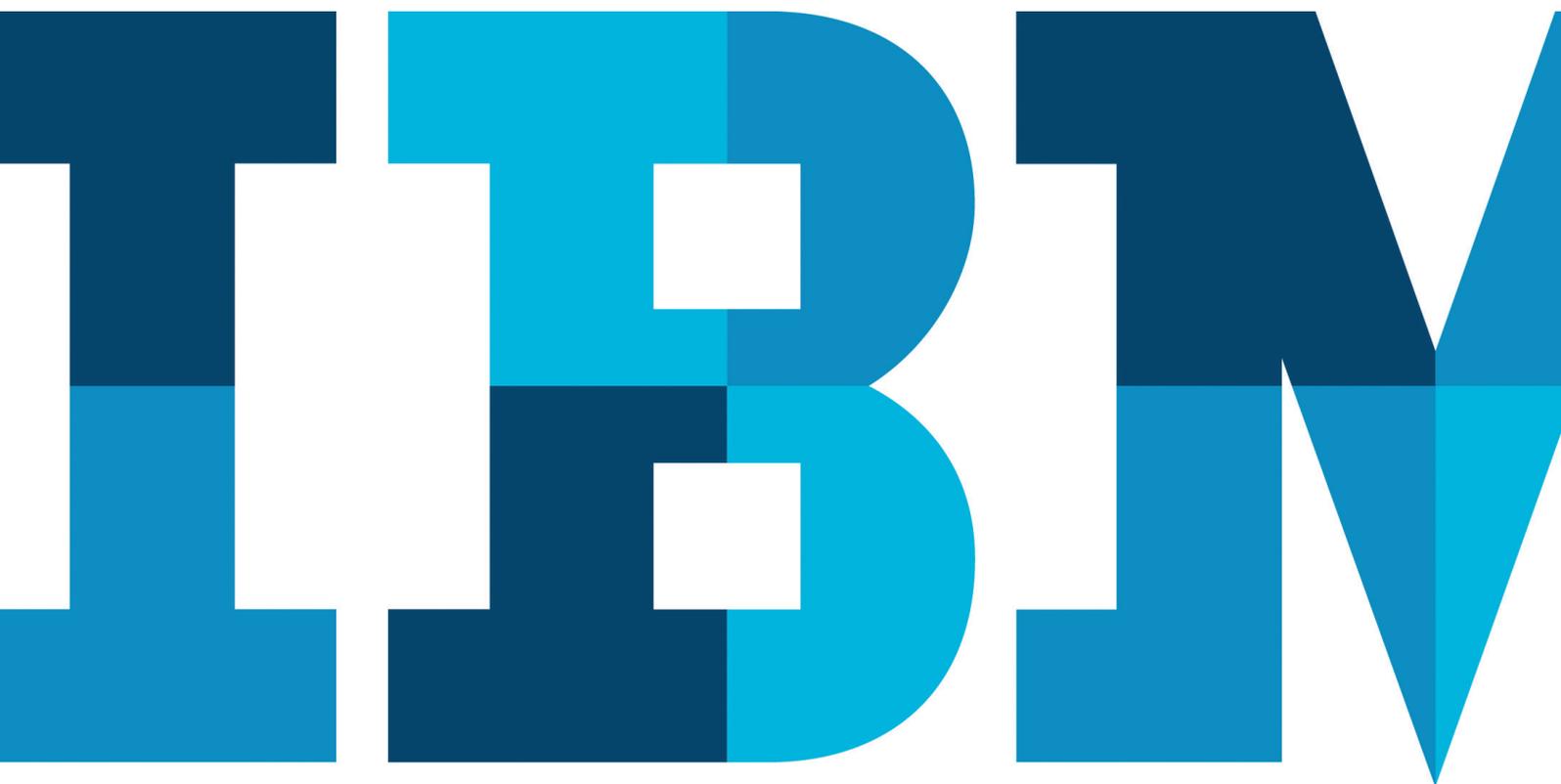


The building block of an insurance revolution

How blockchain technology will change the insurance industry



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As recently as the 1970s, paper contracts and processing dominated the insurance industry. Technical advancements were primarily limited to filing systems.

Then, computing capabilities expanded and carrier and agency systems became more complex. Mobility and the instant-information era piled additional demands on the industry's information technology systems.

But throughout, technological advances focused on streamlining data management and processing. Now, the blockchain promises more than just data processing advances – it promises to transform how we do business.

Why blockchain and why now?

Since 2015, blockchain-related announcements have become commonplace across the industry. The sheer volume of industry announcements suggests blockchain is quickly moving towards broad acceptance.

In 2016, Manulife announced they are collaborating with Consensus and BlockApps to incorporate blockchain technology through John Hancock's Lab of Forward Thinking. For this proof of concept, they are using blockchain to show how distributed ledger technology could reinvent the insurance industry.

In 2016, Allianz announced the use of blockchain-based smart contracts. Their goals: automate catastrophe swaps and bonds, improve transaction processing and accelerate settlement of funds between insurers and investors following unforeseen disasters.

Since 2015, the Lloyd's of London innovation team has actively explored blockchain. They see the opportunity to improve collaboration between market participants, as well as streamline market operations as part of their Target Operating Model (TOM) modernisation plan.

Even mobile payments platform Saldo.mx has realised blockchain's potential. Saldo debuted a microinsurance service, Consuelo, which allows users to easily obtain a fixed health and life insurance policy. Consuelo uses the smart contract capabilities within blockchain to provide direct insurance to end consumers and protect against fraud.

Not to be left behind, new insurance industry entrants are actively implementing blockchain applications. Everledger has been using blockchain technology to track diamond ownership, verify transaction histories and record loss records—enabling insurers to confidently underwrite policies.

Safeshare uses blockchain to offer on-demand, Lloyd's-underwritten insurance coverage for the sharing economy, such as home rental for commercial use. Startup Dynamis operates a blockchain-based platform for a peer-to-peer insurance model. The Dynamis model functions as a community-based, decentralised autonomous organisation where smart contracts fully control the activities, including managing premium pools.

More insurance industry benefits

These examples are just a few indicators of an industry-wide groundswell. Blockchain technology is driving incremental changes and fundamental innovations throughout the insurance industry.

Securely sharing identity information on a blockchain network can reduce verification and compliance costs and improve underwriting cycle times, for processes such as know your customer (KYC) and anti-money laundering (AML). Also tracking provenance of high-value assets in a supply chain network can help reduce insurance fraud.

Event ledgers that record and track physical events can increase accuracy and automatically trigger policy clauses for insured risks, such as vehicles, individual physical activities and supply chain goods. For immutable events, such as document signings, blockchain technology can compress cycle times and provide a fully auditable sequence of events.

Event ledger analysis can reveal cost-saving opportunities, such as expenditures with a single supplier, or challenges with a particular contractor. Also shared ledgers can streamline management of financial collateral documentation, such as letters of credit and investment and collateral instruments.

The combination of immutable ledgers, smart contracts and automated data ingest already enables self-administering and temporary insurance for the sharing economy. Also as Auger demonstrates, blockchain technology promises more innovation for the transparent electronic prediction markets.

For insurers, blockchain-driven prediction markets can help hedge underwriting risks by trading financial instruments linked to the insured risks. Alternatively, prediction markets could be used as a modelling tool to estimate risk.

Blockchain basics

In a traditional, multiparty network like insurance, asset transfers or transactions must be monitored for ownership or responsibility. This creates challenges as each party keeps their own transaction records in a ledger. As transactions occur, each party then updates and validates their ledger against other ledgers in the network.

This method increases costs and reduces efficiency as the governing conditions, or contract, is duplicated by network participants within their own ledgers. In addition, errors can arise due to financial fraud, cyber-attack or even honest mistakes.



Figure 1. The four basics of blockchain

By contrast, blockchain establishes shared, replicated and permissioned ledger technology that allows network participants to see and edit the system of record, or master ledger, as transactions and permissions allow. There are four key concepts critical to understanding how blockchain will affect the industry:

1. **Shared ledger:** The ledger is an append-only, distributed system of record that is shared across the business network. Each participant has his or her own copy through replication. Entries are permissioned, so participants see only transactions for which they've received authorisation
2. **Smart contract:** The contract for asset transfer is encoded in programming language and embedded in the transaction database. This code determines the conditions under which the transaction can occur
3. **Privacy:** Blockchain ensures appropriate visibility of transactions. They are cryptographically secure, authenticated and verifiable
4. **Consensus:** All parties agree to abide by network-verified transactions. In anonymous blockchain networks like Bitcoin, this cryptographic commitment is expensive. In business networks, where participants are known and trusted, cryptographic commitment requires less computational cost.

How blockchain impacts shared assets

Within the insurance business network, a wide variety of asset classes can benefit from blockchain. We have limited this discussion to several asset classes that are routinely shared and, therefore, represent the largest opportunities for blockchain exploitation.

Client identity: Writing new insurance requires verifying client identity, including KYC and AML compliance checks. Traditionally, multiple ledgers resulted in multiple certified client identity versions existing across an insurer's divisions or across the broader network. Blockchain permits a single, verified client identity and grants changes on a shared, permissioned basis to interested parties. The result—reduced KYC costs, lower identity theft risk and lower damaged reputation costs.

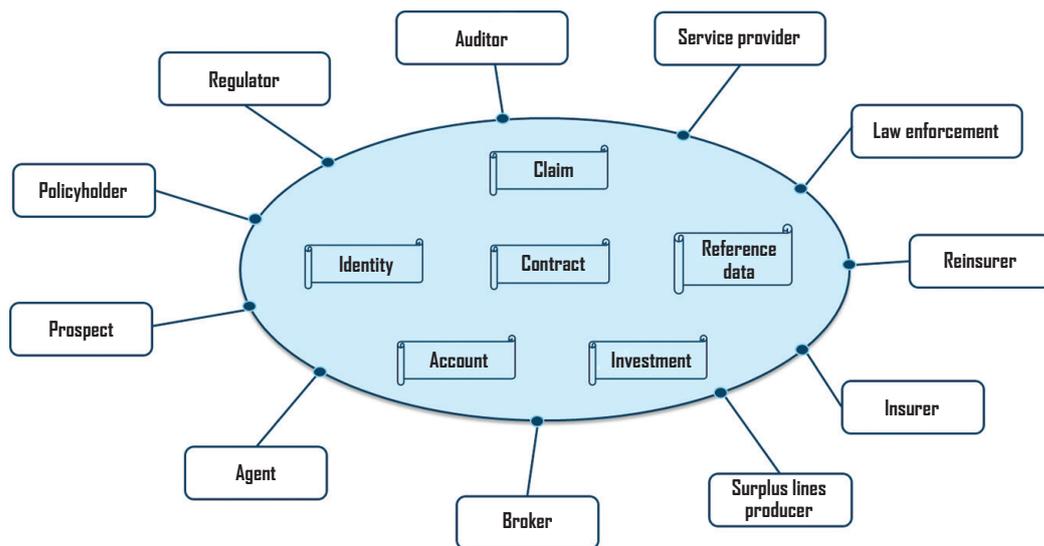


Figure 2. Blockchain impacts to shared assets

Risk provenance: Blockchain supports tracking high-value risks and supply chain transactions in a single location. This process reduces costs for insureds and insurers due to immutability of risk provenance data, reduces fraud in underwriting and claims processing and improves accuracy of risk estimates.

Asset usage history: Combining blockchain event time-stamps and internet of things (IoT) sensors allows tracing of an insured asset's usage history. This enables new insurance revenue models for the sharing economy and brings usage transparency where participants dynamically join and leave the shared network.

Insurance contract: Smart contracts based on blockchain can streamline processing, minimise query-to-contract cycle times and reduce operational cost. For underwriting and claims, blockchain also supports straight-through processing for contract clause triggers and flow of funds between parties. Also blockchain can strengthen the trust between parties and insurers by serving as a digital repository for electronic and paper insurance contract documents.

Business credentials: Blockchain can serve as a repository for broker and agent licensure and operating authorisations. Coupled with smart contracts, this permits tracking of insurer financial relationships governing payouts, lowering the overhead in the broker-agent network.

Reference data: To improve underwriting and claims processing, insurers regularly rely on reference data provided by third-party providers. Blockchain can improve file accuracy, change traceability and data fidelity by streamlining data updates including addresses, credit histories, motor vehicle records, weather conditions and medical and drug treatments to name a few.

Claims file: The blockchain can record a clean, auditable, non-reputable claims processing history across the network. This audit trail enables advanced analytics, fraud reduction and compliance validation, while reducing paper or electronic exchanges and eliminating the typical one to three percent messaging errors.

Accounting instrument: Insurers have complex financial relationships with their network partners, including brokers, agents, surplus lines producers, different insurance divisions, re-insurers and supply chain partners. Accounts are reconciled periodically, with account positions validated against the insurer's general ledger.

This process can create errors due to contract complexity, insecure collaboration tools, key person dependency risks and limited data validation. Resolving these errors takes additional time and money. Using blockchain to maintain shared, permissioned financial ledgers across the network with embedded accounting rules can reduce errors, saving time and money, as well as smoothing cash flows.

Investment: Insurers invest premiums and reserves to generate investment income. Blockchain technology can streamline permissioned transactions involving these investments, reducing the layers of intermediaries and, therefore, each transaction's duration and cost. In addition, smart contracts with automation logic could automatically initiate transactions to further reduce operating cost.

Blockchain industry use cases

We've described a wide variety of potential insurance industry applications of blockchain technology. This provides a sense of what is possible and what is coming. But given blockchain's capabilities and the current state of the industry, these are representative deployment examples.

Medical claim

A patient visits her doctor. After coverage and co-pay are confirmed, the doctor provides a diagnosis and a prescription. The doctor's office initiates a claim, which generates reports that include treatment, procedure codes, negotiated rates and the patient's co-pay. The process triggers an explanation of benefits (EOB) that is provided to the insured and billing support.

The medical claim process requires extensive overhead with high costs and time requirements. Further, the multiple steps and involved parties create opportunities for billing errors and confusion, payment errors and confusion and disputed coverages. Even credit reporting can be involved.

A shared ledger and smart contracts help quickly and accurately capture and track claim data and changes, along with the applicable terms and conditions—while protecting patient data. Throughout the process, errors and rework lessen and accuracy and traceability improve.

Scheduled property claim

A homeowner purchases a high-value item. He receives order and shipping confirmation from the seller then, upon receiving the item, notifies his insurance agent to add the item to his insurance policy. The underwriter calculates the premium and coverages using information provided by the agent. Two months later the item is stolen and the owner files a police report and initiates a claim.

Adding the item to the policy and processing the claim involves significant time and effort. The agent must coordinate service with the insured while the company follows mandatory fraud-prevention procedures. Given the high value, unique characteristics and potential for locating the stolen item, such claims are frequently placed on industry or topical bulletin boards that are not always monitored.

Blockchain's ledger, smart contract and security help establish item provenance. Blockchain then stores key identifying characteristics and construction details that assist the underwriting process, as well as the subsequent police report and claim. By rapidly obtaining the police report and distributing it to the appropriate law enforcement and recovery organisations, the recovery possibility rises, along with the likelihood of a final claim cost reduction.

Also if a replacement item is required, the blockchain data can help establish a suitable replacement item and value. Throughout the process, blockchain allows for up-to-date communication with the claimant.

Catastrophic claim

A storm with high winds, rainfall and hail damages a covered home and the homeowner files a claim. Upon receiving the claim, the insurer establishes coverage limits and actual damages. The insurer may use a contract adjuster and trusted external data to identify claim validity and amounts.

Once complete, the insurer communicates the decisions to the agent and the homeowner and the repair process can begin.

The contractor receives notice of fund availability to determine what additional funds must be provided by the homeowner and the insurer monitors the process until it's complete. The catastrophic claim typically involves multiple parties and has process risks, such as incomplete documentation, partial payments, disputed coverages, incomplete reviews, as well as billing and payment errors.

Blockchain's shared ledger provides a single repository for capturing the claim data and any changes. Smart contracts establish the applicable terms and conditions throughout the process, minimising errors and rework, while improving the claim's accuracy and traceability. The blockchain provides a fully auditable record that any of the permissioned parties may access during or after the claim and maintains the record for future reference.

Reinsurance contract

To limit exposure to a particular risk, an insurer obtains facultative reinsurance through the broker market. The insurer makes payments throughout the policy period on a reporting form basis. The reinsurer creates multiple claims reserves during the policy period, although payments are not made—nor expected for several years.

Incurred but not reported (IBNR) reserves are established based on the incurred loss reserves and exposure estimates. At the policy close, the primary insurer initiates a premium

audit of the insured, which determines additional premium is due because of reporting form errors. The audit triggers adjustments that impact the reinsurer.

Reinsurance contracts can be very transaction intensive. Administering a single contract can last several years and present multiple conflict opportunities due to slow, missing or incomplete documentation exchange among parties—especially during complex and lengthy claims processes. The complexity is increased by detailed financial transactions, letters of credit creation, renewal requirements, collateralisation needs and collateral drawdown.

Using blockchain allows an insurer and its reinsurers to share a common, permissioned ledger that streamlines the process through consensus. Smart contracts establish reinsurance terms and conditions and authorised transactions provide triggers and conditions for coverage and payments, as well as collateral creation and drawdown. The result—fewer disputes, easier reinsurance audits and lower volatility.

Reinsurance claims

During the course of a reinsurance contract, the insurer reports a claim. The insurer provides claim-related information to the reinsurer, including the insuring agreement, claimants, litigation issues, claim evidence and outcome scenarios. They collateralise claim reserves with deposits and qualified letters of credit. When claim reserves exceed the expected levels, premium adjustments may be made if the ultimate claim payments differ significantly from the claim's reserves, including IBNR.

As with the reinsurance contract, reinsurance claims can be complex, extend many years and present multiple conflict opportunities due to slow, missing or incomplete documentation. Reinsurers require access to any underwriting documentation that may impact the claim. Claim payments, structured settlements and intermediary payments to lawyers, expert witnesses and others can be complicated and take time. Also because of the close association between claims and the collateralisation process, the insurer, reinsurer and any financial institutions must closely coordinate.

Combining a blockchain-shared ledger with smart contracts among the key parties can provide a permissioned, common view of the contract, claim details and associated financials. This minimises disputes and reduces resolution time, resulting in more efficient financial transactions with fewer errors and lower costs.

Surety insurance

A customer, such as a building contractor, requests a construction bond or contract for performance. The surety, or insurer, issues a bond to the building owner that will be executed if the contractor fails to complete the job. The bond is set based on the construction project's unique specifications and timelines. Bond collateral is established using a standby letter of credit.

Events that trigger the bond may not be fully understood, documented or effectively communicated to all affected parties in a reasonable time. This can create unnecessary bond activation or inappropriate release of supporting collateral.

The blockchain's shared ledger provides permissioned parties, such as the contractor, subcontractors, inspectors, owners, insurers and reinsurers, with clear visibility to the bond. This lowers policy administration costs and reduces the likelihood of inappropriate or unsubstantiated modification to the bond, collateral or terms. Also blockchain's smart contract can speed resolution when disputes arise.

Parametric-based insurance

An insurer issues a policy that automatically pays based on the occurrence of a well-defined and identified event, known as a parametric event, or to certain index thresholds. Examples of such occurrences are a hurricane event, rainfall quantity, temperature range and feedstock vegetation amount. The policy payment provision is triggered when the parametric event happens.

Parametric policies typically cover low-value events that have minimal claims infrastructure and low event-disagreement risk, or low value but easily defined events, such as event or flight cancellations. In all cases, policy viability demands minimising fraud risks along with processing and claims administration costs.

This blockchain application combines a smart contract with a permissioned, shared ledger. The ledger connects the insurer; the payment conduit provider, such as a mobile phone or credit card company; and an agreed upon source known as the oracle. The oracle's purpose is to communicate when an insured payment event happens.

The oracle records the complete event details in the ledger, and payment is transmitted securely and automatically from the insurer to the insured. The ledger retains all transaction details that can be used to modify contract terms, conditions and trigger parameters in the future.

Financial audits and reporting

For financial audits of insurers, the auditor first accesses detailed reports and financial data to develop regulatory and financial reports. The auditor may request additional information required to audit targeted transactions.

The auditor evaluates the transactions against required levels of accuracy, confirmation, auditability and uniformity and then identifies any deviations from standards, failure to meet approved protocols or transactions with missing records. The auditor concludes by generating and filing reports, as well as providing appropriate certifications.

Audit complexity stems from insurance transactions that can span many years, combined with challenges created by reserve changes, claim payments, investment positions, agent balances and collateral management. Errors are common, entries are frequently corrected and after-the-fact adjustments can be made for losses.

This complexity causes reconciliation, analysis and documentation challenges. Also that's in addition to the obstacles of providing detailed reports on accident year, calendar year and policy year terms for required generally accepted accounting principles (GAAP) and statutory reconciliation.

Using the shared ledger and smart contracts typical in a blockchain, the insurer simply establishes the auditor as a permissioned user. This access allows the auditor to evaluate

summary accounts and individual transactions at the insured level, along with individual transactions found in the associated smart contracts. Transaction immutability, combined with access security and transaction security, allows for faster review, reconciliation and audit with fewer errors.

Investment tracking and reconciliation

Using premiums, the insurer makes investments in specific securities. As the transaction progresses, the buyer and seller are identified, the security price is communicated and agreed upon and ownership is transferred, along with associated rights and documentation of obligations. These details must be captured.

Such securities transactions and their details create numerous records and transaction histories that must be maintained, audited and managed in compliance with good business practices and legal requirements. Also these records and histories must be secured while allowing authorised users absolute transparency as required.

Using the blockchain ecosystem, the buyer, seller, intermediaries, market makers and others can seamlessly connect—improving transaction speed, security, transparency and recording. As the transaction proceeds, individualised permissions are provided depending on role and transaction stage and regulatory compliance, oversight and review can be performed. Similar to the audit use case, transaction immutability, combined with access security and transaction security, allows for a quicker, more adaptable investment market with fewer investment errors.

IBM is committed to your success

The insurance industry is beginning a transformational shift—one that will change the infrastructure of the entire industry. Succeeding in this environment requires that you take advantage of new technologies to streamline operations and reduce costs.

For over a century, IBM® has been pioneering technologies, including blockchain and providing services that help communities exploit these technologies. This is why we are a founding member of the Linux Foundation's blockchain-focused Hyperledger Project and have provided 44,000 lines of code to support the open source effort.

IBM has also created small, hands on blockchain labs in New York, London, Singapore and Tokyo to facilitate collaboration between our experts and developers. Also we are working with the London Stock Exchange to create an open blockchain solution to help manage risk and enhance transparency in the global financial markets.

Our extensive blockchain expertise allows us to help you see how the technology can improve your insurance business. And we stand ready to assist you in the design, construction, deployment and management of blockchain to meet your unique needs and business practices.

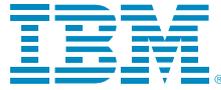
For more information

To learn more about how to position yourself for success with blockchain, please contact your IBM representative or IBM Business Partner (BP), or visit: ibm.com/blockchain.

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