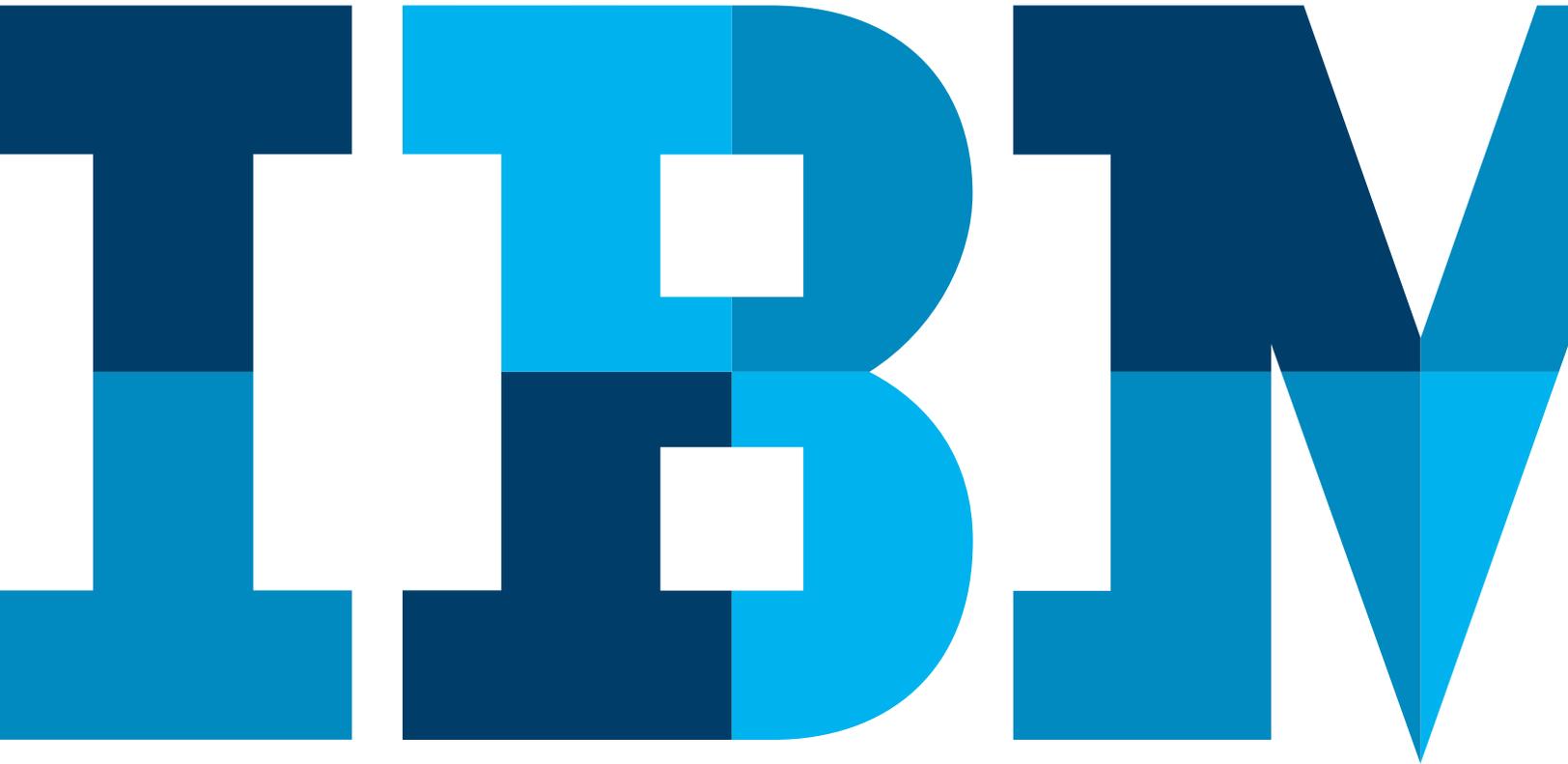# Blockchain

*The Chain of Trust and its Potential to Transform
Insurance Industry – Our Point of View*

IBM

Executive Summary

The insurance industry is looking at technology to enable new ways of working for the market. Blockchain is one such technology. Some of the First Mover Insurers (Trialblazers) are looking to blockchain to help drive their wider transformation agenda by focusing on new access to trusted information and new business models. These Trialblazers not only see the value in participating in the broader financial services blockchain ecosystem, but they also see blockchain as an opportunity to improve efficiency, lower the costs of transaction processing, enhance the customer experience, improve data quality, increase trust between parties and support auditability, among other benefits.

Although blockchain is currently embryonic and unproven, it has the potential to radically alter insurance business models and even render them obsolete.

In the longer term, the potential disruption to the insurance industry from blockchain technology is staggering. Blockchain technologies will enable the creation of assets in a new, distributed form — such as documents, credentials, assessments and transactions — that span the entire insurance value chain. These distributed assets will challenge the traditional insurance business model.

IBM is helping Insurers across the globe to determine what use cases are best suited for blockchain, and how to make it easier to innovate on top this middleware fabric. During our discussions, it has come out clearly that a majority of the Insurance CIO's are keen to understand how they can potentially leverage Blockchain to overcome the challenges they are facing today in the Insurance Industry. In this paper, we discuss the challenges in the Insurance Industry and how blockchain can potentially solve them

"Blockchain is so profound it will do for trusted transactions what the internet did for information."

— Ginni Rometty, IBM CEO,
   FinTech Ideas Festival Keynote, 2017

Insurance Industry Challenges and How Blockchain Can Solve Them

The term "blockchain" arises from the structure of the data model (Shared Ledger) and the way in which new transactions are recorded. The data model is a simple, "flat file"-style linear list wherein new records, or blocks, are appended through a process called "mining," in which new transactions are verified and added by solving complex "proof of work" problems. New transactions are added in groups to the next block, which contains a cryptographic hash of the data in the previous block. Through this reference to the previous block, and verification across the entire peer-to-peer network, the integrity of this "chain" of blocks is maintained. A key differentiating aspect of this model is that the ledger is distributed across every node of the network—no central database or system of record serves as a final authority.
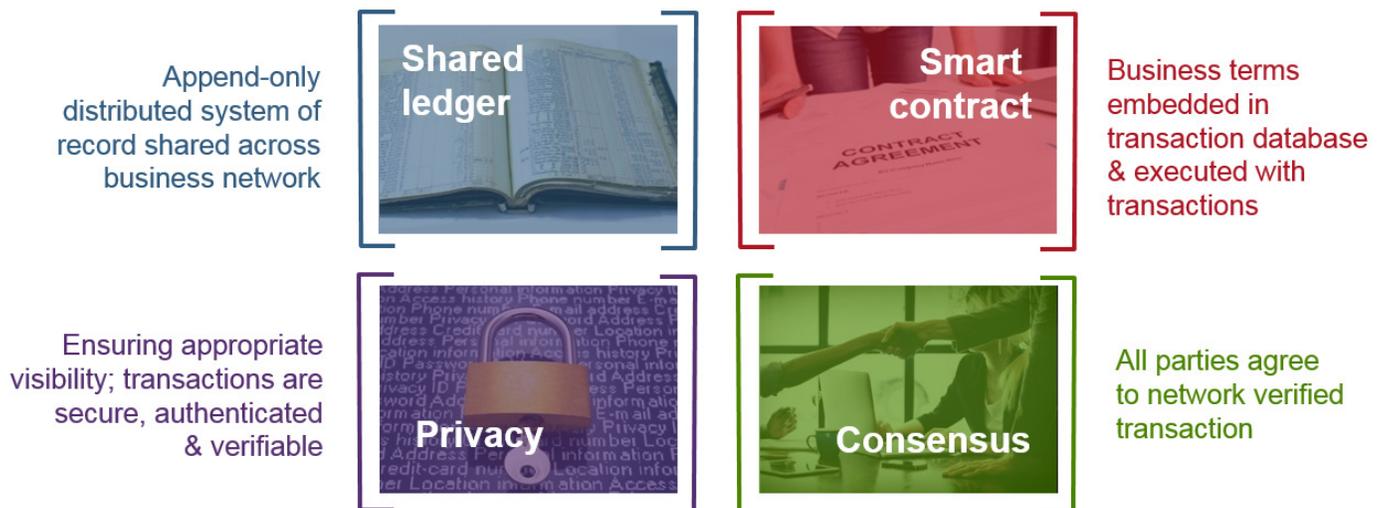
Append-only distributed system of record shared across business network

Shared ledger

Smart contract

Business terms embedded in transaction database & executed with transactions

Ensuring appropriate visibility; transactions are secure, authenticated & verifiable

Privacy

Consensus

All parties agree to network verified transaction

Figure 1: Blockchain Key Concepts

Saves
time

Transaction time
from days to near
instantaneous

Removes
cost

Overheads and
cost intermediaries

Reduces
risk

Tampering, fraud
& cyber crime

Increases
trust

Through shared
processes and
recordkeeping

Figure 2: Blockchain Benefits

Insurance industry leaders realized the potential of combining blockchain technology with the IoT (Internet of Things) and smart contracts to open the door to new insurance products and services with reduced friction and accelerated time frames.

In the longer term, the potential disruption to the insurance industry from blockchain technology is staggering. Blockchain technologies will enable the creation of assets in a new, distributed form such as party identity credentials, contract documents, claim assessments and accounting transactions that span the entire insurance value chain. These distributed assets will challenge the traditional insurance business model.

The Table below lists the current challenges the Insurance industry is facing in some key focus areas and our views on how blockchain could be leveraged to overcome the same

Table 1: Insurance Industry challenges and potential blockchain solutions

Key Focus	Current Challenges	Blockchain's Impact	Benefits
Emerging Markets	• Huge investments needed to start the operations in Emerging markets • ROI is unknown	• P2P (Peer to Peer) blockchains with smart contracts could be applied to micro-insurances and underwriting and claims handling can be automated based on defined rules and the availability of reliable data sources	• Offer Insurance services at low handling costs without incurring huge initial expenses to check the viability of the market
On Boarding of New customers (KYC)	• Customers' fears about losing control of personal data as soon as it is handed over to an insurance company and their frustration to repeat the same identification and verification process every time for different contracts	• Once the KYC profile is verified, a customer can forward the verified identity data to other companies for different contracts ,avoiding the need to repeated data entry • Personal data does not need to be stored on the blockchain; • access control to such sensitive data can remain with the customer on his personal device, while data is verifiable and (after approval by the customer) reusable for other parties	• Speed up and simplify the onboarding of new customers • Blockchain may reduce administrative/operations cost through automated verification of policyholder identity and contract validity

Key Focus	Current Challenges	Blockchain's Impact	Benefits
Policy Sales	• Coordinate sales by establishing sales territories, quotas and goals • Establish training for agents • Determine potential customers	• Intermediaries are reduced through use of smart contracts (distributed trust) • The combination of immutable ledgers, smart contracts and automated data ingest enables self-administering insurance for the sharing economy.	• Better serve clients through faster, more convenient and secure services
Underwriting	• Underwriting commercial risks involve mitigating exposure to the insurer to the extent affordable premiums can be offered to the insured. • Limiting exposure involves finding other more efficient risk pools to recede risks at a lower price. • The options available for recession are limited by the insurer's ability to share information about the insured as well as rigid standards of risk recession	• Blockchains hold the promise of extending the insurer's ability to guarantee properties of risk, specific to the insured as well as execute terms of recession more customized to the policyholder	• Brings efficiencies in the insurer's underwriting process and ability to underwrite more diverse kinds of risks • Automation: smart contracts can drive significant automation in underwriting. This will reduce the operational costs and lead times of processes • Efficient risk distribution: Smart contracts can efficiently accommodate customized policy-level terms in a standardized execution framework and enforce them at scale. This will significantly enhance the efficiencies of risk recession and hence distribution of risk into appropriate risk pools

Key Focus	Current Challenges	Blockchain's Impact	Benefits
Contracts	• Physical contracts • Transactions among stake holders are not transparent and auditing is very time consuming • Each stake holder maintains their own contract and other data bases, hence lack of consistency	• Blockchain offers huge potential for enabling digital contracts and transactions amongst multiple parties to be executed in a secure, transparent and auditable way. • By establishing trusted relationships among all participants, Blockchain has the potential to provide a consistent, automatic smart contract execution environment where transactions and contracts are stored on a shared ledger, thus reducing the administrative workload of multiple stakeholders to ensure contract consistency and execution.	• Reducing the administrative workload of multiple stakeholders to ensure contract consistency and execution
Claims management	• Complex pools of risks in P&C are usually shared by multiple parties involving insurers and reinsurers, who would jointly indemnify the insured of losses to the extent of the insured's interest. However, the risk is distributed across complex layers of paper contracts with very little transparency and information sharing • Claims processing and disbursements of payments are riddled with complex workflows between brokers, insurers and reinsurers involving layers of verifications. The payment itself is a complex chain of transactions involving banks across borders with high fees.	• Blockchain's properties of transparency with privacy designs can make information sharing feasible and seamless. Its properties of composability can help policy-granular recession of risk with co-insurers and reinsurers. • Claims will be settled using smart contracts that streamline the verification of coverage and payment for repairs at authorized repair shops. Claims are filed and adjudicated using the coverage information recorded on the smart contract, thereby avoiding disputes and the need for additional reviews by claims adjustors. Claims payments will also be automated.	• Blockchain may reduce administrative/operations cost through automated verification of policyholder identity and contract validity, auditable registration of claims and data from third parties, improved speed for claims payment and payouts for claims via a Blockchain based payments infrastructure or smart contracts.

	• Ascertaining the timeline of incidents leading up to a claim of loss can be very challenging, especially for the institutions that share indemnity downstream away from the insured.	• Example: Flight insurance policy built on Blockchain with smart contracts. These smart contracts initiate payouts automatically for insured flight tickets when cancellations or delays are reported from verified flight data sources • Blockchain's immutability and transparency properties can bring significant efficiencies in enabling all stakeholders of the claims process to arrive at a consensus on the timeline of incidents, and verify adherence to the share of obligations	• Automation: smart contracts can drive significant automation in claim processing. This will reduce the operational costs and lead times of processes
Fraud and abuse	• Fraud is pervasive, growing and has become a board room issue • Fraudsters are much more sophisticated, technology enabled and transnational • Fraudulent activity continues to rise, methods more sophisticated • Organized crime rings are more prevalent • Enormous amounts of data to uncover fraudulent activity is a daunting task (Structured & Unstructured)	• Risk ledgers that store and trace information about the risk being insured (for example, property titles, land titles, precious gem fingerprints and high-value asset fingerprints) can help reduce cost of verification and reduce fraud costs over time • The promise of Blockchain is to remove the need to trust a third party by trusting the network-agreed data set contained in each block and visible to all parties in the chain.	• Abuse is reduced through Blockchain-enabled traceability and accountability. • Fraud is reduced with Blockchain-timestamped protocols • claims fraud determination with quicker turnaround reducing recovery risks

Key Focus	Current Challenges	Blockchain's Impact	Benefits
Reserve calculation	• While insurers use well-tested actuarial approaches to determine reserves, even the best reserving methods will always be subject to adjustments – as the nature of risks and the resulting claims are subject to unforeseen events and other factors, such as technological and legal developments, medical progress and changing attitudes in society and legal development • Real time data on claims will not flow, there will be substantial lag	• Blockchain enables real time data flows and claims determination between various stake holders in the Insurance value chain	• Provide faster insights for reserve calculation
Reinsurance	• Amount of data flowing between client, broker, and reinsurer and outsource service providers, all of which requires multiple data entry and reconciliation, the transformational potential within reinsurance is even greater.	• A risk can be ceded/retroceded using a Blockchain application specifically designed to process treaties, notify all parties and then process premium and commission payments. The technology could also be applied to speed up claims processing and verification. • Improve Processing efficiency – using Blockchain to remove multiple rekeying of data and task duplication • Full transparency among the stakeholders – if all underlying risks are on a Blockchain, these could be aggregated onto a reinsurance Blockchain so all information, documents and transactions flow into the reinsurance	• Faster placement and settlement opens the way for a significant boost in client satisfaction and retention • Giving reinsurers, controlled access to claims and claims histories registered on the Blockchain improves transparency for the reinsurer in an automated and, at the same time, auditable way • Blockchain solutions will help with more efficient data processing and reductions in claims leakage and fraud resulting in lower Reinsurance expense ratios

Key Focus	Current Challenges	Blockchain's Impact	Benefits
Accounting	• 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 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.	• The potential of Blockchain lies in its ability to create a distributed ledger of transactions, of which all participants have an identical copy that can be accessed and viewed in real-time. • Every participant in the process can manipulate the ledger securely and without the need for a central authority, because they all see it simultaneously. • The combination of immutable ledgers, smart contracts and automated data ingest enables self-administering insurance contracts for the sharing economy	• 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.
Internet of Things (IOT)	• Nascent technology - cannot support IOT • Interoperability • Embracing multiple standards across the IoT stack to support various vendor's devices • Data sharing limits- Insurers can't just force vendors to share their data, making it difficult for insurers to build services on top of whatever data device-makers are willing to share.	• With IoT, cars, electronic devices or home appliances can have their own insurance policies registered and administered by smart contracts in a Blockchain network, automatically detecting damage first and then triggering the repair process, as well as claims and payments.	• Blockchain technology offers a good match for IoT scenarios. IoT applications are by definition distributed and call for devices to interact directly with each other rather than via existing centralized models.

Key Focus	Current Challenges	Blockchain's Impact	Benefits
Privacy and security	• Information privacy and security are high profile, serious concerns for the Insurance industry which routinely collects, uses and stores financial, health and medical information for their insured. Coupled with the increasing number of cyber-attacks and network intrusions attempts, preventing unauthorized access to sensitive data is a growing concern	• Promotes electronic prescriptions and decentralized, trust-based, authenticated data exchange. • Supports data encryption and the management and enforcement of complex permission settings for participants and third parties.	• Security is enhanced through encryption and cryptology. • Integrity improves due to peer-to-peer accountability (distributed ledger).
Governance and compliance	• Siloed Operations • Compliance to regulatory requirements • Increased regulatory focus on the ability of insurance companies to remain solvent in an uncertain landscape. Insurers need to adhere to a host of stringent and changing compliance requirements • Failure to comply could cost companies dearly in terms of money and reputation. They also put additional pressure on already stretched resources by increasing costs and bringing in operational challenges.	• Blockchain could be used to keep track of the steps required by regulation. • Practical immutability: as soon as data is saved into the chain, it cannot be changed or deleted. That is why Blockchain is used as the document or proof for the transfer of any digital asset • Recording actions and their outputs immutably in a Blockchain would create an audit trail for regulators to verify compliance. • Regulators could have read-only, near real-time access into the private Blockchain of financial organizations. This would allow them to play a more proactive role and analyze information in real-time mode.	• Reduce dramatically the time and effort (and therefore cost) that financial institutions spend on regulatory reporting, as well as improving the quality, accuracy and confidence of and in the process. • The automation of compliance reporting through smart contracts will make shared risks across legal jurisdictions much more efficient.

We believes blockchain can be applied to resolve many of these challenges, including the fundamental issues of security, scalability, interoperability, and privacy (particularly for EMR data).

Blockchain is more suited if the following conditions are fulfilled:

- Involves multiple parties
- Involves new intermediaries

- No need for a central trusted authority for executing various transactions
- Accurate record of the date and time of each transaction needs to be captured
- Retroactive manipulation of data is not encouraged
- Multiple uses of the same data is possible by different stake holders.

IBM's experience in implementing Blockchain solutions

FX Netting	Settlements through digital currency	Identity management
Food Safety	Trade Finance	Channel Financing
Low liquidity securities trading and settlement	Reward points management	Contract Management

Figure 3: Blockchain Implementation References

How can IBM Help apply Blockchain

IBM is a founding member of Hyperledger, a Linux Foundation Project and has been a leading voice in developing collaborative open standards for distributed ledgers and smart contracts. Here is an overview of The Linux Foundation, Hyper Ledger and its respective sub-projects:

The Linux Foundation®

The Linux Foundation is the organization of choice for the world's top developers and companies to build ecosystems that accelerate open technology development and commercial adoption. Together with the global technology community, The Linux Foundation is solving the world's hardest problems through open source and creating the largest shared technology investment in history. Founded in 2000, The Linux Foundation today provides tools, training and events to scale any open source project, which together deliver an economic impact not achievable by any one company.

Hyperledger

Hyperledger is an open source collaborative effort created to advance cross-industry blockchain technologies. It is a global collaboration including leaders in finance, banking, Internet of Things, supply chains, manufacturing and Technology. The Linux Foundation hosts Hyperledger under the foundation.

IBM Hyper ledger Frameworks

Hyperledger Iroha

Hyperledger Iroha is a blockchain framework and one of the Hyperledger projects hosted by The Linux Foundation. Hyperledger Iroha is designed to be simple and easy to incorporate into infrastructural projects requires distributed ledger technology. Hyperledger Iroha features a simple construction, modern, domain-driven C++ design, emphasis on mobile application development and a new, chain-based Byzantine fault tolerant consensus algorithm, called Sumeragi. Hyperledger Iroha was initially contributed by Makoto Takemiya (Soramitsu), Toshiya Cho (Hitachi), Takahiro Inaba (NTT Data) and Mark Smargon (Colu).

Hyperledger Sawtooth

Hyperledger Sawtooth is a blockchain framework and one of the Hyperledger projects hosted by The Linux Foundation. With potential in many fields, from IoT to financials, Hyperledger Sawtooth has an architecture that recognizes the diversity of requirements across the spectrum with support for both permissioned and permissionless deployments. It includes a novel consensus algorithm, Proof of Elapsed Time (PoET), which targets large distributed validator populations with minimal resource consumption. Designed for versatility and scalability, Hyperledger Sawtooth was initially contributed by Intel.

Hyperledger Fabric

Hyperledger Fabric is a blockchain framework implementation and one of the Hyperledger projects hosted by The Linux Foundation. Intended as a foundation for developing applications or solutions with a modular architecture, Hyperledger Fabric allows components, such as consensus and membership services, to be plug-and-play. Hyperledger Fabric leverages container technology to host smart contracts called "chaincode" that comprise the application logic of the system. Hyperledger Fabric was initially contributed by Tamas Blummer (DAH) and Christopher Ferris (IBM), as a result of the first hackathon.

IBM Hyper ledger Modules

Hyperledger Blockchain Explorer

Hyperledger Blockchain Explorer is a blockchain module and one of the Hyperledger projects hosted by The Linux Foundation. Designed to create a user-friendly Web application, Hyperledger Blockchain Explorer can view, invoke, deploy or query blocks, transactions and associated data, network information (name, status, list of nodes), chain codes and transaction families, as well as any other relevant information stored in the ledger. Hyperledger Blockchain Explorer was initially contributed by Christopher Ferris (IBM), Dan Middleton (Intel) and Pardha Vishnumolakala (DTCC).

Hyperledger Cello

Hyperledger Cello is a blockchain module toolkit and one of the Hyperledger projects hosted by The Linux Foundation. Hyperledger Cello aims to bring the on-demand "as-a-service" deployment model to the blockchain ecosystem to reduce the effort required for creating, managing and terminating blockchains. It provides a multi-tenant chain service efficiently and automatically on top of various infrastructures, e.g., baremetal, virtual machine, and more container platforms. Hyperledger Cello was initially contributed by Baohua Yang and Haitao Yue (IBM), with sponsors from Soramitsu, Huawei and Intel.

For More Information

More information on IBM's commitment to Blockchain can be found at www.ibm.com/blockchain.

About the authors

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Shyam Kumar Yerramsetti is working as Senior Managing Consultant in IBM's Insurance COC (Center Of Competency). Mr. Shyam is recognized as one of the thought leaders within IBM on how to deliver leading edge solutions that combine Cloud, Big Data, Analytics, Mobility, Telematics and IBM Watson cognitive computing technologies. He specializes in helping Insurance companies to fundamentally transform the customer experience, customer insight and customer engagement by leveraging advanced research capabilities from IBM research. Mr. Shyam has over 10 years' experience within the insurance industry (Commercial Property & Casualty, Healthcare, and Personal Lines) and another 15 years of consulting experience in world's leading IT companies. He has co-authored industry white papers, and worked as SME in major transformation projects for the world's largest insurance companies. In addition to masters in Engineering, Shyam is a qualified CPCU and FLMI. Shyam can be reached at shyam.kumar@in.ibm.com

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