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What Blockchain Can Do for the Insurance Industry

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Introduction

Blockchain is a hot topic in the financial services sector, but many think it's all hype. Comments about blockchain technology being the greatest technological revolution since the advent of the Internet certainly help fuel that view. But, if investment in blockchain-related start-ups is a good barometer for the interest in the technology, then it's clear that many believe there's something to blockchain.

McKinsey & Company estimates that investment in blockchain-related start-ups across all industries topped U.S. $800 million in 2014/2015. More than 40 financial service organizations have invested in blockchain or related start-ups since early 2014. Indeed, many expect that blockchain will fuel the insurance sector's growth in the future. IBM reports that trailblazers in the insurance industry 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."

Those who remain skeptical may be interested to read that many companies that report investing lots of money in blockchain technology are doing so even though their corporate executives admit they have only a basic understanding of what blockchain is. A Deloitte

survey showed that of more than 3,000 U.S. execs polled, 39% admit they have little or no knowledge at all about the technology even though 28% reported their companies had invested $4 million or more on blockchain technology, while 10% reported their companies have invested at least $10 million.

Regardless of whether you're a skeptic or a trailblazer, blockchain is top of mind for many in the insurance industry, so it's useful to know a bit about it. The good news is, as one commentator put it, "Like the internet (or your car), you don't need to know how the blockchain works to use it. However, having a basic knowledge of this new technology shows why it's considered revolutionary."
This trends paper will:

- describe the basics of blockchain technology,
- review its primary features, and
- consider some uses specific to the insurance industry.

Brief History
The idea of the blockchain came out of development of Bitcoin, the cryptocurrency launched in 2009. Bitcoin is a virtual currency governed by programming rules that run on a decentralized peer-to-peer network, without a central bank. To many, the notion of a virtual currency is an attractive alternative to some of the more volatile national currencies. The fact Bitcoin was launched in the immediate aftermath of the 2008 financial meltdown was a particularly fortuitous coincidence for proponents of Bitcoin who are quick to blame the financial crisis on the lack of integrity of central bankers – supposed "trusted third parties". Proponents of Bitcoin believe elimination of central bankers from the financial system could prevent such crises in the future.

On the flip side, those suspicious of Bitcoin are quick to dismiss it as "magic Internet money" likely, in part, because it is untraceable quality makes it the currency of choice for hackers seeking ransom. No matter where you stand on Bitcoin, as of January 2017, the total of all issued Bitcoin was about U.S. $17 billion, so it has definitely found its place in the world.

Despite its affiliation with Bitcoin, it's important to distinguish blockchain from Bitcoin. Blockchain is simply the technology that underpins Bitcoin. Blockchain's widespread appeal – in the fintech world and the wider financial services sector – is as a platform for other applications, such as "smart contracts", which are described below.

What is Blockchain Technology?
Blockchain is a technology platform that enables so-called distributed ledgers (DLTs, for short). The blockchain ledger contains transactions that "record and track the transfer of assets between two or more parties. These assets can be anything of value that has, or can be given, a digital representation – money, goods property, documents, or data."
Transactions are technologically, permanently recorded on a blockchain in such a way that they cannot be erased; they can only be sequentially updated.

One commentator explained blockchain in a very down-to-earth way: "Picture a spreadsheet that is duplicated thousands of times across a network of computers. Then imagine that this network is designed to regularly update this spreadsheet and you have a basic understanding of the blockchain."

There's no single standard or overall governance regime for blockchain. But, a number of well-known blockchain platforms and frameworks are particularly popular (for example, Hyperledger, Everledger, and Ethereum). At this point, some analysts believe the fact there are different platforms may slow the growth and acceptance of blockchain, as businesses wait to see whether a particular standard will emerge. Meanwhile, a number of companies and consulting firms have started providing "Blockchain as a Service" (BaaS), including IBM, Microsoft and Amazon Web Service, just to name a few.
Much of the power of Blockchain has to do with the fact that applications can be written that run on top of the platform, allowing businesses and groups to use the blockchain to record all manner of things, from static records to dynamic transactions. "In addition to tracking assets, blockchain nodes have sophisticated software that's able to run applications. These applications can contain complex logic which may interact with off-blockchain applications and transitional enterprise software."

General Business Uses for Blockchain
Blockchain technology is useful for a variety of business purposes – both within a company and across industries. In terms of internal uses, the technology can be used to reduce costs by increasing internal efficiency and process simplification. It can also be helpful during audits and when regulators come calling because the technology makes it nearly impossible to tamper with data entered on it.

According to IBM's Global Business Services, blockchain technology is ideally suited in situations:

- that involve multiple parties
- that involve new intermediaries
- where there is no need for a central trusted authority to execute various transactions
- where an accurate record of the date and time of each transaction needs to be captured
- where multiple stakeholders make use of the same data

Blockchain can also be used to digitally verify and store customer data, so customers wouldn't have to submit documents more than once. Many believe customer engagement and satisfaction increases when customers don't have to re-submit documents and information.

Key Features of Blockchain
A block on the blockchain is essentially a record that's encrypted, time and date stamped, and then linked (chained) to previous blocks. Blocks on the chain are locked, showing the full history of a transaction. Because the ledger is made up of "append-only" blocks, to

manipulate or change a block a hacker would have to also change all subsequent blocks. And, because the ledger is continually reconciling among the different nodes, "there is only one version of the truth" and there can be no single point of failure.

Because the blockchain is decentralize, the distributed ledger eliminates risks that can occur when data is held centrally. Traditional databases typically rely on a database-wide security layer. So, if that layer is breached, the content of the entire database is accessible. With a blockchain, individual messages/records are encrypted.

A distributed ledger eliminates the need for multiple databases and the errors that arise from maintaining and transferring data among them. A downside is that the search functionality of a blockchain may not be as good as is currently available with a typical database.

The nodes that make up the network of ledgers do not merely maintain a copy of transactions. They are continually synced through a protocol referred to as a consensus. "Each node helps to keep the transaction history correct by working to "agree" with all other nodes about the contents of the ledger. This makes the chain extremely reliable, tamper-resistant and trustworthy. The state of agreement between blockchain nodes is achieved through the use of consensus algorithms."

Digital Trust

The creators of Bitcoin (note: there's a lot of controversy about who created Bitcoin, and someone – or a group – going by the name of Satoshi Nakamoto is credited with the idea that was set out in a paper published in 2008: Bitcoin: A Peer-to-Peer Electronic Cash System) had a healthy skepticism of authority such as central banks. They sought to create a payment system that doesn't rely on a central bank or any other third-party intermediary (such as a credit card company or PayPal.) With no trusted third party to act as intermediary, however, some other way is needed to verify transactions. The creators realized they had to come up with a way to: 1) ensure that when the cryptocurrency is transferred on-line, it isn't diverted to the wrong account, and 2) ensure that it could not be spent twice by the same person. Blockchain was the solution they designed: because blocks cannot be altered once entered on the ledger, participants on the network verify the transaction, ensuring there's no duplication of value. The blockchain replaces the trusted third party because the ledger basically acts as a database that contains the payment history of every transaction entered on it and everyone on the network can see the history. As the Economist put it, blockchain "offers a way for people who do not know or trust each other to create a record of who owns what."

The whole concept of "digital trust" that's inherent in blockchain is one of the main selling points. "The implications of decentralized ledger technology (DLT) are astounding: Digital trust is now an ever reasonable possibility; meaning online and offline assets can now be assigned ownership and the transference between those parties can be proven both linearly and cryptographically."

Blockchains Can Be Public or Private

Distributed ledgers can be public or private. Public blockchains are open to anyone. Bitcoin, for example, runs on a public blockchain. A participant downloads the publicly available software. The software generates a "public key", which is a randomly generated string of numbers that then becomes their address on the blockchain. Though the public key is known to everyone, the identity of the person or entity behind the public address can remain anonymous. The software also generates a private key that only the individual knows. When a person wants to add a transaction to the ledger they do so using their public key (their address) and they encrypt the message using their private key. The private key functions kind of like a password or signature to verify the transaction is from them.

Private blockchains can be set up by a single company to improve their internal efficiency and to reduce costs. For example, a company can use a blockchain to authenticate transactions with customers, vendors, and employees. The business can set up the blockchain as a permissioned network, deciding who is allowed to participate and what transactions will be allowed on the ledger.

Private blockchains can also be established by networks of businesses that form a consortium. The consortium can set up a governing authority to determine who may participate. Because private blockchains are permissioned, the participants know who they are transacting with and there are legal frameworks in place to provide recourse. Every entity that joins then plays a role as a node on the blockchain. Such blockchains are ideally suited to situations where different parties all need to rely on the same information – such as in insurance, which involves brokers, underwriters, claims handlers, and so on. Indeed, many believe that blockchains established by consortia of insurance industry players are the best starting point for introduction of blockchain within the industry.

Changing Role for Trusted Third Party Administrators

One of the features of blockchain is that it allows disintermediation, which means transactions can be completed without the use of intermediaries. But, that doesn't mean that "trust brokers" necessarily need be written out of the equation. Instead, most believe there will still be a role for trusted brokers in the insurance industry, but they'll likely have to adapt their business model and become more transparent.

As Paul Meeusen of Swiss Re sees it, automating the administrative tasks currently done by counterparties could be a threat to them, but automating such processes could also be looked at as a way to allow the counterparties to focus on value-added advisory products.

Applications that Run on Blockchain

Because the blockchain on which Bitcoin originated was created as an open source platform (like the Internet), developers are free to build all manner of applications to run on the blockchain. As a result, quite a lot of brainpower and creativity has been focused on creation of "decentralized applications" (Dapp, for short). Dapp are applications (computer code) that run on a blockchain but are not controlled by any individual or central entity. Because they run on the blockchain, they benefit from the properties of the blockchain, such as: no single point of failure, cryptographic security, the fact that third parties can't make changes to data, and zero down time.

The Ethereum blockchain platform, for example, was designed specifically to enable developers to build and deploy Dapp. "Any services that are centralized can be decentralized using Ethereum. Think about all the intermediary services that exist across hundreds of different industries. From obvious services like loans provided by banks to intermediary services rarely thought about by most people like title registries, voting systems, regulatory compliance and much more."

Smart Contracts

So-called smart contracts are a prime example of the kind of application that can be run on a blockchain. They are basically contracts digitally programmed so they are self-executing. Once a smart contract provision is triggered, the smart contract works with the blockchain to enforce the contract across all counterparties. A smart contract "can facilitate the exchange of money, content, property, shares, or anything of value. With a self-executing smart contract, the risk of human error is minimized and speed and efficiency is increased. When running on the blockchain a smart contract becomes like a self-operating computer program that automatically executes when specific conditions are met. Because smart contracts run on the blockchain, they run exactly as programmed without any possibility of censorship, downtime, fraud or third party interference."

Smart contracts have the potential to reduce costs associated with compliance, recordkeeping and manual intervention. According to Capgemini Consulting, use of smart contracts in the personal auto insurance industry could save U.S. $21 billion globally, as a result of automation and reduced processing overhead in claims handling.

Say, for example, a traveller purchases flight cancellation insurance. The policy, which is programmed as a smart contract that's triggered when the flight is delayed two hours or more, is entered on the blockchain. Airline flight departure information is also uploaded to the blockchain from an "off-chain oracle", which is some trusted and secure source of information (perhaps the airline itself in this case). When the flight departure information goes up on the blockchain, the smart contract application checks to see whether the contract's departure delay threshold was exceeded. If it was, the insurance is triggered and payment would automatically be processed without the insured having to file a claim.

A German company (Etherisc) did a blockchain experiment in September 2016 related to flight delay insurance. Participants travelling to a conference in Singapore were allowed to purchase flight delay insurance that would payout automatically if the flight was delayed or cancelled. A Dapp was digitally notified and it automatically processed the payout without any manual verification.

Though the concept of smart contracts seems straightforward, some have cautioned that creating them won't necessarily be easy and there are a number of legal issues to be dealt with. For example, there are issues of data protection and privacy if the transaction involves personal data. Despite the potential legal and programming issues to be ironed out, many believe these hurdles are surmountable with the right professionals working on it. A UK-based global law firm, Clyde & Co., recently launched a separate consulting firm (Clyde Code) specifically to provide legal and technical advice on smart contracts.

Clyde Code specializes in creating smart contracts and ensuring they function as intended – both from a technical and legal perspective. One of the more intriguing examples Clyde Code talks about is how a smart contract could be used for cargo insurance. The scenario they describe relates to a ship owner that has installed sensors on cargo containers that track, in real-time, where the containers are. The insurance could change in real-time based on the exact location of the cargo. So, for example, if the ship is traversing an area where piracy is rampant, the rate could change for the period the cargo is traveling through dangerous waters.

Governance Issues

There are a number of different governance and possible regulatory issues related to blockchain. If the blockchain is permissioned (such as one used by a consortium), rules regarding participation are needed. Who sets those rules must also be decided. As well, participants would have to sign an agreement setting out rights and obligations related to things like non-disclosure, privacy, and dispute resolution. The agreement may also specify, for example, that participants must ensure they comply with know your client-type legal requirements and anti-money laundering laws.

In terms of legal concerns, blockchain networks could give rise to competition and anti-trust concerns. For example, there's the potential for collusion among competitors who are on the same blockchain network. There could be an argument that the adoption of technical standards prevents participation by competitors, as well as the potential for the exchange of commercially sensitive information between competitors participating in the network.

Lawmakers and Regulators

An IBM survey of financial institutions in 16 countries found that regulatory constraints are the biggest barrier to implementing blockchain today. "The issue of regulatory governance may be the largest hurdle the insurance industry must face if it embraces blockchain." Regulating blockchain will likely require new laws, practices and protocols, all of which may take years to create. Though some caution against regulators acting too quickly and

therefore stifling innovation, some believe that regulation that supports the use of blockchain will lead to wider adoption of it.

For now, regulators are talking amongst themselves and working to understand blockchain and they are taking a "wait and see" approach before they decide if new rules will be needed. But, in the banking industry, which has shown more interest in adopting blockchain technology than the insurance industry, regulators are already working with major banks to develop regulatory frameworks.

Insurance Applications

In this section we discuss the Blockchain Insurance Initiative (referred to as the B3i) and survey the following specific examples of how blockchain would be particularly useful in the insurance context:

- Establishing Customer Identity
- Insurance Underwriting and Claims Process
- Combating Insurance Fraud
- Reinsurance
- Micro Insurance
- Parametric Insurance
- Real-time Insurance

And finally, we take a brief look at a few insurance-related blockchain "use cases" that are currently underway.

B3i Initiative

The B3i consortium started in October 2016. Initially it was comprised of just five insurers: Aegon, Alliance, Munch Re, Swiss Re, and Zurich Insurance. In early 2017 the consortium added 10 new members, and in September 2017 they added more, bringing the total up to more than three dozen. The group was specifically established to explore the potential use of blockchain in the insurance industry.

The goal was to create a prototype covering the core functionalities required to enable a distributed smart contract management system for Property Cat XoL (Excess of Loss) contracts. The consortium chose to initially focus on reinsurance because they thought it would be easier to develop consensus on common standards for business-to-business products, rather than a product aimed at consumers because such insurance can vary greatly in different jurisdictions. The consortium is also dedicated to developing trading platforms across the whole insurance value chain using blockchain based technologies to "improve the efficiency of transacting insurance and reinsurance across the whole value chain and thereby reduce value lost through delays and manual reconciliations."

In September 2017 the B3i consortium released a full functional beta version of a joint distributed ledger for reinsurance transactions and shared details of its vision and the business case. Participation on the beta ledger is permissioned, but the consortium is

welcoming all insurance industry participants (insurers, brokers and reinsurers) to join the testing program and play in the sandbox environment created for testing.

The consortium members are functioning under a memorandum of understanding whereby the members share costs and resources. The work is managed by a steering committee with a variety of sub-groups looking after various aspects, including technology development, legal and compliance, and marketing. The group intends to create a legal entity in 2018 to manage the operational implications.

Insurance-Specific Uses for Blockchain

Establishing Customer Identity

When applying for insurance, customers often have to fill out complex questionnaires. There's quite a lot of paperwork customers must complete when applying for insurance. Once customer identification information (know your client-type information) is submitted to the blockchain it can be validated by comparing it to trusted databases (for example, government databases). Once the customer's identity is validated, the data is available to all participants on the blockchain, which means the customer should not have to enter the information again.

The Insurance Underwriting and Claims Process

There are a number of ways blockchain can be used to improve insurance underwriting. For example, it can be used to centralize data about risks, helping insurers and underwriters with risk modelling and risk assessment. Improving risk assessment should help insurers price risk more accurately.

The insurance claims process could be drastically changed through the use of real-time data that is increasingly made available thanks to the "Internet of Things" technology. For example, a digital token can be assigned to a car and a sensor can be attached to detect when the car has been in an accident. The sensor data would be automatically sent to the blockchain, triggering the smart contract. Processing of the claim would then begin and coordination among all necessary parties would be handled automatically. The insured would benefit thanks to a speedier and easier claims process (besides not having to submit a claim, the insured would not have to submit accident reports and receipts), which should

increase customer satisfaction. The insurer would benefit as a result of reduced loss adjustment and processing costs.

Combating Insurance Fraud

McKinsey & Company reports that an estimated 5-10% of all insurance claims are fraudulent. Blockchain can be used to detect identity fraud by validating customers' identities and by detecting falsified injury or damage reports. Traditional claims processing involving intermediaries (claims adjusters) adds expense and creates the potential for manipulation by fraudsters. The blockchain can eliminate the need for intermediaries to validate information, such as item authenticity and ownership.

Everledger, a UK-based company, has already shown that blockchain can be used to validate the history of ownership of goods, making it much harder for people to pass off fakes or make fraudulent claims related to stolen goods. Everledger has created a blockchain that is a global registry for diamonds, helping to curb the distribution of so-called blood diamonds. Everledger documents 40 data points for each diamond and then cryptographically stores the information on the blockchain. Over one million diamonds have been registered with Everledger. The blockchain provides a mechanism to allow insurance companies and buyers to validate the stone's authenticity.

"The encrypted and immutable nature of blockchain transactions, coupled with its extraordinarily strong provenance capability and transparency of the transaction record, presents an opportunity to create an authoritative digital record or 'fingerprint' of real-world items and policies and claims. These unique digital records can be used to authenticate and track physical items of value throughout their entire life while making it extraordinarily difficult for criminals to defraud the system."

The transparency of the blockchain also makes it easier to detect multiple claims. Claims shared on the blockchain network can be verified and are transparent to all participants, helping identify possible fraud and multiple claims.

Of course, as McKinsey & Company points out, achieving benefits in combatting insurance fraud will require participation of numerous parties, including insurers, manufacturers, service providers, and others.

Reinsurance

It's not a coincidence that the B3i initiative's initial activities centered around reinsurance. According to PwC, blockchain was made for reinsurance. With reinsurance expense ratios typically running 5-10% of premiums, PwC believes blockchain provides straightforward ways to cut costs and improve client satisfaction. As PwC notes, given the amount of data that has to flow between the client, broker, reinsurer, and outsource service providers and that currently relies on multiple data entry and reconciliation, using blockchain technology could remove 15-25% of expenses. They estimate that use of blockchain would yield an industry-wide savings of $5-$10 billion. Furthermore, blockchain technology could help speed placement and settlement, which would boost client satisfaction and retention.

Microinsurance
Microinsurance is designed for low-income individuals, often for those in developing countries and remote regions. It is characterized by low premiums and limited coverage. It functions just as normal insurance does, but it's specifically designed to provide protection for low-income people for particular perils. One of the challenges for people seeking microinsurance is that it can be difficult for them to establish their identity. They may not have personal property or financial accounts, or even formal identity documents. Government corruption could also present roadblocks.

Blockchain technology can help collect identity data about someone from smartphones along with things like a verifiable employment identity. And, once the individual's identity is established on the blockchain, they will never have to establish their identity again and they don't have to involve government authorities that may otherwise stand in their way. Their verified identity information can be encrypted and made immediately available to others via the distributed ledger.

High policy processing costs related to third party verification of claims in remote locations also makes providing microinsurance unappealing to many insurers. Using blockchain technology to automate underwriting and claims handling can translate to lower handling costs and savings, making the microinsurance market more attractive. And, if the microinsurance policy is programmed as a smart contract, once a covered trigger event happens, the insured need not even make a claim – the claim will be automatically processed without the need or expense of third party verification.

Parametric Insurance
Blockchain technology is well suited to parametric insurance. Under a parametric insurance policy, the insurer pays based on a risk event occurring or when certain index thresholds are exceeded, for example, a given amount of rainfall, a seismic event (earthquake) above a certain level, temperature of a certain level, and so on. Instead of indemnifying the pure loss, the insurance pays the insured a pre-set amount if a specific parameter is exceeded. Because parametric insurance is event driven, capturing it as a smart contract is fairly straightforward.

So, for example, under a parametric policy for earthquake coverage, the policy might pay amounts on a sliding scale, depending on the severity of an earthquake. In other words, the insurance payout is not dependent on the amount of damage caused, it is based solely on the magnitude of the quake. Information about the magnitude would be communicated automatically from some information source (an oracle), and the smart contract would determine whether the insurance payout is triggered. The key is to set up triggers with clearly defined parameters.

The flight delay insurance described above is another example of parametric insurance that can be facilitated by a blockchain. Once the data from the oracle comes in and the smart contract parameter has been reached, the payout is automatically executed.

Real-time Insurance

Another category of insurance that could benefit from blockchain technology is what some have referred to as "real-time insurance". This is coverage that changes as real-time conditions change. For example, SafeShare Global, a UK-based company, created a blockchain-based solution for the sharing economy – for homeowners who rent space in their homes to people looking for space to run their small business. Under this coverage, which is underwritten by Lloyd's of London, the homeowner can acquire short-term insurance for each day the small business owner rents space. The blockchain allows the company to provide a time-stamped, immutable record of the insurance in real-time at substantially lower cost than traditional home-based business insurance.

The cargo insurance described earlier is another example of real-time insurance that's made possible thanks to blockchain technology. Tracking devices in the cargo containers signal to the smart contract that the ship is subject to a different risk profile at different locations and the cargo insurance premium is adjusted in real-time to accurately reflect the risk.

Use Cases Underway

In addition to the beta version of the blockchain solution for reinsurance announced by the B3i consortium, Cookhouse Labs, a Toronto-based InsurTech Innovation lab dedicated to accelerating digital innovation for insurance, has a number of insurance blockchain use cases going on:

- Streamlining manual and complex multi-party processes – exploring ways blockchain technology can be used to coordinate the payment of benefits claims from multiple insurers.
- Automating the claims process for travel insurance – exploring how blockchain technology has the potential to streamline the claims process by automating the touchpoints between the First Notice of Loss and the payout of the claim.
- Centralizing the storage and management of risk data – exploring how the insurance industry can jointly create and maintain a global risk exposure data warehouse where all data relating to real property and associated buildings can be stored, enriched, and managed.
- Enabling real-time validation of broker licensing – looking at ways blockchain can enable organizations within the insurance industry to access and validate broker licencing information securely.

Conclusion

Given that blockchain technology was specifically created to provide a "single source of truth" and that insurance "relies on trust and truth around events, properties or people", it's easy to imagine ways in which the insurance industry stands to benefit by adoption of distributed ledgers.

Indeed, EY thinks insurance executives shouldn't be skeptical of the hype around blockchain. As EY points out, blockchain's ability to increase trust and transparency speaks "to the heart of the insurance business. After all, the industry's inherent bond of trust and

'promise to pay' are based on disclosure of accurate personal data describing the insurable interest of the client, the agreement of a contract between two parties and timely exchange of payment."

Of course, adopting blockchain will require investment of time and money. Given the volume of stored information involved in a distributed ledger, scalability will be a challenge. Other potential challenges will likely emerge related to things like migrating information from a business' legacy system to the blockchain, coding smart contracts, standardizing data among participants in the blockchain, and so on. And of course, legal and regulatory issues may come into play.

By nature, the insurance industry is cautious and is not one to lead the charge on technology. Fortunately, the banking industry is leading the way in terms of blockchain and the insurance industry will benefit from the banking industry's experiences. But, many believe the insurance industry should be making investments now to be in a position to take advantage of efficiencies and opportunities blockchain technology can deliver long term.