ADDENDA

EVOLVING INSURANCE WITH BLOCKCHAIN

How distributed ledger technologies can revolutionize the UAE's insurance industry

Contents

1. FOREWORD

Takaful Emarat has coached the team at ADDENDA over the last year with their Proof Of Concept for the Insurance industry. I am deeply moved by their passion for Blockchain as a disruptive technology and its potential impact on our industry. Their report explains the fundamentals of Blockchain and examines some of its potential uses in the UAE's insurance sector.

There is no doubt that from a global perspective, Insurance companies are facing several challenges, which range from complex global compliance issues, subdued growth in developed markets, fraudulent claims, increasing third party payment transactions and an on-going need to manage and secure vast amounts of generated data. The steady move to a 'digital ecosystem' has left many insurers uncertain of the best approach to optimize their business processes, secure sensitive information and manage costs of moving money in a digital world.

These issues have been compounded by the Internet of Things (IoT). Today, wave upon wave of connected devices and an ever-growing amount of consumer data is pushing insurers to manage, understand and analyze this data to create the next generation of 'smart' insurance products and services.

Many companies are considering using Blockchain as part of their operations to effectively manage, share, collaborate and reduce costs that result from duplicate information across the ecosystem. Crucial to the insurance industry, Blockchain has many use cases that can reduce administrative costs through automation of industry specific chains. Examples include information verification for claims and payments processing, reuse of medical examination results, and smart contracts.

Worthy to mention is the emergence of smart contracts as a means of connecting real-time information from multiple systems across many organizations to execute processes. These processes include claims, payments and reimbursements in real-time, with greater accuracy, and without human intervention. This ultimately reduces costs for insurance companies and provides an optimized customer experience.

With these global challenges in mind, which are also reflected across the region, this ADDENDA report illuminates how Blockchain technology can be used within our domestic insurance ecosystem to improve efficiencies, reduce costs, as well as improve the customer experience.

- **Fadi Hindi, CEO, Takaful Emarat**

Mr. Fadi Hindi is the Chief Executive Officer of Takaful Emarat Insurance (PSC) which is listed on the Dubai Financial Market. He is currently implementing a business wide transformation strategy, which is incorporating both digital and disruptive new technologies.

Mr. Hindi has over 28 years of experience in strategy planning and digital transformation and prior to his current role, he served as Chief Operating Officer and Acting Chief Innovation Officer for Innovation & The Future at Dubai Electricity and Water Authority (DEWA). Prior to joining DEWA, Mr. Hindi was a Strategy, Operations and Partnerships Consultant at Smart Dubai. He also served as Office of Strategy Management (OSM) Consultant at Dubai Smart Government. Mr. Hindi has a Bachelor's degree in Computer Engineering (with a minor in Robotics & Artificial Intelligence) from North Carolina State University.

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2. EXECUTIVE SUMMARY

Despite the several cryptocurrency bubbles, hacks, and crashes that have plagued the reputation of blockchain technology since 2009, distributed ledger technology (DLT) is steadily evolving as a means of authenticating and reconciling disparate ledgers between entities that otherwise may not trust each other.

The past couple of years have showcased numerous blockchain pilot projects around the globe testing out possible use cases from blockchain in healthcare to logistics. The United Arab Emirates (UAE) even had its very own blockchain center inaugurated by His Highness Sheikh Mohammed bin Rashid Al Maktoum on the 15th of May 2018.

Another pleasant surprise is the recent interest in disruptive technology from the region's corporate side, and not just the regulators. Projects that stood out include Al Hilal Bank partnering with Jibrel technologies to transfer digital sukuk across the blockchain, as well as du and Consensys building the region's first blockchain platform as a service (BPaaS).

Every other day, a new blockchain pilot is announced and celebrated in local papers. C-suite executives have caught up on the hype train and have finally moved away from the curiosity stage and are now pushing for functional prototypes and MVPs to resolve their industry bottlenecks.

And while this paper does not discuss ICOs or cryptocurrencies in general, it is definitely a move forward for the UAE to have almost finalized the regulatory framework around ICOs in a bid to provide companies with other means to raise capital through crowdfunding.

Globally, the insurance sector is no different. B3i, a global consortium of insurers and reinsurers, is currently working on several prototypes for the reinsurance market. Chainthat is an InsurTech startup working on blockchain-based settlement, accounting, settlement and claims agreement using Corda.

While at first sight, it may seem that UAE insurers are lagging a bit behind against global players, Addenda is also working quietly on blockchain proof-of-concepts (PoCs) with leading local insurers in both life and motor insurance segments, which we'll be able to announce soon.

This whitepaper breaks down a few clear use cases for blockchain in the local insurance ecosystem.

3. BACKGROUND

3.1   Current insurance ecosystem in the UAE

AED 62.1B   is the expected market value of the insurance sector in the UAE by 2020, with an expected annual growth rate of ~19%[1].

The largest segment by gross written premium (GWP) is health insurance at almost AED 19.4 billion in the last year alone. This is followed by motor insurance at AED 7.5 billion and individual life insurance at AED 7 billion, as shown in the table below:

AED in 000's

Line of Business	TOTAL	
	2017	**2016**
Fire	2,861,486	2,730,690
Marine & Aviation	1,235,902	1,280,766
Motor & Transportation	7,548,004	6,478,703
Engineering, Construction & Energy	2,208,328	1,925,349
Other	1,822,507	1,831,734
Total - Property & Liability Insurance	**15,676,226**	**14,247,241**
Total - Health Insurance	**19,392,488**	**17,181,718**
Group Life	707,922	1,174,515
Group Credit Life	672,954	644,629
Individual Life	7,015,725	6,244,203
Annuities & Fund Accumulation	1,358,913	516,844
Total - Insurance of Persons & Fund Accumulation	**9,755,514**	**8,580,192**
TOTAL - All Types of Business Combined	**44,824,228**	**40,009,151**

Table 1 The Annual Report on the UAE Insurance Sector for 2017[2]

The reason the health insurance sector GWP has hiked between 2016 and 2017 is due to the introduction of mandatory health insurance regulations in Dubai in March of 2017. It is expected that other emirates will follow suit, leading to a compound annual growth rate (CAGR) of 11.7% in the health insurance market by 2021.

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[1] According to a research done by Alpen Capital.

[2] The Annual Report on the UAE Insurance Sector for 2017 by the UAE insurance authority.

The UAE's insurance ecosystem is becoming more competitive by the day with more than 60 insures competing for the same premium pool, so technological innovation and digitization, along with identifying new venues to sell policies to the masses (e.g.: through aggregator websites) has become a priority for insurers to survive competition. What is interesting is that out of the 60+ insurance companies in the UAE, the top 5 insurers control more than 50% of the overall gross written premium for the past two years. This cut throat competition is leading smaller insurers to merge in a bid to control larger segments of the market.

The regulatory framework of the insurance ecosystem in the UAE relies on the Federal Law No. (6) of 2007 concerning Establishment of the Insurance Authority & Organization of its Operations. Through this regulation, the insurance authority (IA) regulates, supervises, and monitors the local insurance market. The insurance authority's responsibilities include overseeing the premium values across the market and enforcing regulations and standards that lead to fair competition between insurers.

Along with the IA, the UAE has a Emirates Insurance Association (EIA), which was formed in 1988 and its members include all insurers, brokers, and loss adjusters in the UAE. The EIA caters to the needs of the local market and collectively acts as an entity that lobbies market needs to the authority.

3.2   Our industry engagement

Addenda was chosen as a finalist within the FinTech Hive accelerator program, which had over 20 financial institutions as partners. Of those partners, 5 insurance companies were mentors for Addenda for a period of three months. During that time, we identified pain points these insurers had that we believe blockchain technology can resolve.

We've also participated as panelists within the Emirates Insurance Association's (EIA) 5th annual health insurance conference, where we discussed the benefits of gradually introducing blockchain as a platform for insurers to collaborate rather than compete with each other.

This report showcases a high level result of research, workshops, and discussions we have conducted in the past few month with direct insurers, regulators and the wider insurance ecosystem.

4. BLOCKCHAIN TECHNOLOGY

4.1 How it works

In a nutshell: A **Blockchain** is a shared ledger of records in the form of "blocks" which are linked using *cryptography.*

Each **block** contains a timestamp and a **cryptographic hash** of the previous block, leading to an up-to-date *chain* of records **distributed** to all participants. The resulting ledger can be accessed by different servers (or nodes) and any update is shared with everyone across the entire network.

The main difference between using a blockchain for record keeping and the existing method of record keeping is shown below:
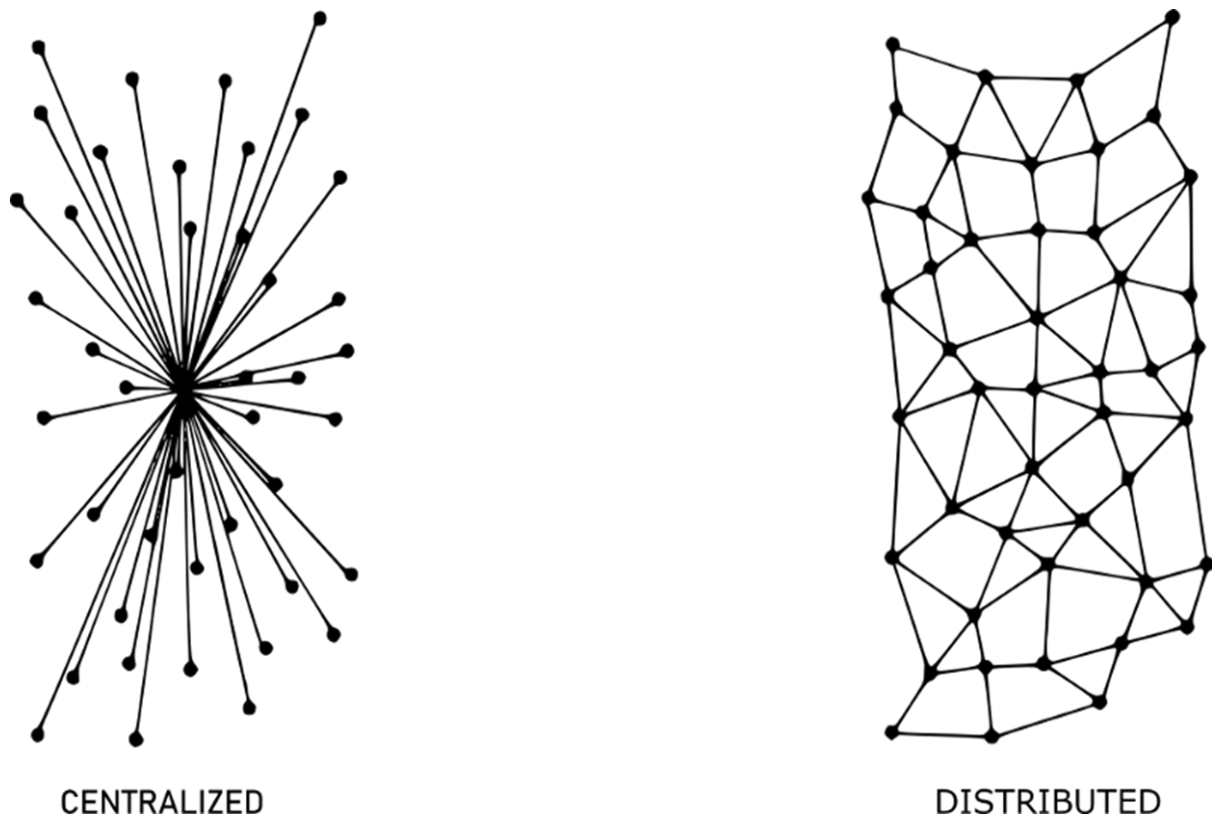

Figure 1 Centralized vs. Decentralized ecosystems[3]

CENTRALIZED: Say a consortium of insurers were to share vehicle accident history data with each other. Without a blockchain, they would either a) have their own versions for each vehicle registered on their internal systems that need to be reconciled on a regular basis; or b) depend on a central authority to vet and update data that is otherwise locked in their independent and isolated silos. This means that there is a lot of data that is either redundant

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[3] Wilbanks Keynote NFAIS, 2012

or simply incorrect and out of date. Two insurers may have different information on the same data point, and comparing each data set may lead to significant operational costs.

DISTRIBUTED: In this ecosystem, data is shared with every node on a distributed ledger. Whenever an "asset" (e.g.: a policyholder ID, vehicle chassis number, or a property plot number) has its "state" updated, that new state is logged and timestamped on a global ledger for all participants to see. By virtue of data being distributed and dynamically updated on the ledger, it creates a single point of truth for all participants as to what the latest state of the asset in question is (i.e.: whether money has been transferred, or who currently owns a plot of land, etc.).

Using the distributed example above, a group of insurers can share, say, life insurance policy applicant history, and the network would look something like this:
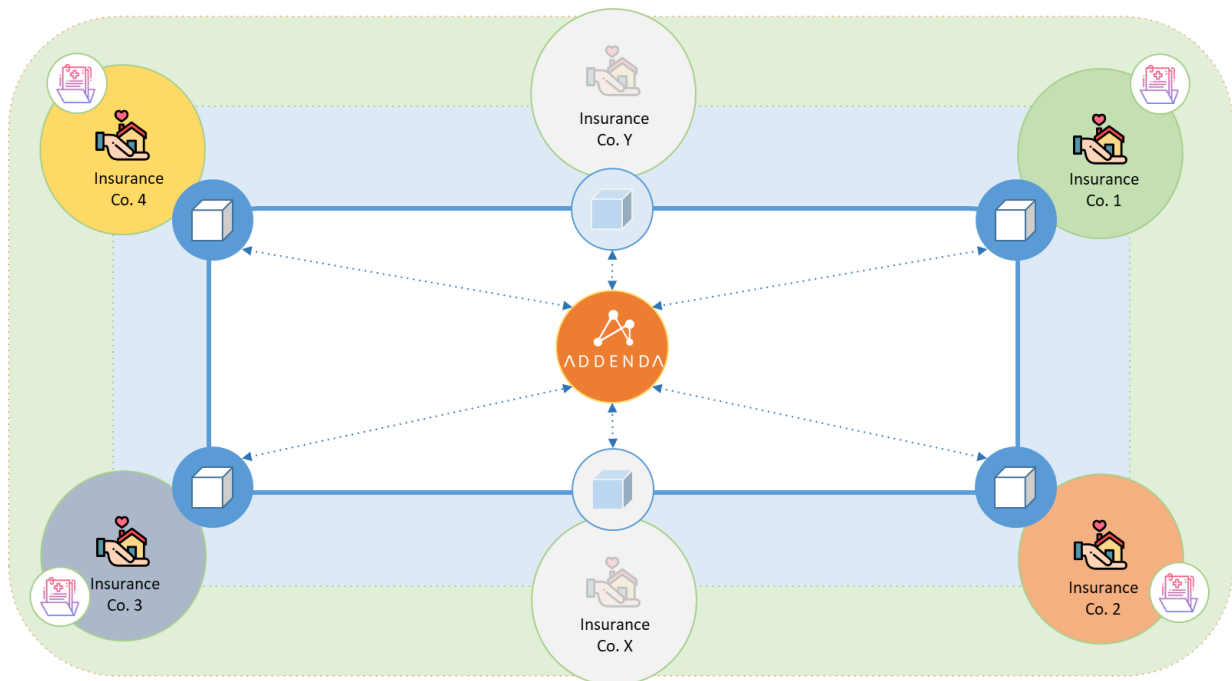

Figure 2 Life insurance consortium example

4.2   Smart contracts

Smart contracts are digital functions that a blockchain ecosystem and its transactions must adhere to. On an enterprise-grade blockchain, a smart contract is a set of rules that all parties within this blockchain have consented to, leading it to set the standard for what is a permissible or inacceptable transaction.

The term was initially coined by Nick Szabo in a 1997 paper titled "Formalizing and securing relationships on public networks"[4], in an effort to transform legal principles, economic theory, and theories of reliable and secure protocols into automatable functions.

For insurance, a blockchain-based smart contract may act as a way to digitally facilitate, verify, or enforce the functions of a policy and whether a claim would be accepted or rejected. If combined with internet of things (IoT), smart contracts could therefore be used to automate certain processes such as triggering transactions when an insured package arrives somewhere, or when a flight is delayed beyond a certain time frame. Once triggered, the transaction changes the state of the asset (i.e.: a flight is confirmed as delayed) thereby automatically paying the policyholder, and notifying the insurer in real time. Smart contracts therefore allow the authentication of transactions without third party intermediaries to confirm their validity. Similar to financial transactions of digital currencies on the blockchain, smart contract transactions are "baked" into the blockchain, leading them to be trackable and irreversible.

4.3   Public vs. permissioned Blockchain

Although it is commonly lumped as the same thing, there is a very large distinction between private (and permissioned) blockchain technology versus public blockchain technology.

First, we'll discuss the similarities between public and private blockchains:

a. They both are peer-to-peer networks that depend on decentralization of information where each node has the same up-to-date ledger acting as a single point of truth.

b. A consensus protocol is required to verify the authenticity of transactions appended to the abovementioned single point of truth.

c. Both operate on the principal of immutability: records logged on the blockchain cannot be altered by nefarious users and data ownership can be proven with cryptographical certainty.

Public blockchains are completely transparent and were made popular by cryptocurrencies such as bitcoin. Transactions can all be traced back to the genesis block (the first block of a blockchain) for all to see by using a block explorer. Anybody can download the opensource code required to operate a node and download the entirety of the latest synchronized blockchain onto their computer. It is also usually possible for people to "mine" new blocks and receive coins as an incentivizing mechanism to maintain the integrity of the network.

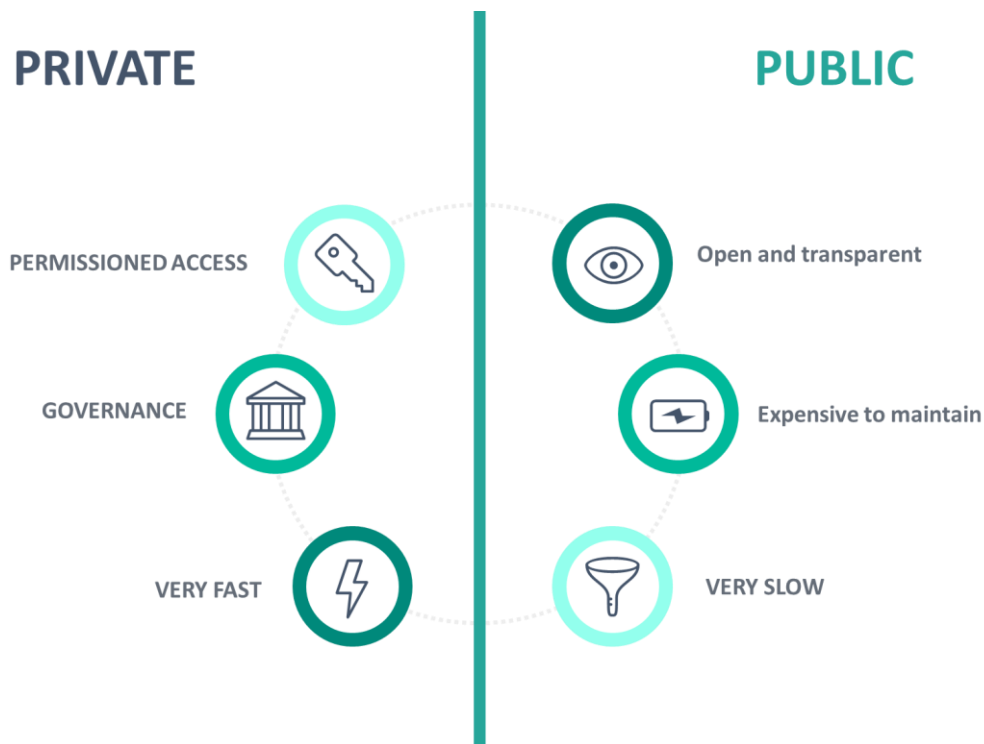[4] Formalizing and securing relationships on public networks – Nick Szabo, 1997

Figure 3 The difference between private and public blockchains

The consensus algorithm required for public blockchains varies for each coin or token, but the general process involves solving a complicated and resource-intensive cryptographic problem in a competition with the rest of the peers on the network to earn the reward of the next block in the form of coins.

The transparency of public blockchains can be viewed as a double edged sword: openness and transparency is great for ensuring that the ledger contains every transaction of a cryptocurrency for all to see, but would most likely not be of use to corporations that wish to maintain confidential customer data, for example.

Popular public blockchains include bitcoin, Ethereum, and Litecoin.
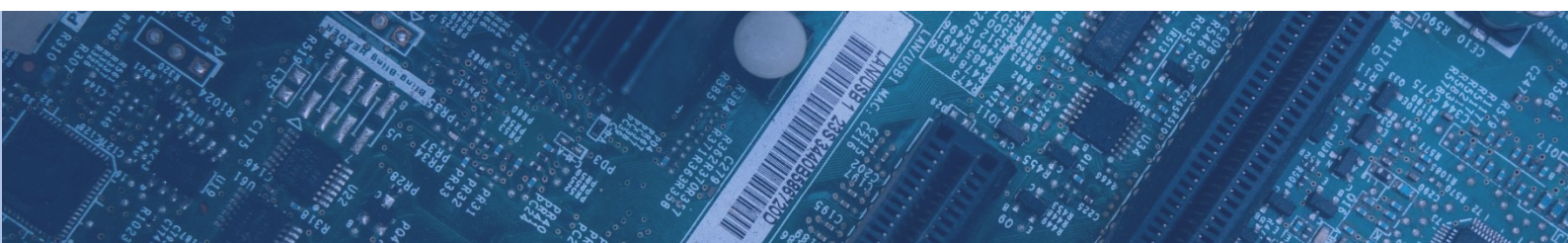
Private blockchains on the other hand require members or peers to be invited to participate. The consensus algorithms involved are also different than public blockchains in the sense that there is no need for "mining" or even having tokens altogether.

This is because the incentive for network participants is to log and receive genuine data, as opposed to public blockchains where the incentive for miners to maintain the network is to receive payment in the form of tokens, regardless of what is being transacted.

One of the main advantages of private blockchains is the ability to have a digital identity. This means that by using a permissioned network, all participants who change the state of any asset are known to the rest of the peers. Decisions for approving a transaction are pre-defined between the consortium members and there are different authority levels issued for each member, allowing certain transactions to be visible to some by choice, and inaccessible by others on the network without explicit permission.

Well known private and permissioned blockchain frameworks include Hyperledger, Corda, and Quorum.

5. BLOCKCHAIN USE CASES IN INSURANCE

As technology evolves in consumer facing applications all around us, insurers are beginning to find that consumer expectations of their offerings are higher and higher as well. With the insurance ecosystem becoming more competitive, it is only natural for insurers to become more consumer-centric in their approach towards transforming their existing business models. Another angle insurers are more interested in these days is task automation, which reduces overheads and allows for less human error in claim processing and policy onboarding.

Luckily, distributed ledger technology can be used throughout the entire insurance value chain across many segments by reducing duplication of processes, and increasing process automation, while still maintaining secure transactions on the network.

5.1   Health insurance

34%	20%	$1Bn
Health insurance	**Compound annual growth rate**	**Cost of medical fraud**
% of insurance market	Highest segment in GCC	Per year in the UAE

While blockchain enthusiasts imagine the future to be one where hospitals, physicians, lab vendors and insurers are all interconnected on one chain, resulting in a dynamic flow of health information policy underwriting and claim handling, we may still be a few years away from that. We have instead conceptualized possible blockchain use cases that relate to the health sector with a core focus on the UAE market.

To better visualize the abovementioned solution, it's important to understand the current regulatory auditing framework for tracking medication inventories in pharmacies across the country. The steps are shown below:
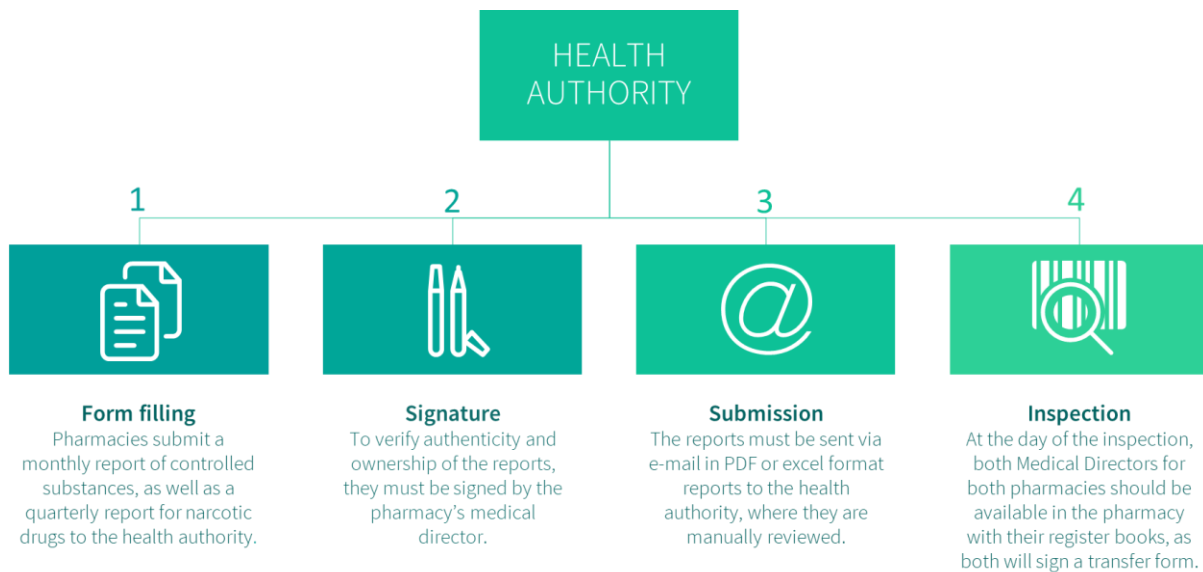

Figure 4 Existing narcotic auditing process

The existing process is inefficient because data is stored in isolated silos within each entity (pharmacy inventory system/electronic claims/regulators/insurers). Availability of drug prescription is not shared in real time with the regulatory bodies.

Pharmacies today are required to manually submit spreadsheets of their narcotics inventory in monthly and quarterly reports which are then audited by the regulator. This redundant process is inefficient at best and leads both sides to incur significant overhead costs that could otherwise be avoided with a blockchain solution.

- **So how does this issue affect insurers?**

Well, most health insurance policies require the issuance of generic medication if a prescription is provided, and only allow policyholders to purchase branded medication if a) the generic medication is unavailable; or b) if the policyholder pays the difference in price between the generic and branded medication.

Obviously, a pharmacy profits more by selling the branded medication, so in today's world, concise form filling of narcotics inventory depends greatly on honesty of the pharmacy issuing the medication to the policyholder.

- **What is the proposed solution?**

The use case below shows how regulatory bodies, narcotic distributors, pharmacies, and insurance companies can track consumption and purchase of branded medication as opposed to generic medication:
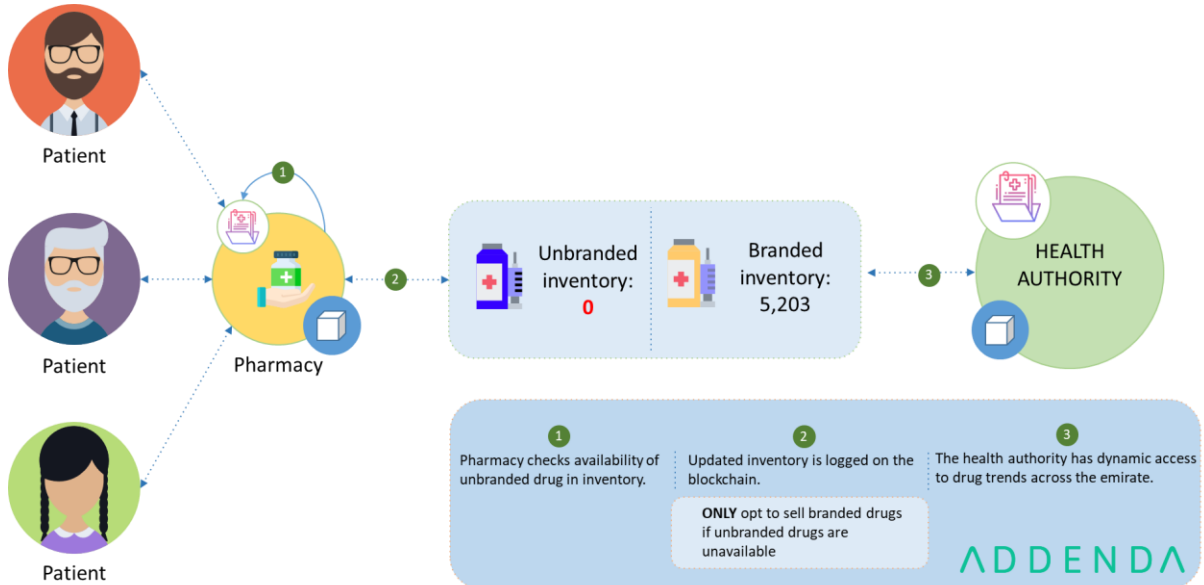

Figure 5 Transparent and digitized drug auditing on the blockchain

The above solution results in digitization and automation being built into the system. The data logged is provably concise: historical information for inventory of branded and generic medication is available on-chain for regulators as and when pharmacies run out of unbranded medication.

5.2   Motor insurance

Although the second largest insurance segment after health insurance, motor insurance claim handling is heavily manual, especially with insurer-to-insurer subrogation within in the UAE.

The manual nature of motor insurance claim handling leads to high overheads in the form of redundant work, omissions and typos, and miscommunication. Today, data is stored in independent databases within each entity – from agent to repair shop to insurer. Having discussed this matter with several insurers, we found that when data *is* shared, it is either by courier or email.

By collaborating together, motor insurers along with brokers and aggregators can form a consortium where the focus is on simplifying the process for onboarding policyholders.

The scenario would be as follows: insurers already have access to their own policyholder data and claim records. By sharing this data within specific parameters on the blockchain, a policyholder no longer needs to obtain a no claim certificate. There is no loss for the

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previous insurer as the policyholder was going to change their insurance company anyway, and if anything, it reduces any overhead needed by automating that process.

While this process is not a major one in the grand scheme of all things motor insurance, we have found that insurers were more keen to test out simpler PoCs with minimal ripple effects as opposed to reinventing the wheel using the blockchain.

Incremental changes such as the above can pave the way to fully-fledged blockchain-based platforms where insurance policies can be purchased, claim loss ratios can be calculated, and vehicle damage can be authenticated.
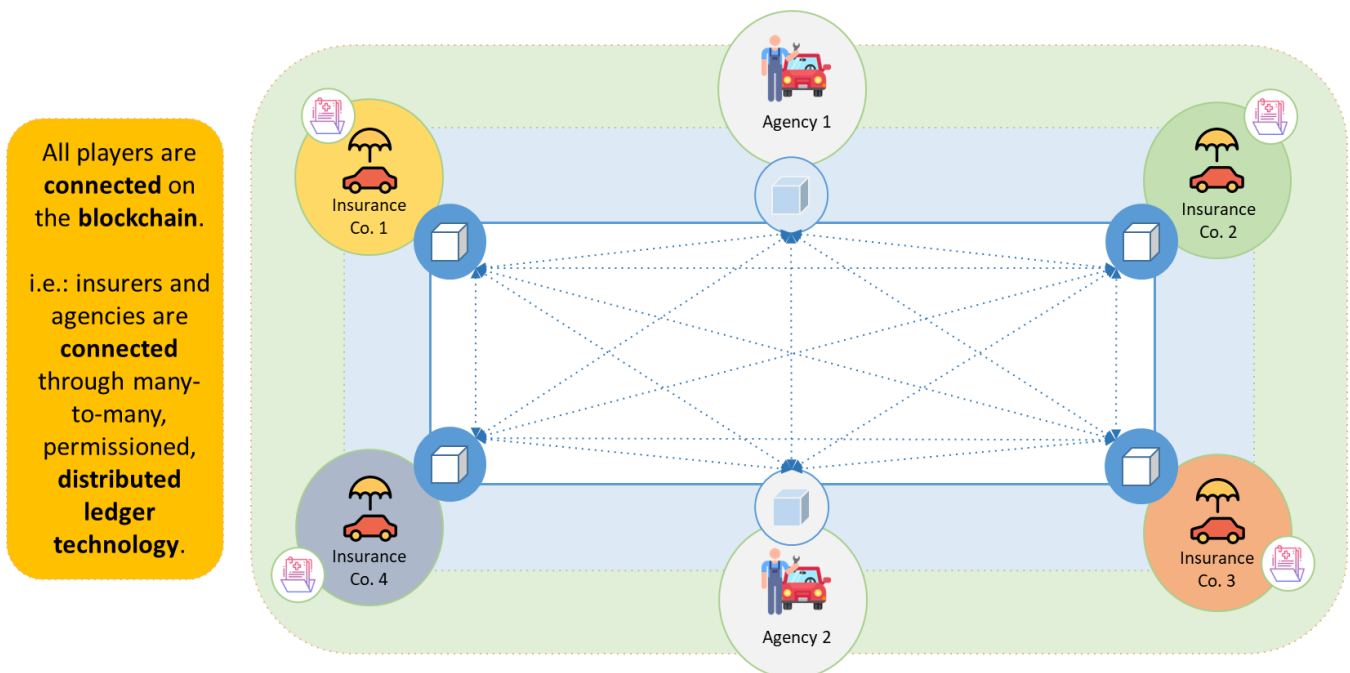

Figure 6 The proposed motor insurance blockchain ecosystem

5.3   Life insurance

The UAE's life insurance market is projected to grow due to the rising expatriate population, growing urbanization and risk awareness. The UAE's life insurance market has 13.9% CAGR, which is higher than anywhere else in the Middle East.

While life insurance penetration is only 0.7% of the UAE's population, this number is more than double what it was in 2011. In fact, the life insurance market is estimated to be worth USD $ 18.1 billion by 2021[5]. Life insurance in the Middle East has previously had very low traction due to the fact that it was often considered as "haram". With life insurance packages being developed by leading Takaful Insurance companies, there is great potential for it to pick up pace.

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[5] GCC Insurance Industry 2017 – Alpen Capital

Finalizing life insurance claims today puts a lot of pressure on the beneficiaries of the deceased policyholder. Death certificate applicants need to physically visit multiple entities to obtain certificates or approvals due to the fact that data within each entity is stored independently and needs to be verified at every step.

The manual nature of obtaining a death certificate means that certain documents need to be printed and submitted to different entities at multiple stages throughout the death certification process.

Below is the simplified version of what is needed for a deceased policyholder's beneficiaries just to prove his death for an insurer:
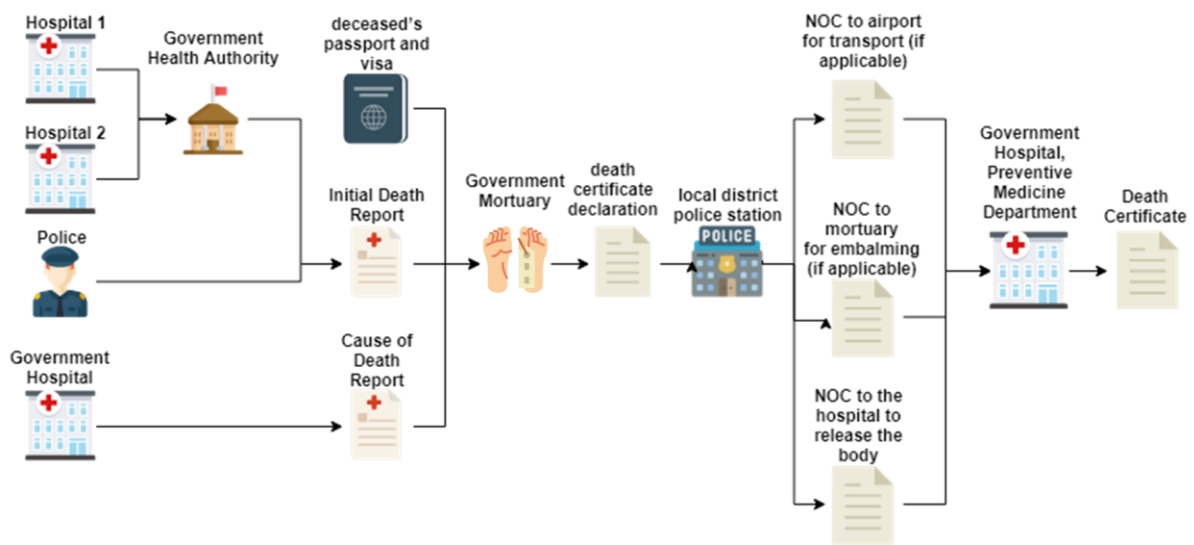

Figure 7 Obtaining and authenticating a death certificate.

Blockchain is a perfect solution for this issue. Using a shared platform with permissioned blockchain immutability allows the entities to share provably authentic data with and only with relevant parties. For added security, sensitive data can be encrypted before being submitted into the shared ledger.
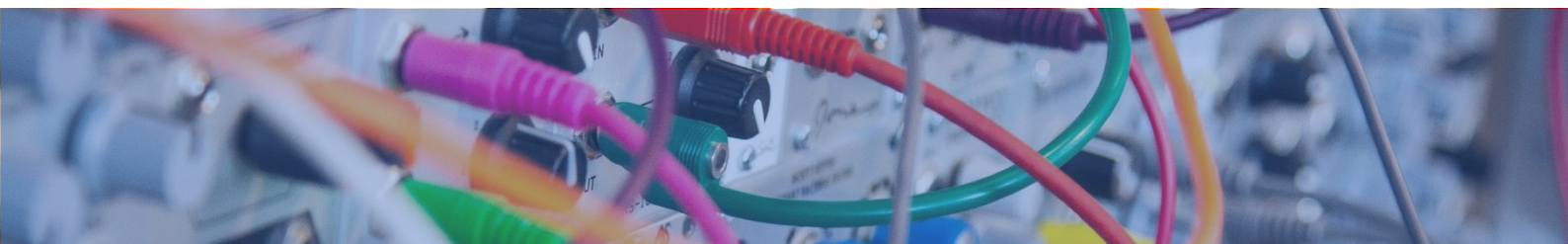
Most importantly, life insurance beneficiaries no longer have to go through volumes of manual work to a death certificate, allowing them to grieve instead.

From a regulatory standpoint, the insurance authority can enforce such a platform to initiate the life insurance claim automatically from the insurer to beneficiaries as most of the required documents would already be logged on-chain.

6. CHALLENGES

Regulatory bodies have always struggled to keep up with disruptive technologies, and dealing with blockchain is no different. In today's world, agreements through smart contracts on a blockchain network are not necessarily legally binding as there is no governmental infrastructure supporting such a notion yet.

Some of the use cases mentioned above bypasses the need for human oversight and manual regulation, which may not necessarily be what governments are looking for. In other words, the original advantage of negating the need for supervision may also be what pushes regulators away from blockchain.

As part of effective change management and digital transformation, the transition from the current ecosystem to one that is regulated via smart contracts on the blockchain may need to be slow and gradual, which is why we see a lot of startups and corporate giants today stuck in PoC limbo. They all have the same question: We've developed the basic framework needed for this technology, but what now?

At the end of the day, understanding the core principal behind blockchain is not rocket science. At its core, the technology is an accounting ledger that is shared by many people with varying and often conflicting interests.

Because of it being distributed across all these players, blockchain may have a disadvantage against existing centralized systems in terms of how many transactions can be processed per second, although this is something that is currently being worked on by several of the large private blockchain developers.

Below are key problems that any industry is facing when they wish to move ahead with blockchain technology.

| UNTESTED AND YOUNG	STEEP LEARNING CURVE	COOPERATIVE NETWORK NEEDED	HUMAN ERROR REMAINS

Human error plays a significant part here. There is a large misconception that blockchain technology may become the arbiter of truth, which is not really the case. The farthest blockchain can go is authenticate the data being transmitted based on certain logic protocols set by smart contracts, and confirm the identity of the person sending that data. The old adage of "garbage in; garbage out" applies to blockchain the same way it applies to any other data-related technology.

While there is no doubt that blockchain will play a huge role in the upcoming industrial revolution, its important to manage expectations. Enterprise-grade blockchain is still very young and will need years to be a better alternative to existing systems.

7. CONCLUSION
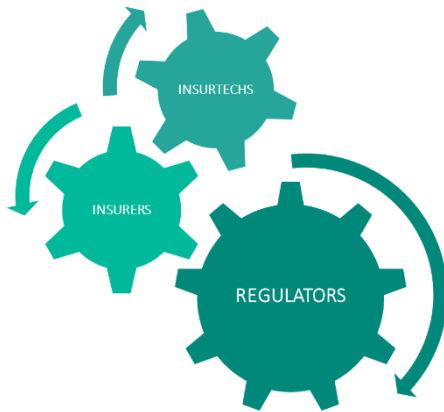
The challenges mentioned in the previous pages are not meant to deter startups and more mature companies from working together on developing great blockchain ecosystems. These challenges merely constitute road blocks along the path to conquering the vast virgin market of InsurTech in the UAE. If the right team lucks out and has the first mover advantage, they stand to make a huge return on investment.

Regulators, startups, and insurers need to work together to build the foundations for the future of blockchain collaboratively to reap its rewards.

At the end of the day, the risk of doing nothing is greater than the risk of doing the wrong thing. Blockchain is slowly exiting its experimental stage and evolving into a technology that can be dependable in insurance.

Smart contract-based claim resolution

Significantly reduce operational costs

Improved fraud detection

Better record keeping

According to PWC's global FinTech survey, 22% of insurance, asset and wealth management business is at risk to disruption from FinTechs[6]. Insurers were considered to be the most at-risk out of the survey. For an industry that is so risk averse, insurers have been investing heavily into InsurTech startups, and cumulative funding of InsurTechs since 2010 has almost reached USD $4 billion[7].

The main body of this report gave a high level concept on several use cases that warrant further review from both insurers and regulators in the UAE. Given the complexity of insurance, the market may need to move on from a competitive approach towards a more collaborative one. The question is: who will be the first to move?

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[6] Blockchain in the insurance sector – PwC, 2016
[7] Based on data from PwC's DeNovo platform

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ABOUT ADDENDA

Addenda Technologies LTD is a registered company working in FinTech Hive, DIFC. We are a team of three who are passionate about blockchain and insurance, and our aim is to bring trust back to an industry that was founded on it.

Our startup utilizes the blockchain to share life insurance information among a consortium of insurers. We have built a prototype from scratch that helps life insurers avoid anti selection, non-disclosure, overexposure, and ensures transparency between the policy applicant and the life insurance company.

The team

Karim Davis Dib
Co-Founder and Business Lead

Walid Daniel Dib
Co-Founder and Project Lead

Harsh Ajmera
Tech Lead

An industrial engineer by profession, Karim started his career as a liaison engineer for engineering consultancy CH2M. Using his engineering knowledge, he soon found himself working as the head of operations for TMS, a traffic management startup in Qatar.

Originally an environmental engineer and certified insurance loss adjuster, Walid has also dedicated most of his free time since 2012 to learning about decentralized technologies. While working in the Insurance industry, he was also researching cryptocurrency for Cointelegraph and Bitcoin Magazine.

Harsh has been coding away for more than 7 years. He's worked on several blockchain proof of concepts from a flight delay smart contract to an avocado supply chain tracker. Harsh has an MBA in IT and worked on Python, shell scripts, PHP and JavaScript. He also codes in Ethereum's Solidity and is a certified Hyperledger Fabric developer.

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