BLOCKCHAIN
IN INSURANCE

by

Deloitte.

The use of blockchain within the Insurance value chain has been underutilized in Mexico. That is why the **Mexican Insurtech Association** brings out this analysis with the aim to show the importance of promoting the application of blockchain in insurance.

This series is directed at insurance professionals with or without knowledge about blockchain. It covers from the basics, such as definitions and how it works, to what are its main applications nowadays in the insurance ecosystem and other industries.

The information collected in this document focuses on presenting several use cases of blockchain applied in different countries. It also covers some examples of the application of blockchain in different affairs such as politics, health, real estate, finance and others.

Particularly in the insurance industry we can find common issues where blockchain represents a powerful tool. In this study, we will focus on five main use cases ranging from Claims Management, Fraud and Risk Prevention, Reinsurance, Emerging Markets and Securing the Blockchain Ecosystem.

On behalf of the Mexican Insurtech Association, we hope all readers find this series interesting and useful.

Marisol Sánchez
AIM's President
2021-2023

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INSURTECH
MÉXICO

We are Deloitte, as a leading professional services firm, looking further from the established work methods and betting on innovative solutions are actions that represent and consolidate us in the market; in addition, they help us create a significant impact in our collaborators, society and, above all, our clients.

This culture has guided and encouraged us to contemplate and use new technologies with the potential to revolutionize business, such as blockchain, which is capable of generating positive results in the development of the insurance industry. Usually known for its highly complex processes.

This document, besides explaining theoretical benefits of distributed ledger technology, allows us to learn through real business cases the outstanding role that has played in generating innovative business solutions for companies and customers.

We enthusiastically hope this study motivates you, as readers, to look at the insurance sector panorama with hope and consider blockchain technology as an engine capable of transforming every single service in the insurance industry, in order to maximize the value improvement of the entire ecosystem.

Eduardo Esteva
Insurance Industry
Leader partner Deloitte
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WHAT IS BLOCKCHAIN
TECHNOLOGY?

CHAPTER 1

1.1 Opening Thoughts

In this series, **"Blockchain in Insurance"**, presented by the Mexican Insurtech Association, we will explore the potential use cases of blockchain within the insurance industry, ranging from underwriting, claims, operations, distribution and unlocking new markets.

Each chapter will consist in a blog post, with a full research paper released as a culmination.
We hope you enjoy our insights and explore the use of innovative technologies to drive the industry forward.

About the Asociacion Insurtech Mexico

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The Asociacion Insurtech Mexico are an independent membership organization that seeks to promote the application of technology in the insurance industry to generate a positive and cultural impact in Mexico.

The Insurtech Mexico Association was born with the idea of exploiting and giving visibility to technological models that manage to meet the needs of the population and meet different objectives.

The Association's main objectives are to promote free competition in the sector, promote better levels of insurance protection to meet the needs of Mexicans, and to focus efforts on the new and current insured.

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1.2 An Introduction to Blockchain Technology

When you hear the word "Blockchain", you may be thinking about Bitcoin and cryptocurrencies. However, in fact, blockchain is revolutionising every industry.

Blockchain technology can seem complicated, but its core concept is straightforward. Put simply, blockchain is a digital ledger that is duplicated and distributed across a network of computers (nodes), making it very difficult to change or hack the information within the ledger.

A blockchain is a specific type of database, however, differs to data sets commonly known in it's security, transparency and storage.

Spreadsheet – One person or small group - store and access limited amounts of information. Only one person at a time can change, delete and add data with the changes automatically saved on everyone's device.

Large database – data on servers powered by large numbers of computers. – people can access simultaneously but normally owned by one company or individual that has control over how it works and what data is included.

Blockchain – Decentralised and distributed database through a network of computers, with everyone having a full record of the data stored since inception. No one individual can alter any data without the network knowing.

Let's separate blockchain into two terms: "Block" and "Chain".

"Blocks" are pieces of information in a digital format.	**"Chain"** is the public database where the information is stored.

Blockchain is a shared ledger for transactions, tracking assets and building trust, where transactions are recorded with an immutable cryptographic signature called a hash. Transactions are grouped together in blocks, with each new block containing a hash of the previous one, chaining them together. Hence, a blockchain!

When we look at a blockchain, we have to understand some key concepts. As explained by Gartner, here are some key definitions: [1]

Distribution
Blockchain participants are located physically apart from each other and are connected on a network. Each participant operating a full node maintains a complete copy of a ledger that updates with new transactions as they occur.

Encryption
Blockchain uses technologies such as public and private keys to record the data in the blocks securely and semi-anonymously (participants have pseudonyms). The participants can control their identity and other personal information and share only what they need to in a transaction.

Immutability

Completed transactions are cryptographically signed, time-stamped and sequentially added to the ledger. Records cannot be corrupted or otherwise changed unless the participants agree on the need to do so.

Tokenization

Transactions and other interactions in a blockchain involve the secure exchange of value. The value comes in the form of tokens, but can represent anything from financial assets to data to physical assets. Tokens also allow participants to control their personal data, a fundamental driver of blockchain's business case.

Decentralization

Both network information and the rules for how the network operates are maintained by nodes on the distributed network due to a consensus mechanism. In practice, decentralization means that no single entity controls all the computers or the information or dictates the rules.

How does it work?

To provide a simple analogy for the key concepts of a blockchain, we can look at a Google Doc. [2] With a Google Doc, a document is distributed between those in the network, rather than transferred or copied. This creates a decentralized chain in which every user of the network has access to the document at the same time.

Unlike a spreadsheet, no one is locked out of the document, while all changes are made in real time, resulting in full transparency.

The history of blockchain technology and the rise of digital assets is a mysterious tale.

The history of cryptography

[3]

As we have just learnt, blocks are linked together using cryptography. The origins of cryptography actually go back to the use of "hieroglyph", 4000 years ago!

This was used in Egypt by scribes to hide secret messages and communicate on behalf of Kings.

In 1991, a cryptographically secured chain of blocks was presented for the first time by Stuart Haber and W Scott Stornetta. Also, in 1998, Nick Szabo started work on "bit gold", which was proposed to be a decentralized digital currency.

2009: The Birth of Bitcoin

However, it was not until 2008 when the concept of blockchain was brought to life. Satoshi Nakamoto, the name used by the pseudonymous person or group who developed Bitcoin, published the Bitcoin Whitepaper on 31st October 2008. As part of this, Satoshi developed the first blockchain database.

On 3rd January 2009, the bitcoin network was created, with Satoshi mining the genesis (first) block, with a reward of 50 bitcoins.

Nakatomo was active within Bitcoin until late 2010, when he disappeared. No one has ever successfully claimed the identity of Satoshi Nakamoto.

The Bitcoin open-source code was revolutionary and it led to other cryptocurrencies emerging.

Ethereum and the Emergence of Smart Contracts

Ethereum was invented in 2013 by programmer Vitalik Buterin. It was launched on 30th July 2015. The founders of Ethereum felt that there was limitations in Bitcoin's functionality.

The difference between Ethereum and Bitcoin is that people can build apps on top of the network. The Ethereum network hosts what is known as smart contracts.

A smart contract is a computer programme or collection of code which automatically executes or documents events and actions according to the terms of the contract.

Smart contracts power decentralised applications, which are not controlled by any one authority, and have wide ranging use cases across several industries.

1.4 Consensus Protocols

How is a blockchain maintained? Consensus protocols are used for network users to agree to trust transactions. The two most popular consensus mechanisms in a blockchain is Proof-of-Work and Proof-Of-Stake.

Proof-Of Work

Proof of work (PoW) is a decentralized consensus mechanism that requires members of a network to work on solving complicated mathematical puzzle to prevent certain kinds of economic attacks against the network, and allows all computers (nodes) to agree on the information contained within the block. This consensus mechanisms allows for transactions to take place in a secure peer-to-peer manner without the need for a third party.
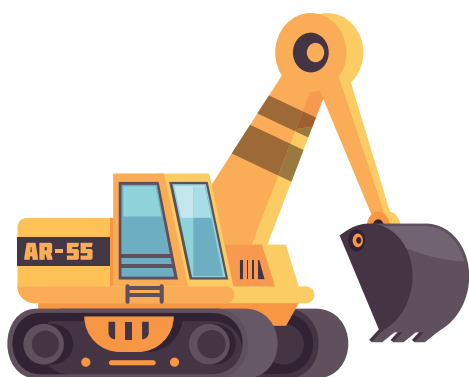
Proof of work is used in cryptocurrency mining, for validating transactions and minting new tokens. Miners use special software compete against each other to complete transactions on the network and get rewarded. However, it is not the type of mining you may be thinking of! [4]

Making a change to any block earlier in the chain requires re-mining not just the block with the change, but all of the blocks that come after. This is why it's extremely difficult to manipulate blockchain technology.

The Bitcoin and Ethereum networks currently run on a proof of work mechanism.

Proof-Of-Stake

Proof of Stake (PoS) is an alternative consensus mechanism to Proof of Work, invented in 2012 by Scott Nadal and Sunny King.

With Proof of Stake, cryptocurrency miners can mine or validate transactions based on the amount of coins or tokens that they hold. A key disadvantage to PoW is the high energy consumption, however with Proof of Stake, mining power is given to those based on the percentage of coins held.

This mechanism is seen as lower risk for a miner to attack the blockchain network, as the miners chosen in the network already have a vested interest in the protocol due to their holdings.

Ethereum is currently planning a migration from Proof of Work to Proof of Stake.

1.5 Types of networks

There are many types of blockchain networks, and it is important that the correct type is used for your particular needs. The most popular network types are:

PUBLIC NETWORK

- Anyone is allowed to join and participate.
- Blocks are validated one after another and cannot be modified.
- Substantial computational power is required, and there is little privacy on transactions.
- Participants are incentivised for growing the network.

PRIVATE NETWORK

- One organisation controls the network, and maintains the shared ledger.
- An invitation may be required to join.
- A private blockchain can run behind a corporate firewall.
- There is no incentive mechanisms.

CONSORTIUM NETWORK

- Multiple organisations maintain the blockchain.
- The organisations involved decide who can view the data or add transactions.

HYBRID NETWORK

- A combination of a public and private blockchain.
- Can be useful in supply chain, finance and IoT.
- The network can opt to incentivise participants.

1.6 The Use Cases of Blockchain

Sure, it is more complicated than that. But as a basic concept, that is a blockchain. However, why do we need it?

The Current Issues

Blockchain has the ability to solve a lot of real-world problems that we currently face in society. These may include:
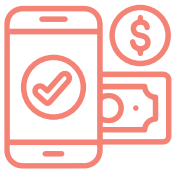
Slow Cross-Border Payments

Costly Supply Chain Management

Accountability Issues in Traditional Contracts

Identity Management and Theft

Corrupted Fundraising

Intellectual Property

Fraudulent Voting

Confidentiality of sensitive data

Finance

Blockchain is already having a significant impact in the finance space, and is expected to continue in the coming years.

Disruptions in the legacy markets can be seen in the following areas:

Cross Border Transactions	Trade Finance	Banking and Lending
Crypto Backed Mortgages	Decentralised Insurance	Fractionalised ownership of real world assets

Within the last two years, a new industry within the cryptocurrency and blockchain space has emerged; Decentralised Finance, or also known as DeFi.

Decentralised Finance (DeFi) is a blockchain-based form of finance that does not rely on central financial intermediaries such as brokerages, exchanges, or banks to offer traditional instruments. Instead it relies on smart contracts on blockchain platforms. At the time of writing, the total value locked (TVL) in DeFi protocols stands at $97 billion. [5]

DeFi is an ecosystem of Decentralized Applications (Dapps) that provide financial services built on top of distributed networks with no governing authority. A majority of the DeFi Dapps currently being built are on the Ethereum blockchain.

Supply Chain Management

A large use case for blockchain in industry is through supply chain management. Due to the transparency and immutability properties of a blockchain, it can increase the transparency of a supply chain. Currently, supply chain networks can be limited by one-up/one-down visibility. However, through a permissioned blockchain network, all participants can view the chain at any one point.

For example, in the diamond industry, the working conditions of extraction have been questioned, with unsuitable conditions and violent circumstances reported. In 2018, De Beers, the world's largest diamond producer, launched a blockchain programme called Tracr, in which every member of the chain uploaded photos and information into the current state of a diamond. [6] This will assist with preventing illegal actions when mining.

Media and Entertainment

Blockchain can help to improve the media industry in the supply chain and copyfright infringements through added security, transparency and control of transactions.

It is reported that in the US music industry, artists only take home 12 percent of total industry sales. [7] Through smart contracts and P2P (peer-to-peer) micropayments, artists can monetise all copywritten assets. Once a content creator has registered their property on a blockchain platform, the blockchain records every usage of that content. This tracking enables real-time and fully transparent consumption-based pricing mechanisms. A smart contract can be used to execute automatic micropayments between the consumer and creator, removing the middleman in the transaction.

Real Estate

The real estate industry can be disrupted by blockchain technology by cutting out costly middleman such as brokers, lawyers and banks. This financially benefits both the buyer and seller, and makes the process much quicker.

Also, through fractional ownership, blockchain can also lower the barrier to investing. Through the use of tokens, investors can buy and sell fractions of an investment. This also means that they will avoid the cost of managing properties such as maintenance and leasing.

Healthcare

In healthcare, blockchain technology can assist with securing patient data. Between 2017 and 2019, more than 176 million patient records were exposed in data breaches. [8] Credit card and banking information were compromised, as well as health and genomic testing records.

Blockchain's ability to keep a decentralized, incorruptible and transparent log of all patient data makes it an interesting proposition for the industry.

Also, a single system can be created to store and update health records. This will allow quicker and accurate communication between different healthcare professionals involved in caring for the same patient, allowing for faster diagnosis and a decrease in mistakes.

Another key use case for blockchain in healthcare is in research. Currently, electronic health records allow automatic updating and sharing of medical information on a given patient within an organisation or network of organisations only. This network pool could be extended if the information was organised in a way that a set of information on the top layer of the blockchain was not personally identifiable information of patients.

This would allow researchers and other necessary organisations to access a wider spectrum of data. The availability of this accurate and updated information would greatly promote clinical research, and adverse event reporting.

Politics

Lastly, a sector rife for disruption is politics and Governmental operations.

Firstly, blockchain technology can improve how registries are used. Managing registries with blockchain-supported distributed ledgers provides the needed transparency to eliminate fraud and corruption while simultaneously offering the potential for real-time updates. The latter feature is critical for speeding up notoriously slow processes like land title transfer.

This can be used for the registration of corporate entities, marriage records, divorce records, land titles and criminal records.

When looking at the voting process, blockchain can allow for the counting of votes in a secure and transparent way. In particular, blockchain has been proven to support voting in the collation period (the process of aggregating votes at individual polling stations to form a regional consensus.)

CASE OF STUDY: REPUBLIC OF GEORGIA

Georgia was the first nation to introduce blockchain based land registries. Now, there is 1,500,000 registered titles, which with the correct multiparty digital signatures, can be legally transferred in minutes. [9]

IN THE NEXT SECTION OF OUR SERIES, WE WILL START TO EXPLORE
THE ARGUMENT FOR BLOCKCHAIN IN INSURANCE

THE ARGUMENT FOR BLOCKCHAIN
IN INSURANCE

CHAPTER 2

2.1 Introduction

In the following chapters, we will break each use case down however we want to provide an overview into the impact that blockchain can have in the insurance sector.

As we discussed in Part 1, a blockchain is a shared ledger for transactions, tracking assets and building trust, where transactions are recorded with an immutable cryptographic signature called a hash.

When we look at a blockchain, we have to understand some key concepts:

DECENTRALISATION
No one computer or organization can own the chain. Instead, it is a distributed ledger via the nodes connected to the chain.

TRANSPARENCY
Since blockchains are transparent, every action in the ledger can be easily checked and viewed.

IMMUTABILITY
The state of not changing, or not being changed.

2.2 Issues with the traditional insurance sector

When we look at the argument for blockchain in insurance, we have to consider the current issues in the sector:
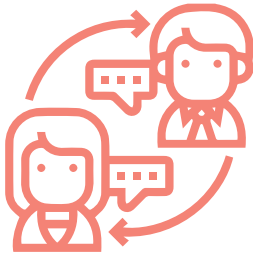
Poor Customer Engagement

Fragmented Data Sources

Low Insurance Penetration in Emerging Markets

Manual Claims Settlements

Fraud-Prone
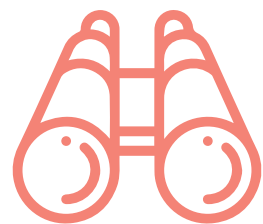
Lack of Transparency

2.3 Why is blockchain suited to disrupting insurance?

The argument for blockchain in insurance is clear. In a value chain with multiple parties and intermediaries, blockchain thrives.

The concept of a secure, decentralised and transparent ledger distributed among permissioned users has the ability to significantly impact the insurance industry, and it's highly complex processes.

In the banking sector, several blockchain use cases are being implemented. Whilst the adoption of the technology in insurance has been slower, the potential benefits are clear to address many of the challenges that majority of incumbents face.

However, blockchain is a team sport. If an organisation is operating individually, there may be better solutions than blockchain. However, if organisations and individuals are willing to collaborate across a value chain, blockchain is a suitable solution.

2.4 Opportunities for blockchain
in insurance

There are many use cases for blockchain in insurance.

The use of blockchain should help to reduce costs related to compliance, documentation and acquisition, as well as delivering greater efficiency and improving customer engagement through the simplicity of contracts.

With Ethereum's smart contracts and decentralised applications, insurance can be conducted over blockchain accounts, introducing more automation and tamper proof audit trails.

Also, the use of blockchain will likely improve the experience of the customer. Currently, insurance companies are known as walled gardens. Consumers are not able to see how their data is managed, and who it is shared with. If multiple insurers contribute data to a decentralised ledger, customers will be able to view the data that insurers have, and how it is used.

In regard to market players, the use of the technology should help new innovators to enter the space and new markets to surface, particularly in developing regions.

In this paper, we will focus on five main use cases:

Claims Management	Fraud and Risk Prevention	Reinsurance

Emerging Markets	Insuring the Blockchain Ecosystem

Across the following chapters, we will dive into each topic but we want to briefly give an introduction into each use case and how blockchain can potentially drive innovation in the respective areas.

Before we start, let's consider a question surrounding blockchain in insurance.
Where is the bigger opportunity?

THE INSURANCE INDUSTRY **USING THE BLOCKCHAIN**	*Or*	**THINGS BEING INSURED** ON THE BLOCKCHAIN

Claims Management and Fraud Prevention

One of the biggest use cases for blockchain in insurance is within the claims process. When an individual or business suffers an insured loss, they want to be indemnified quickly. However, due to heavily manual processes, much of the insurance claims process is slow and cumbersome.

The use of blockchain and more specifically, smart contracts, can be important driver in the automation of the claims journey.

The insurance industry also faces an increased issue with consumer fraud. This can be caused in innumerable ways. This is in part due to the industry suffering from poor visibility of customer's activity across different institutions.

If we focus on the United Kingdom, the ABI state that "every 5 minutes a new insurance fraud is uncovered." [10]

In Chapter three, we will look at how blockchain can impact the claims management and handling process, and how it can mitigate and reduce fraud, through improvements in KYC and AML processes, product authentication and a tamper-proof register.

Reinsurance

The current reinsurance process is inefficient and incredibly complex. As insurers usually engage several reinsurers, data needs to be exchanged between various parties as part of the underwriting and claims process.

Blockchain can allow primary insurers, reinsurers and brokers to share data securely and transparently in real-time, and streamline claims processing and risk transfer.

In Chapter Four, we will explore how current reinsurance process can be disrupted using blockchain technology, and examine the multiple case studies and organisations that are already operating in the space.

Emerging Markets

In developing regions, especially in rural areas, insurance is not common place. It is known that less than 3% of Africa is insured, with Mckinsey reporting that "South Africa accounts for 70 percent of total premiums." [11]

The barrier to adoption of insurance, or also known as microinsurance in emerging markets, consists of several factors.

In Chapter five, we will investigate how blockchain technology and parametric insurance can aid with driving adoption in emerging markets, and provide a safety net for individuals and businesses should an unexpected event occur.

Insuring the Blockchain Ecosystem

As the blockchain ecosystem grows, it will need insurance itself. This presents further opportunities to innovators, insurtechs and crypto native projects to take advantage of a new and exciting industry.

This type of cover may include:

Crypto wallet cover	Exchange cover	Smart contract cover
NFT insurance	Professional liability for developers	Specie and Crime cover

In chapter six, we will look at the coverages that the new ecosystem will need, and the current market players.

IN THE NEXT PART OF OUR SERIES, WE WILL EXPLAIN HOW BLOCKCHAIN CAN IMPACT
THE CLAIMS MANAGEMENT AND FRAUD PREVENTION PROCESS

CLAIMS MANAGEMENT AND
FRAUD PREVENTION

CHAPTER 3

3.1 Current Claims Process

The point of claim is the most important element of the insurance value chain. It is at this stage that the policy is tested.

Effective claims management will save an insurer time and money, whilst improving customer engagement, which leads to better retention rates and referrals.

Issues in the current claims process

Lack of clarity in policy wordings
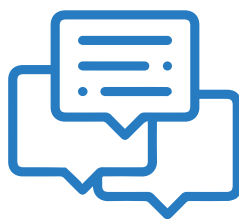
Communication

Long Settlement Periods

Human Error

Lack of transparency of the use of data

3.2 Traditional Process vs
Blockchain Based

Currently, the insurance claims process is a sequence of manual steps, which place large emphasis on human intervention. The use of blockchain in the value chain provides the possibility of reducing friction in the process, improving data exchange efficiency, and accelerated settlement periods.

When comparing the difference in processes, please see the two diagrams below: [12]

Traditional Process
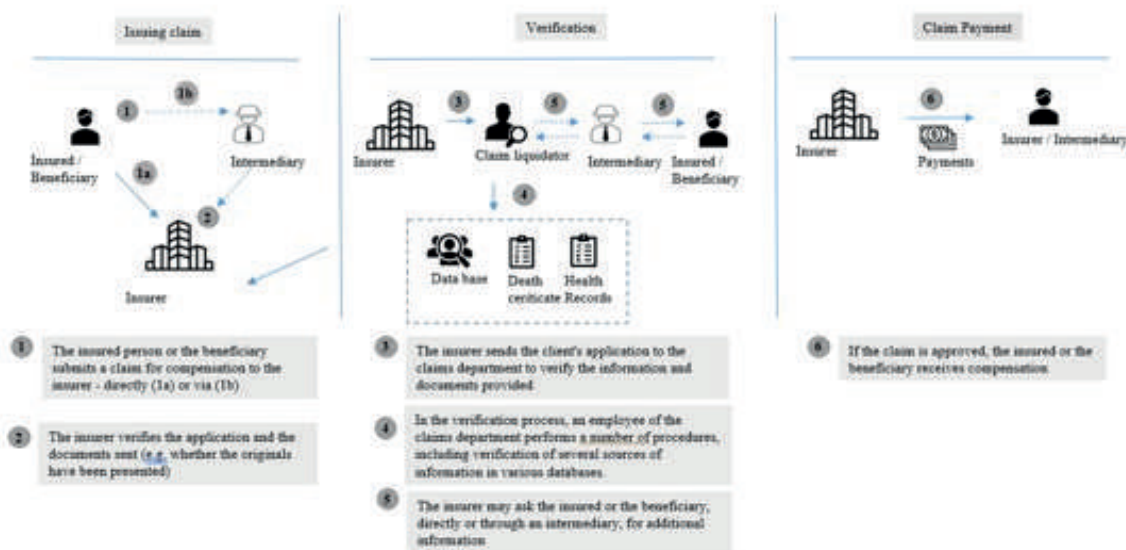
Blockchain Based
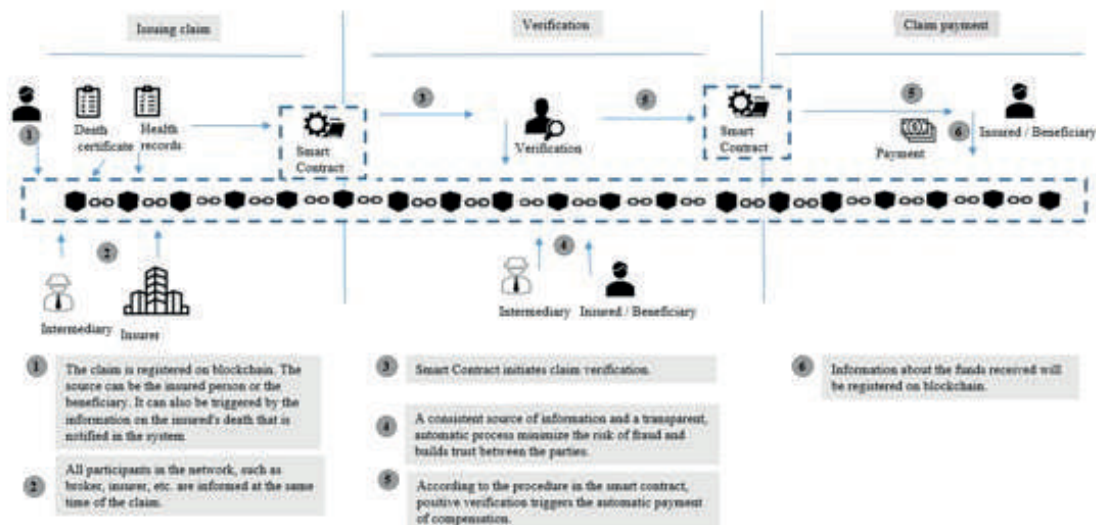
3.3 The Use of Smart Contracts

As we covered in Chapter one, A smart contract is a computer programme or collection of code which automatically executes or documents events and actions according to the terms of the contract. Smart contracts power decentralised applications, which are not controlled by any one authority, and have wide ranging use cases across several industries.

Smart contracts can turn paper based mechanisms into programmable code. These smart contracts can be used to automate the claims process and automatically calculate liability for all parties, whilst triggering settlements on the basis that all conditions of the contract is met. Therefore, this is an extremely efficient way for an insurer to understand and confirm their affected assets.

[13]

The low cost of using smart contracts can reduce the administrative bill and ensure consistency between different parties of data exchange. All parties involved in the chain can view an immutable ledger of transparent and up-to-date transactions and information. Therefore, insurance companies can save on time, and capital, whilst this improves customer engagement.

USING SMART CONTRACTS IN MOTOR CLAIMS

Smart contracts can be integrated with vehicle sensors that automatically alert the insurer when an accident happens.

Without the need for human intervention, the smart contract will initiate the process, through requesting a medical team, towing service and bodyshop services.

This accelerates the claims process and also heavily reduces an insurer's operating costs.

USING SMART CONTRACTS IN MEDICAL CLAIMS

Currently, the claims process for medical related incidents is very complexed and manual. There is the possibility of partial payments, disputed coverages, discrepancies of data and errors in billing.

If the patient's file was securely stored on a blockchain, data can be accessed by all parties in a permissioned chain, and the use of smart contracts to verify terms and conditions at each stage of the process, will lead to an improvement in the traceability and accuracy of settlements.

Case Study: AXA (Fizzy Project)
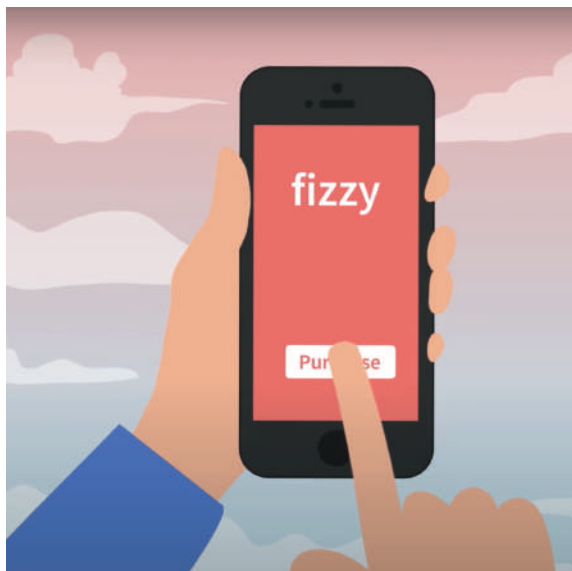
AXA was the first major insurer to offer insurance using blockchain technology. In September 2017, AXA launched Fizzy, which as described by the official publication, "offered direct, automatic compensation to policyholders whose flights are delayed." [14] The pay-out occurred if the flight was delayed by more than two hours. They made use of smart contracts on Ethereum, and connected into a global air traffic database, to provide the information needed to trigger the policy compensation.

Whilst the experiment was withdrawn in 2019, this was the inspiration behind many projects to come and showcased the power of blockchain, and the ability to be paid without needing to claim. Project head Laurent Benichou commented that "we have nonetheless learned a lot on Ethereum and initiated a few ideas on customer centricity that will grow in the insurance sector." [15]

Case Study: Etherisc

Whilst the Fizzy Project closed its doors, it paved the way for a number of new projects and ideas for blockchain and DLT to upend the claims process. Similar in product to the Fizzy product, insurtech start-up Etherisc launched a flight delay parametric policy. [16]

Etherisc are a Swiss-based insurtech company, who focus on decentralised insurance applications. The Etherisc Flight Delay Insurance DApp is a fully licensed and regulated product, which operates on Ethereum. [17]

Similarly to the Fizzy product, if a flight is delayed by 45 minutes or more, a payout is immediately received without the need to claim.

In order to purchase the product, the consumer needs to connect a blockchain wallet (such as metamask) to the platform and pay with cryptocurrency.

As this is a peer-to-peer product, users can also stake against the product to provide coverage.

3.4 Claims Recovery

Another area in which blockchain can make improvements across the claims process is in the recovery stage. When an insurer first pays the claim of their policyholder, following an event caused by a third party, the process of recovery is called subrogation.

This process can be extremely complexed with multiple parties communicating, from insurers to third party organisations and individuals. This means that there is often discrepancies with the information and data provided, which can lead to a significant amount of resources being used, both financially and time.

Through using a blockchain, all parties involved in the subrogation process can add and view a shared ledger of information, to efficiently share evidence and agree on claim payments, to streamline the recovery process.

3.5 International Claims

When looking at international and global insurance claims, the process can be incredibly complex due to the number of parties involved.

As we have discussed before, when there is a large number of parties involved in a manual process, this recipe is perfect for the use of blockchain in operations.

The number of parties involved in a global claim can be endless, from multiple insurers across different territories, brokers, auditors, forensic accountants and local enforcement departments.

Through the use of a permissioned blockchain, all parties can access a shared ledger of tamper-proof data, where evidence can be shared.

When we look at the international claims space, it is important to consider a recent case study from global insurer Allianz.

Case Study: Allianz

In May 2021, Allianz introduced a solution to streamline motor insurance products. As Ledger Insights report, "In the first six weeks following the launch, hundreds of Allianz staff processed around 145,000 transactions supporting over 10,000 international accident claims." [18]

In this project, Allianz used the Hyperledger fabric blockchain, which is a private network. When someone submits a motor claim, the local Allianz office will determine that it is a cross border event and use the international claims portal. Each country will have it's own node, and the information submitted to the blockchain consists of policy number, claims number, countries involved and details of the claim. Smart contracts are used to calculate the cost split between each organisation, along with billing and VAT calculations. Allianz have also said that they would consider opening this up to other insurers, to facilitate negotiation between carriers in international motor losses.

3.6 Integration with other emerging technologies

The blockchain and Internet of Things (IoT) is another interesting use case in disrupting traditional insurance. Through connected devices, and the large amount of data exchanged, insurers can use this to improve their models.

Products such as home appliances, electronic equipment and cars in the future can have their own policies registered and administered by smart contracts in a blockchain network, which automatically detects damages and triggers the repairing process.

Case Study : Lemonade

Lemonade combines Artificial Intelligence and DLT to offer insurance to renters and homeowners. Lemonade is a US based peer-to-peer insurtech.

Lemonade makes use of smart contracts in it's claims process. When a claim is made, the contracts will immediately attempt to verify the loss so the customers can be indemnified quickly.

Lemonade takes a transparent 20% in fees, and allocates the rest of capital into a fund to pay claims as soon as possible, when conditions in a smart contract are met.

According to their website, they claim to be able to **"pay claims in a world record 3 seconds."** [19]

The use of technology in what have been traditionally inefficient processes is clearly having a positive effect for Lemonade in the eyes of the customer, who have been rated "No.1 ranked renters insurance company in the U.S. out of 300-plus insurance companies." [20]

3.7 Fraud Prevention

Statistics on insurance fraud

Fraud is a big problem because of the lack of visibility between insurers. Fraudsters are able to take advantage of these vulnerabilities in the system. Common practices include:

Insurance of counterfeit goods

Double-Booking of the same claim

Manipulation into the policy's ownership

As reported by the Association of British Insurers, "every 5 minutes, a fraudulent claim in the UK is discovered." [21] – AND these are the ones that were found!

Fraud occurs in about 10% of property-casualty insurance losses. [22]

As reported by the FBI, the total cost of non-medical insurance fraud in the US stands at more than $40 billion each year, costing the average family an additional $400-$700 in premium increases. [23]

To fight against fraud, insurers gather publicly available data to predict fraudulent activities. With this data, they can determine patterns which improve the recognition of fraud. However, currently, there is no industry wide prevention measures due to the inability for insurers and third party companies in the eco-system to share sensitive or personally identifiable information (PII). Therefore, for carriers in the space, there is a lack of visibility of data which prevents them from being able to mitigate fraud related risks.

The use of blockchain help to improve co-ordination between insurers to combat fraud. On a blockchain, by cryptographically securing data sets, will allow claims information to be distributed on a shared ledger, accessed by insurers, without revealing sensitive and personal information. Through the provision of storing information on a shared ledger will improve visibilty between insurers, and help insurers collaborate to identify suspicious activites.

Double-Booking

Due to the lack of visibility between insurers, dubious policyholders withhold material facts into coverage they have elsewhere, so that they are able to claim on multiple policies. This is a serious problem for carriers.

Blockchain can prevent double transactions in a similar way to cryptocurrencies preventing double spending. When we look at a cryptocurrency transaction, if we think back to Chapter 1, the information contained in the block has to be verified in a consensus mechanism. The transaction which reaches majority consensus will be deemed legitimate, with the other being declined. This approach can be used when looking at the claims process, and where there is several claims attempted for one loss event.

As the information is shared across a digital ledger accessed by all insurers, carriers can know if a claim has already been indemnified.

Case Study : ClaimShare

An interesting recent case study is that of the app ClaimShare, developed by Intellect EU, in partnership with KPMG in March 2021.

As reported by Ledger Insights, "KPMG claim fraud accounts for about 5-10% of the payouts that insurers make." [24]

So how does ClaimShare work? When an insurer files a claim onto the system, ClaimShare compiles the data into two types; personally identifiable information (PII) and non-PII. The non-PII data is shared with other insurers in real-time, and automatically inputted into a confidential computing system called Conclave, which compares claims across insurers and detect potentially fraudulent losses. Following the checks, any potential cases of fraud will be sent to the insurer, who can then link back to the PII for further investigation. ClaimShare runs on R3 Corda.

Product Authentication and Anti-Fraud Registry

Claims related to counterfeit luxury products is a key issue for insurers when paying claims. It is reported that fraudulent jewellery claims cost insurers approximately $2 billion a year.

Product authentication is already a significant use case for blockchain when looking at the supply chain industry. The use of a certification system and fraud registry can help to mitigate fraudulent claims of these luxury goods.

Case Study: Everledger

EVERLEDGER

An interesting case study is that of Everledger. Everledger is a digital transparency company, which offers a certification system for luxury products using a mix of public blockchain and private blockchain. [25] Their product provides the ability to create a global registry for precious stones, inputting fourty characteristics for every stone recorded. The components are used to create a unique number, which is laser engraved to the stone and added to the blockchain.

This can create a tamper-proof registry, for insurers to cross reference against when a claim is made.

Medical Fraud

Health insurance has long been a centre for fraudulent claims, and exaggeration of claims amount. Health insurance companies face issues of fraudulent claimants asking for compensation for services not received from the hospital or doctor, or exaggerating the number of services to receive a higher pay out.

This is due again, to the lack of visibility for insurers and the inability to share sensitive and medical information across the value chain.

If we examine an example of a platform that is shared by multiple insurance carriers, who share information with each other to cross check the validity of claims. Hospitals have the ability to be participants (nodes) in the network, and upload information regarding a patient, including their medical history and treatment received. With this, the information on the blockchain cannot be edited, or deleted, and provides a tamper-proof trail for insurers to decide on the extent and validity of a claim when a policyholder makes communication.

Case Study: Blue Cross

Hong Kong insurer Blue Cross was an early adopter of blockchain technology and launched a platform in April 2019 to improve the processing times for medical insurance losses and prevent fraud. Blue Cross's platform, built on the Hyperledger blockchain, removes the need to reconcile data across multiple parties, and validates the data related to claims in real time, which reduces the potential of duplicate claims.

Blue Cross also credited blockchain as a big help during the Coronavirus outbreak. As reported by Insurance Business Mag, Patrick Wan, the Managing Director of Blue Cross stated. ""Our blockchain-backed claims service has played a key role during the outbreak of the coronavirus by totally eliminating the paper process and the need for back-and-forth documents delivery to clinics." [26] Blue Cross's platform can automatically handle more than 1,000 transactions per second.

Similarly, to other use cases of blockchain in insurance, the ability to mitigate fraud is dependant on co-operation across the industry, and with third party organisations. If there is little collaboration between carriers, and other sectors, the technology will not be useful in fighting against fraud. The benefits of blockchain are found when the value chain plays as a team.

REINSURANCE

A reinsurer is an organisation that provides coverage to insurance companies. Reinsurers are used to handle risks that are too large for primary carriers to take on their own. Reinsurance is an integral part of the industry, as it provides a safety net for primary insurers to mitigate risks and prevent against disasters.

There are several types of reinsurance, including:

Treaty Reinsurance
One reinsurance contract covers a large pool of similar risks in the primary insurer's portfolio.

Proportional Reinsurance
Allows for reinsurers and primary insurers to share a proportionate amount of risk.

Facultative Reinsurance
Coverage for one specific insurance contract.

Issues with current process

The current reinsurance system is incredibly complex and inefficient. Why is this?

Manual processes and determined by one-off contracts	Insurers generally engage with multiple reinsurers for each risk	Data and information are stored in silo

Due to primary insurers engaging with multiple reinsurance carriers for the same risk, this leads to a significant amount of data which is needed to exchange between relevant parties. As this is stored in silos and not shared, there is often differing interpretations, the need for further information and disputes on claim pay outs. Also, with each organisation having different data standards, the quality of the information provided differs between entities.

Due to these inefficiencies, it can pose a major problem for a primary insurer when an event occurs. It can take up to three months for a reinsurance contract to be decided on. This means that the whole process is costly, time consuming and inefficient.

For those that have read chapter 2 and 3, you will see where this is going! An inefficient process with multiple parties and manual processes is the perfect recipe for the introduction of blockchain.

4.2 Blockchain as a solution

The introduction of blockchain technology into the reinsurance process can streamline risk transfer and claims processing, through the efficient exchange of data and use of smart contracts.

Some key solutions are below: [27]

All parties involved in a reinsurance contract input data into a private permissioned blockchain.	Reinsurance treaties/swaps terms are written into a smart contract.

Sharing of Data

As we look at Solution 1, a private permissioned blockchain can be used for all parties involved in a reinsurance contract to input and share data. This will allow reinsurers, primary insurers and regulators to share data securely in real-time.

With all relevant parties having access to a shared ledger, this results in a single source of truth. As we have discussed before with a blockchain, the information cannot be tampered or modified.

As there are usually a number of insurers and reinsurers collaborating, especially on major events such as hurricanes and other natural disasters, the challenges operationally are huge. For reinsurers, the ability to see operational data in real time is key.

Through a system such as this, the benefits can include:

More efficient underwriting process

Contract certainty

Reinsurers able to allocate capital towards claims in real time

Auditable Records

Reduction in disputes at point of claim

Collaboration to effectively deal with large events

As PWC stated, blockchain in reinsurance could "open up a $5-10 billion cost saving opportunity through faster, more efficient and more accurate placement, claims settlements and compliance checks." [28]

This saving could trickle down to lower premiums for the end consumer, as it is estimated that 5-10% of existing premiums arise from the costs of reinsurance accounts.

Use of smart contracts

As we have focused on in previous chapters, the use of smart contracts has the potential to change the way that insurance works. Reinsurance treaties or swap terms can be written into a smart contract which automatically executes payments (premiums and claims) to/from reinsurers when pre-determined conditions are met.

By securing reinsurance treaties through smart contracts, the flow of data and payments across the value chain can be simplified.

Internal Reinsurance

In recent times, many major insurance companies have set up internal reinsurance mechanisms, to drive efficiency in their processes and reduce capital requirements.

Whilst this can improve the process, the exchange of data and information is still complexed, and involves third parties such as brokers. As PWC noted in their report 'Blockchain: A catalyst for new approaches in insurance.' "it may be possible to organise information flows for internal reinsurance via a private blockchain." [29]

Case Study: B3i

B3i is a company set up by some of the biggest players in the global (re)insurance industry to create **"better insurance enabled by frictionless risk transfer."** The list of shareholders includes the likes of Allianz, AXA, SwissRe and Zurich. [30]

As reported by CB Insights, "B3i launched a prototype in 2017 of a smart contract management system for Property Cat XOL contracts, which is a type of reinsurance for catastrophe risk." [31] Each contract on the platform is written as a smart contract, with programmable code on the shared infastructure. If an event occurred, such as an earthquake or cyclone, the smart contract would evaluate the data sources (oracles) from the participants (nodes) in the network, and automatically calculate payouts.

More recently, B3i were appointed in September 2021 to develop DLT solutions for the management of inter-pool nuclear reinsurance contracts. As told by Reinsurance.ws, "Nuclear pools act as the technical underwriting vehicles in their respective domestic markets for the pooling of net capacity for nuclear risks." [32] Six pools in North-Western Europe, hope to benefit from increased contract certainty, process efficiency and real-time portfolio oversight.

B3i are working towards the completion of the product by the renewals of January 1st 2022.

Case Study: Legal & General Pension Reinsurance Platform

In 2019, Legal and General Reinsurance announced its blockchain solution for pension risk transfer. Pension Risk Transfer (PRT) is a product where an insurer agrees to take on the risk of a shortfall of assets in a company pension scheme against the defined benefits.

L&G previously had several separate systems and the blockchain model, supported by Hypeledger Fabric, was introduced to treamline the reinsurance process.

Ledger Insights reported the news at the time and quoted CEO Thomas Olunloyo, "We believe that blockchain is uniquely suited to the long term nature of annuities business as it allows data and transactions to be signed, recorded and maintained in a permanent and secure nature over the lifetime of these contracts, which can span over 50 years." [33]

The platform addressed two key pain points for L&G Re, decentralisation of data, and the ability to use data dynamically. The platform was conceived, designed, built and tested within an 18 month period.

As we looked at in the B3i case study, the importance of teamwork in blockchain is imperative. If a reinsurer acts alone, it is likely that a blockchain solution will not work and other technologies can produce greater results in improving their operations. However, if organisations collaborate together, a distributed ledger technology is a great solution for the efficient exchange of data, and an improvement across the whole reinsurance value chain.

EMERGING
MARKETS

CHAPTER 5

5.1 The current protection gap
in emerging markets

There are currently over four billion individuals uninsured and a large protection gap specifically in emerging territories. For example, as reported by Mckinsey, the insurance penetration in Africa currently stands at 3%." [34]

When there is a death in the family, many farmers will have to sell their land or assets to pay for the burial costs and funeral. Because the need for cash is so sudden, they often sell for a lot less than the market price. So now, they are left without an income generating asset to support the family.

Illness and injury represents a permanent threat to a family's income earning capacity. Beside the direct costs for treatment and drugs, indirect costs for the missing labour of the ill person have to be shouldered by the household.

As reported by the Food and Agriculture organisation of the United Nations, small holder farmers with less than 2 hectares of land, produce 1/3 of the world's food. These small holder farmers usually live in areas that are most affected by climate change, but have the least levels of protection against those risks. [35]

With no safety net, an unexpected event will lead to an out-of-pocket expense and plunge a family back into poverty.

5.2 Inclusive Insurance and
the barriers to adoption

Inclusive Insurance is commonly referred to as insurance tailored towards low-income groups, offering security against specific perils rather than an all-encompassing policy.

Whilst microinsurance has had some success across emerging markets, particularly around health risks, it is still in it's infancy in terms of adoption.

High Distribution Costs vs Premium Level

Consumer Trust

Lack of appropriate products

Lack of Education

Low and Unpredictable Income

5.3 How can blockchain increase penetration of insurance in emerging markets?

Blockchain technology can enable incumbents to reach new markets, especially in developing regions. Traditional insurance software is extremely costly, due to back office inefficiencies. A blockchain based system can allow insurers to process policies at a fraction of the cost, meaning that they can maintain profitability in a low margin customer segment.

If we adopt a focus on Africa, whilst insurance penetration is low on the continent, the use of mobiles is extremely popular. The development of mobile-based payments via telephone operators are widely used across the continent, and this provides an opportunity for the insurance sector to capitalise on this.

Blockchain can improve the underwriting and KYC process, whilst the use of smart contracts can accelerate the claims process.

In many rural areas, families and households do not have an official address. This results in several problems including the inability of purchasing home insurance. However, with blockchain and it's immutable properties, GPS co-ordinates can be included on a data set accessible by all parties involved, allowing for the arrangement of policies.

Case Study: Blocksure

Blocksure is a UK-based insurtech firm that offer a blockchain solution for insurers across the world. They focus on simplifying the value chain to offer microinsurance.

Blocksure OS is built on the Corda Blockchain platform and can process a policy with a back office cost of $0.50. This allows insures to be able to sell a policy to a consumer for between $2-$10 a year. [36] The platform is used in Indonesia for General Personal Accident and Life Cover.

Their platform allows all nodes in the value chain can access the same data in real-time, which reduces delays in communication and data being transferred. Also, the frictionless system allows for microinsurance to be commercially viable for insurers, reinsurers and brokers.

The below illustration details the proposed benefits of Blocksure OS: [37]

QUALITY	COSTS	SPEED	GOVERNANCE
Data quality and security	**Reduce back-office costs by up to 90%**	**Transaction speed increased from months to just seconds**	**Improved governance of transactions and regulatory requirements**
Digitally secure identity	Removes or automates processes	Real-time data sharing across all parties	Full auditability of all transaction events
Consistent and immutable	No need for bordereau, cash reconciliation and credit control	Customers, brokers and insurers can transact on the go	Reduced burden of insurers and brokers, e.g. automated client money management
No re-keying of data across value chain	Premium allocation, FNOL, and claim file makeup - all automated	Everyone in sync	
Accurate magagement information			

Parametric Insurance (Index-Based Policies)

One of the largest use cases of blockchain in inclusive insurance across emerging markets is through parametric contracts.

As defined by SwissRe, " a parametric (or index based) solutions are a type of insurance that covers the probability of a predefined event happening instead of indemnifying actual loss incurred." [38]

Parametric insurance requires real-time data interface and exchange among different parties. It has proved to be a popular method of risk transfer.

As the conditions of the policy are clearly pre-defined, this makes it suitable for blockchain. Blockchain has the ability to digitise most parts of a parametric contract. The efficiency of data exchange can be improved through the use of smart contracts. Due to the low cost of using smart contracts, human intervention will be reduced, improving an insurance company's operating costs.
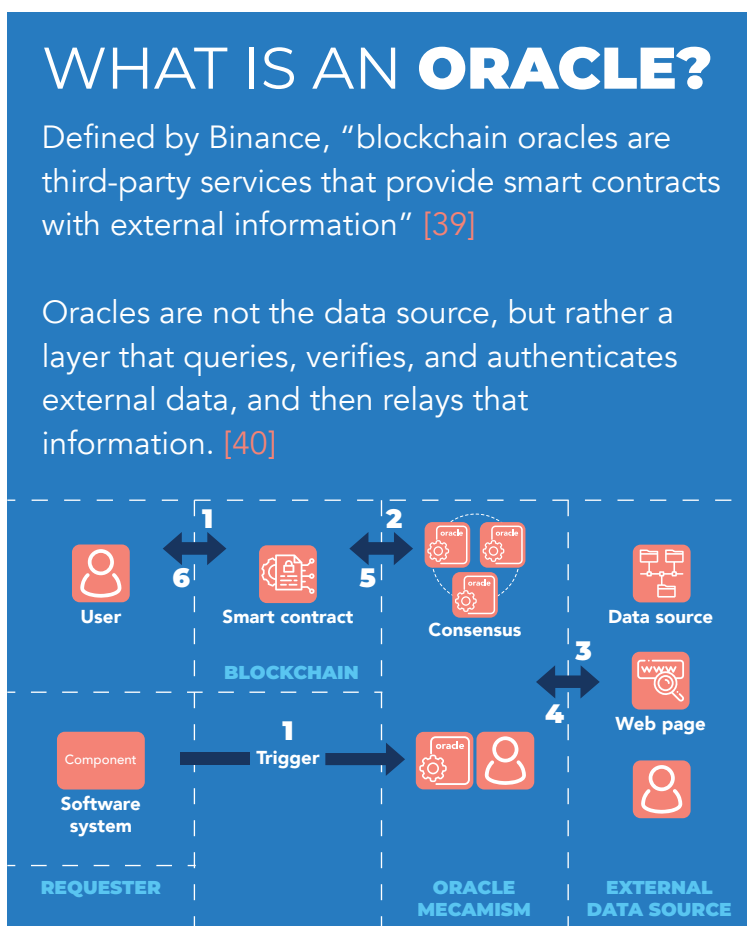
A parametric product is a much more transparent product, as it is based on an index and not the actual damage, meaning loss assessments can be carried out remotely. A policy can be linked to an index such as temperature, rainfall or earthquake severity.

In parametric contracts, the use of blockchain is particularly beneficial during the claims process. When exploring agricultural insurance in a traditional system, a customer would claim and produce all of the relevant documents needed to decide on settlement. Following this, an expert or loss adjuster would visit the site of the loss, to inspect the damage and identify if it was caused by an insured peril. Following this, negotiation would take place with the policyholder before a payment is made.

In a blockchain based parametric contract, a pre-defined limit is already in place to determine where a pay out would occur. When an event occurs, if the conditions of the smart contract are met, settlement is automatically executed.

The data needed to execute the contract may be located outside of the blockchain. With this, there is a need for a trusted third party to provide data into the smart contract. This is known as an **"oracle."** Upon a loss, an oracle pushes information about the event to the blockchain. There are usually a number of oracles used to increase the reliability of the data.

With the levels of premium for microinsurance products, it is uneconomical for a loss adjuster to visit a small holder farmer. Therefore, this provides as a viable alternative to traditional agricultural policies. The low cost of smart contracts and their transactions means that many products can be rendered more competitive for penetration of underinsured markets in the developing world.

WHAT IS AN **ORACLE?**

Defined by Binance, "blockchain oracles are third-party services that provide smart contracts with external information" [39]

Oracles are not the data source, but rather a layer that queries, verifies, and authenticates external data, and then relays that information. [40]

When we explore how blockchain is used in emerging markets, to drive forward the insurance industry, we can look at two main players:

Case Study: Etherisc & Acre Africa

Our first case study is that of Etherisc. Etherisc is a decentralised insurance protocol on the Ethereum blockchain to digitise parametic products. [41]

Etherisc has partnered with Acre Africa to develop a groundbreaking new type of crop insurance in 2021. Acre Africa are a sub-saharan African insurer, specialising in agricultural protection. [42] Etherisc had already proved the concept in a small pilot in Sri Lanka in 2019, alongside AON and Oxfam. [43]

The product is an index weather policy and is aimed at the Kenyan market. The first product was called "Bima Pima Crop Insurance." The product is distributed through farm input suppliers and champion farmers in villages. A champion farmers is a trusted individual in the community who is financially literate. [44]

When planting seeds, a farmer can register a code using the SMS USSD function on their phone. The basic premium is included in the price of the seeds, and additional coverage can be purchased through M-PESA. M-PESA is the largest mobile operator in Kenya.

Once the insurance smart contract is active, it will automatically track the weather data relevant to the policy. This data can be sourced through oracles.

The smart contract will be executed once the parameter for levels of drought or flood are reached. The claims payment will be automatically be sent to the farmer's M-PESA mobile wallet.

Case Study: IBISA Network

Another case study of a company using blockchain in the space is IBISA. No, they are actually using blockchain and space!

IBISA means Inclusive Blockchain Insurance using Space Assets. It is a platform to enable parametric microinsurance for weather related risks in agriculture, across developing countries.

IBISA's mission is to enable agricultural insurance everywhere, in an easy manner. They partner with local insurers and mutuals, and leverage technology to build innovative and commercially viable insurance products. [45] The IBISA platform is a full stack end-to-end solution, encompassing underwriting, policy handling, customer administration and claim assessments.

Similar to our previous case study, this is a platform for weather index products. The platform is currently used in India, and is crop agnostic.

IBISA's claim process is unique in that they perform a proactive loss assessment. Instead of waiting for a claim to happen at end of season, they assess every month during the season (for drought coverage). If there is an indication of drought in second or third month, they will make a partial payout so that farmers can do a second plant or change to a more resistant crop, or revenue stability.

IBISA work with European Space Agency to obtain earth observation data from satellites. This includes historical data to define the scope of coverage, and use actual data and anomalies as part of their loss assessment.

IBISA also use wisdom of the crowd, by Ethereum based Augur as part of the loss assessment. They use a decentralised consensus mechanism through a crowdwatching platform, in which a group of people will assess areas where farmers are located (approximately 20-30) to decide on the severity of loss. This is calculated between 0-100%. The crowdwatching platform along with the parametric outputs increase the reliability in loss verification. To ensure reliability in the system, there is a reputation based incentive mechanism for watchers.

[46]
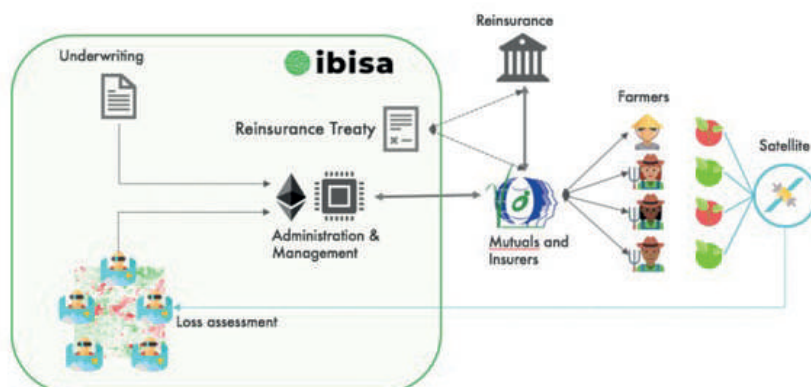
INSURING THE BLOCKCHAIN
ECOSYSTEM

CHAPTER 6

6.1 The Blockchain Ecosystem

The cryptocurrency and blockchain ecosystem has exploded in recent years, due to the number of use cases and applications that can be developed from blockchain protocols such as Ethereum.

When we look at the largest cryptocurrencies, bitcoin (BTC) and Ethereum (ETH), at the time of writing, the market cap (USD) is at $1.1tn and $450bn respectively. [47]

In the past two years, we have seen the rise of two particular trends: decentralised finance (DeFi) and Non-Fungible Tokens (NFT).

WHAT IS **DeFi?**

As defined by Ethereum, "DeFi is an open and global financial system built for the internet age – an alternative to a system that's opaque, tightly controlled, and held together by decades-old infrastructure and processes." [48] With DeFi, the user has control and visibility over their money. It can give you exposure to global markets and alternatives to your local currency or banking options. DeFi products open up financial services to anyone with an internet connection and they're largely owned and maintained by their users.

WHAT IS AN **NFT?**

NFTs are tokens that we can use to represent ownership of unique items. They let us tokenise things like art, collectibles and real estate. They can only have one official owner at a time and they're secured by a blockchain, most commonly Ethereum– no one can modify the record of ownership or copy/paste a new NFT into existence. [49]

NFT stands for non-fungible token. Non-fungible is an economic term that you could use to describe things like your furniture, a song file, or your computer. These things are not interchangeable for other items because they have unique properties.

DeFi **METRICS**

- Total Value Locked - $88.96 Billion * [50]

- Top Lending Protocol – Aave *

- Top Decentralised Exchange – Uniswap *

With the explosion of this new industry, there is a need for insurance across the ecosystem.
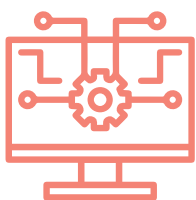
*At time of writing

6.2 Decentralised Finance (DeFi) and the Early Risks

Whilst DeFi has gained incredible traction in the past twelve months, and is closing on $100 billion total value locked in protocols, it carries significant risks for the user.

Software Risks and Hacks

Rug Pulls

Regulatory Risks

Software Risks and Hacks

A significant risk in Decentralised Finance is that of protocol software, and the potential exposures in code. The threat of technical risks is evident, and can compromise the functionality of a platform.

One example of this was the famous Ethereum DAO (Decentralised Autonomous Organisation) hack in 2016, which drained $50m of funds from members of the DAO. [51]

Also, on August 10th 2021, a hacker exploited a vulnerability in the Poly Network platform, and made away with $600,000,000, the biggest crypto theft in history. [52] They later returned the funds but it showcases the need for adequate consumer protection against risk, as many unaudited protocols are able to attract significant capital.

Rug Pulls

Another risk for users in DeFi is that of a crypto term named "rug pull". A rug pull is when investors are targeted by exit scams, where founders or promoters abandon their projects and leave with the funds. This is more commonly found when the project founder is anonymous and large APY's are offered to retail liquidity providers, which leads to a large influx of capital locked into smart contracts, with the developer able to withdraw funds from the liquidity pool.

In September 2020, the anonymous founder of Sushiswap drained over $13m from the developer fund, after the protocol had amassed significant capital in the first week of operations. [53] This caused the token price to crash.

Another project to note is that of Meerkat Finance. After attracting $31million of capital into the protocol in it's first day of launch, the funds were drained in which many believed to be a rug pull. [54]

Regulatory Risks

DeFi is still in it's infancy and many projects are offered by unincorporated entities that operate outside of regulatory structures that are common in existing financial services.

There has been little guidance from regulators, and there is a stress for greater clarity on this highly complex area.

6.3 What can be insured?
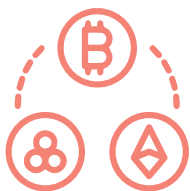
Assets stored on cryptocurrency exchanges and custodians

Crypto Wallet Cover

Smart Contract Coverage

NFT Insurance

Coverage against Stablecoins losing their peg

Professional Liability for Blockchain Developers

Insurers need to bring in external knowledge from the blockchain space to assess risk and advise on best practices for loss control and mitigation.

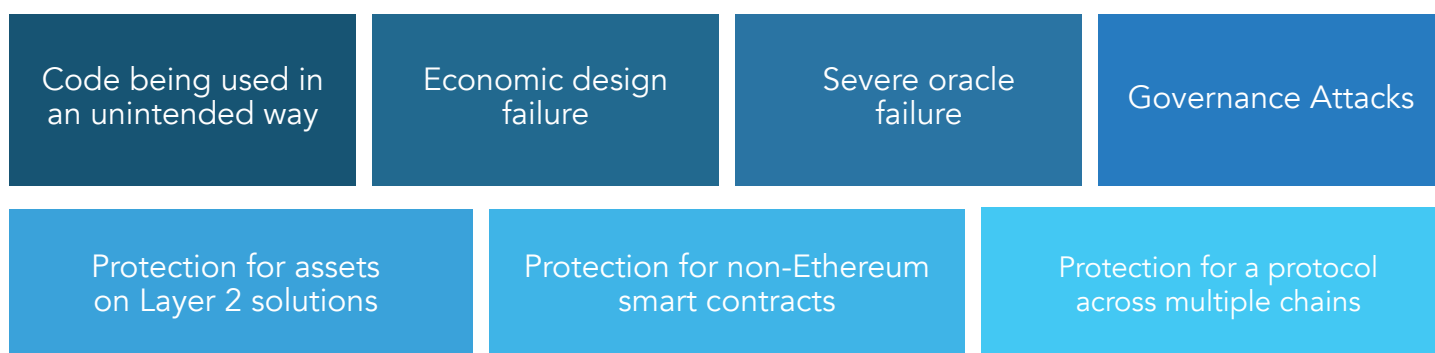# Case Study: Nexus Mutual

Nexus Mutual is a popular decentralised alternative to insurance, using the power of Ethereum so people can share risks.

The coverage is not a contract of insurance, but discretionary cover with fellow members deciding on claims. Nexus Mutual is a registered mutual in the UK and membership rights are represented by NXM tokens. Tokens can be used to purchase cover as well as participate in claims assessment, underwriting and governance. Only members can decide which claims are valid. All member decisions are recorded and enforced by smart contracts on the Ethereum public blockchain.

Nexus Mutual's core product is Protocol Cover. As defined in their gitbook, it protects against a hack on a specific protocol, with the following risks covered: [55]

Code being used in an unintended way	Economic design failure	Severe oracle failure	Governance Attacks
Protection for assets on Layer 2 solutions	Protection for non-Ethereum smart contracts	Protection for a protocol across multiple chains	

The cover wording can be found here at https://nexusmutual.io/pages/ProtocolCoverv1.0.pdf

Members will stake their NXM tokens against protocols, which dictates the availability of capacity for those that want to buy cover, and the premium level. These members are known as risk assessors. [56]

In February 2021, popular DeFi yield aggregator platform Yearn Finance was attacked. As reported by the Defiant, "12 claims have been accepted for payout by Nexus Mutual worth $2.1M." [57]

Case Study: Gemini Custody

Gemini are a well known New York based cryptocurrency exchange, founded by the Winklevoss brothers.

As part of their services, there is a separate platform called Gemini Custody which offers a storage of a users crypto in a secured offline cold storage system. This service is designed for individual users wanting the highest levels of security and institutional clients such as hedge funds and mutual funds.

Gemini is a fiduciary and qualified custodian under New York Banking Law and is licensed by the State of New York to custody digital assets. [58]

Gemini were one of the first custodians to secure insurance coverage from the traditional market. They secured capacity of $200 Million in cold storage cover, which is brokered and managed by Marsh and Aon. Customers can also buy additional insurance for their assets. [59]

Case Study: Nexo

Nexo is a cryptocurrency platform which enables the possibility to buy, earn and borrow cryptocurrencies. To provide protection for users, Nexo has introduced an insurance programme for funds on the platform.

Nexo's current insurance programme stands at $375 million and comes through partnerships with BitGo, Ledger Vault and Lloyd's of London. However, Nexo's current assets under management stands at over $4 Billion, and they aim to increase insurance capacity to $1 Billion by the end of 2021. [60]

Nexo's first partnership was with BitGo, who provide cold storage wallets to Nexo. BitGo Custody carries $100 million in insurance capacity through Lloyd's of London. As detailed by Nexo, "the policy covers digital assets where the private keys are held 100% by BitGo in the event of:

Third-Party hacks, copying, or theft of private keys	Insider theft or dishonest acts by BitGo employees or executives	Loss of keys [61]

Nexo also implemented Ledger Vault's solutions, which insures digital assets for up to $150 million through a programme backed by Arch and Marsh. [62]

RISKS AND OBSTACLES
TO ADOPTION

CHAPTER 7

As we have discussed in this paper, blockchain technology has an abundance of use cases in the insurance industry across the whole value chain, spanning from underwriting, automating the claims process, reinsurance, unlocking new opportunities in developing markets and insuring the new industry itself. However, there are risks and obstacles ahead when looking ahead to the future and it's adoption in the sector.

7.1 Cost of adoption

Blockchain is still in it's infancy when looking at the insurance industry. Whilst there has been some successful projects and innovations, the impact in insurance lags far behind that of other industries in the financial sector.

There was a significant number of proof of concepts and trials in 2017-2018, however many did not move forward to a stage of production.

One reason noted was the cost of adoption. For those looking to develop their own solutions, it can be difficult to find appropriate blockchain developers to build the programmes. Also, there are few professionals with experience in both the blockchain and insurance sectors that can lead the development of new solutions.

It will take time for solutions to be cost-effective for mass use, and tested under real-world adversarial conditions.

7.2 Security

Another potential obstacle to adoption is that of security. Whilst this is one of blockchain's best properties, in that it is a trustless system, there is still a level of trust in the adequacy of the underlying cryptography and consensus mechanism.

As we discussed in Chapter 6, there can also be security issues within the software, with the potential for vulnerabilities within smart contract codes. We have seen that within the blockchain sphere, new type of attacks arise, in which the industry understands to a lesser extent and subsequently, is less capable of mitigating those risks.

As smart contracts often are dependant on external data from oracle sources, there is a potential vulnerability for this off-chain data to be corrupted or inaccurate. This is known as the "Oracle Problem." If we look at climate insurance, an oracle provider will usually use several points of data to determine the weather at a specific point in time at a specific location. However, whilst this does increase the reliability of the data, smart contracts are not able to verify the credibility of this off-chain data, and therefore this presents an obstacle for adoption of smart contracts in the claims process.

7.3 Regulatory Issues

As we touched on in Chapter 6 when discussing decentralised finance (DeFi), the regulatory landscape surrounding the space is still in development. This is something that Governments and regulators across the world are assessing.

One important topic to focus on here that relates to the insurance industry is that of Data Privacy. The General Data Protection Regulation (GDPR), and in particular, the right to "be forgotten", is a direct contrast to the immutable nature of blockchain. This is something for insurers who are looking to adopt the technology in their processes to consider. To combat this, a system can be implemented in which no personally identifiable information (PII) is on the blockchain.

Another development to monitor is the legality of smart contracts. It is still unclear in many jurisdictions whether smart contracts are recognised as a legally binding contract. This is needed to provide confidence in the use of smart contracts by industry players.

Also, there is a lack of standards and implementation procedures for market players to adopt and follow. Therefore, the risk of implementing solutions currently are high.

7.4 Competitive Culture

Another obstacle to adoption of blockchain in insurance is that of the competitive nature of business culture. For blockchain to work efficiently, companies need to be prepared to cooperate and work on the same network. After all, blockchain only works as a team sport.

Insurers may not want to share commercially sensitive data with each other, which may result in a loss of competitive advantage.

Also, incumbents in the industry are resistant to change. For blockchain to be adopted, there needs to be a transformation of mindset across the industry, and more of a collaborative attitude towards providing solutions. For sure, this journey will not be overnight.

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