inclusion

Beyond efficiency, the promise of AI and blockchain in Takaful lies in financial inclusion. By reducing administrative costs and simplifying operations, digital Takaful models can extend micro-Takaful services to underbanked populations across South Asia, Africa, and the Middle East. Mobile-based microinsurance initiatives in Africa and Asia already demonstrate how digital platforms can reach low-income communities at scale. In Kenya, for example, the Kilimo Salama program uses mobile money (M-Pesa) to sell and pay out weather-indexed insurance for smallholder farmers, enabling both premium payments and payouts through mobile phones. In Rwanda, partnerships between mobile network operators like MTN and insurance providers such as MicroEnsure have made affordable health insurance accessible through mobile wallets, improving coverage in rural areas. Similar models exist across several African countries, where mobile-powered insurance offerings from aYo Holdings provide life and asset protection to millions previously excluded from formal insurance. In South Asia, insurers in countries such as Bangladesh and India are also expanding mobile and SMS-based microinsurance for health and agriculture to low-income households, combining accessibility with flexible payment mechanisms.

These experiences indicate that combining mobile delivery with AI and blockchain could enable scalable micro-Takaful models for underserved communities.

Limitations and implementation challenges

Despite its potential, the integration of AI and blockchain into Takaful faces several challenges. First, high implementation costs and limited technical expertise may prevent smaller operators from adopting advanced digital systems. Second, algorithmic bias in AI models may unintentionally disadvantage certain groups if training data is incomplete or unrepresentative. Third, regulatory uncertainty remains a major barrier, as many jurisdictions lack clear legal frameworks for blockchain-based insurance contracts. Fourth, Sharia scholars may face difficulties in auditing complex algorithms and smart contracts without specialized technical support. Finally, unequal access to digital infrastructure may exclude vulnerable populations if technology adoption is not accompanied by inclusive design and education.

Conclusion

AI and blockchain offer Takaful a pathway to greater inclusion, transparency, and efficiency, but their impact depends on thoughtful implementation. Policymakers should enable innovation through regulatory sandboxes that allow Takaful operators to test digital solutions under proper supervision. At the same time, Sharia scholars need targeted training in data analytics, smart contracts, and algorithmic auditing to ensure effective ethical oversight.

Progress also requires coordination: governments, regulators, and Takaful operators should collaborate on shared digital infrastructure, such as interoperable platforms and trusted digital identity systems, to reduce costs and strengthen trust. International standard-setting bodies, such as AAOIFI, must complement these efforts by developing common guidelines for AI ethics and blockchain governance in Islamic finance.

In this evolving digital landscape, technology should serve as an enabler of Takaful's original mission, not a departure from it. When guided by thoughtful policy, informed governance, and ethical oversight, AI and blockchain can help Takaful move closer to its foundational purpose: safeguarding communities through cooperation, justice, and shared responsibility in a digitally connected world.