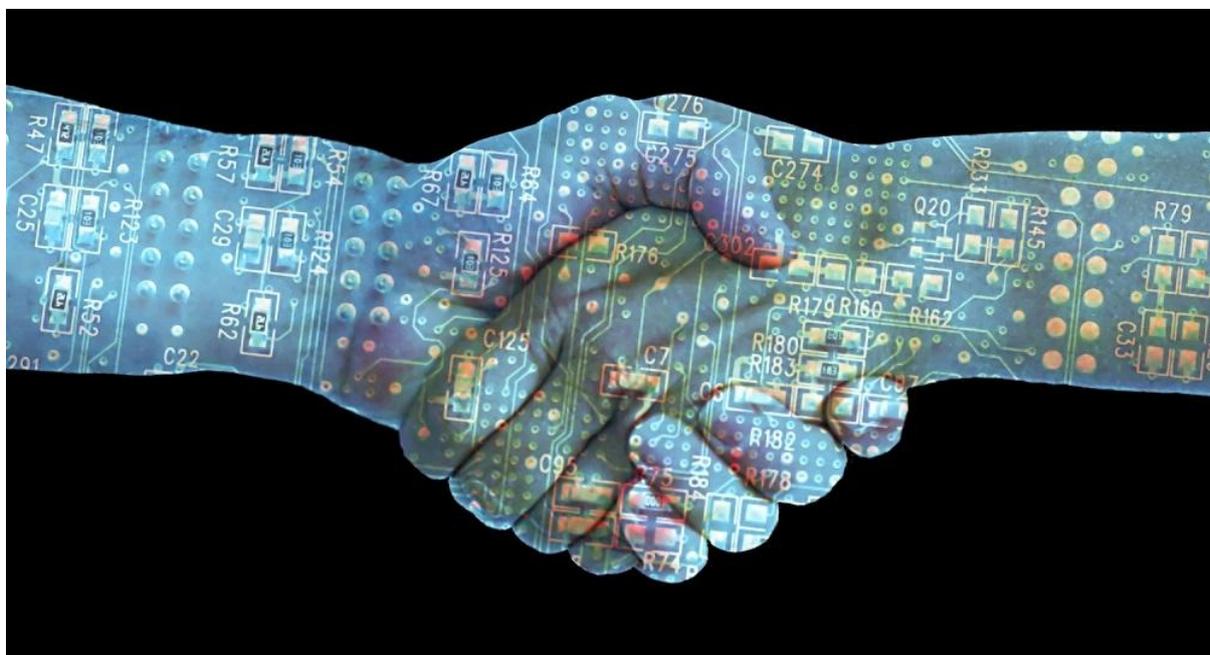




State of blockchain: tokenizing the states?

How can the secure, distributed, transparent and cost effective blockchain technology can be used for enabling of smart governments and bring trust to the public sector?



The [InnMind](#) review of the current initiatives of implementation of blockchain technologies in the industry and public sector.

Abstract

The blockchain technology has recently emerged as a disruptive innovation with a wide range of applications in the financial, industrial, supply chain, government and many other sectors. It attracts the public attention worldwide, becoming the major focus of interest of media, investment institutions, innovative hubs, financial organisations and even governments. In early August, the World Economic Forum declared that blockchain will become “the beating heart” of the financial industry.

However, since the Bitcoin appeared on the global scene in 2009, the major point of attention has been in the cryptocurrency (or FinTech) field, which is only a fraction of the potential of blockchain technology.

Meanwhile the secure, distributed, transparent database technology can be used for enabling of smart governments and bringing more trust to the public sector. As it is stated in the new article “The truth about blockchain” (*M Lansiti, KR Lakhani*), published in Harward Business Review, “*Blockchain could dramatically reduce the cost of transactions. It has the potential to become the system of record for all transactions. If that happens, the economy will once again undergo a radical shift as new, blockchain-based sources of influence and control emerge*”.

In its newest report the global innovative network [InnMind](#) is trying to look beyond the fintech/currency segment, exploring and investigating the innovation potential of the blockchain technology in the industrial and government sector.

What is blockchain?

In a white paper published in November 2008, Satoshi Nakamoto proposed Bitcoin as the first electronic payment system based on a decentralized peer-to-peer network, without the need for a trusted third party. The core technology of this protocol, the blockchain, is widely acknowledged as a major breakthrough in fault-tolerant distributed computing, after decades of research in this field. In overly concise terms, we can define the blockchain as a database that contains all the transactions ever executed in the Bitcoin network. It consists of a permanent, distributed, digital ledger, resistant to tampering and carried out collectively by all the nodes of the system. The formidable innovation introduced by this technology is that the network is open and participants do not need to know or trust each other to interact: the electronic transactions can be automatically verified and recorded by the nodes of the network through cryptographic algorithms, without human intervention, central authority, point of control or third party (e.g. governments, banks, financial institutions or other organizations). Even if some nodes are unreliable, dishonest or malicious, the network is able to correctly verify the transactions and protect the ledger from tampering through a mathematical mechanism called proof-of-work, which makes human intervention or controlling authority unnecessary.

Applications of blockchain technologies beyond the crypto currencies

Documents verification / Notary

Verifying the authenticity of a document can be done using blockchain and eliminates the need for a centralized authority. A document certification service helps bring Proof of Ownership (who authored it), Proof of Existence (at a certain time) and Proof of Integrity (not tampered with) of the documents. Since it is counterfeit-proof and can be verified by independent third parties automatically, these services can be legally binding. Using blockchain for notarization secures the privacy of the document as well as those who seek certification.

By publishing proof of publication using cryptographic hashes of files into blockchain takes the notary timestamping to a new level.

Using blockchain technology also eliminates the need for expensive notarization fees and ineffective ways of transferring documents.

Here are some examples of interesting startups, which already use open protocol for variety of notary services:

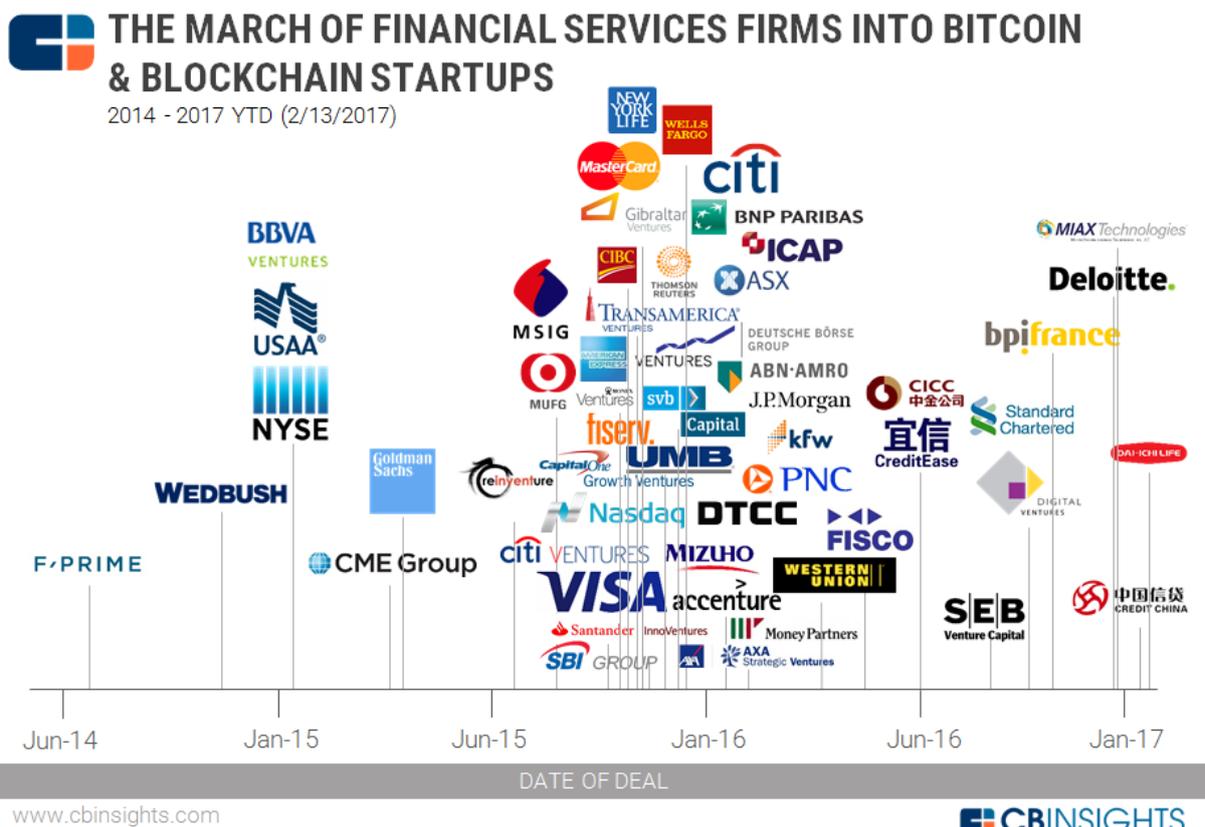
- Stampery is a company which can stamp email or any files using blockchain. It simplifies certifying of emails by just emailing them to an email specifically created for each customer. Law firms are using Stampery's technology for a very cost effective way to certify documents.
- Viacoin is one of the companies which uses clearinghouse protocol for notary service.
- Block Notary is an iOS app which helps you create proof of existence of any content (photo, files, any media) using TestNet3 or a Bitcoin network.
- Crypto Public Notary uses Blockchain of Bitcoin to notarize documents by using trivial amount of bitcoins to record the file's checksum in a public blockchain.

Intellectual property

- Such systems generally rely on the blockchain to store the hash of a document, together with its timestamp, in order to prove its existence and authorship (<http://proofofexistence.com>, <http://virtual-notary.org>).
- Ascribe is a company which does authorship certification using blockchain. It also offers transfer of ownership service with attribution to the original author.
- Such platforms as Monegraph and Ujomusic also allow authors to license their work and to receive automatic payments, triggered by smart contracts, when others access it (<http://monegraph.com>, <http://ujomusic.com>).

Insurance

The insurance sector recently showed a high interest for blockchain. Large companies made significant investments to explore its potentialities for their business, while consultancy firms investigated its applicability to the insurance sector.



As it was stated in the report by CBInsights, «From American Express to Goldman Sachs to Deloitte, major firms across the financial services landscape have made investments in bitcoin and blockchain startups. And the financial services investments have continued into 2017... In total, over 50 financial services firms or their strategic investment arms have invested in a bitcoin or blockchain-specific startup since the start of 2014».

Assets which can be uniquely identified by one or more identifiers that are difficult to destroy or replicate can be registered in a blockchain. This can be used to verify ownership of an asset and also trace the transaction history. Any property (physical or digital such as real estate, automobiles, physical assets, laptops, other valuables) can potentially be registered in a blockchain and the ownership, transaction history can be validated by anyone, including insurers.

[Everledger](#) is a company which creates permanent ledger of diamond certification and the transaction history of the diamond using blockchain. They collect an asset's defining characteristics, history, and ownership to create a permanent record on the blockchain. The verification of diamonds can be done by insurance companies, law enforcement agencies, owners and claimants. Everledger provides a simple to use web service API for looking at a diamond, and create, read or update claims by insurance companies, and to the same for police reports on diamonds.

[Blockverify](#) provides the blockchain-based solution to trace and locate goods along the supply chain. They work directly with manufacturers in the fields of luxury goods, diamonds and electronics industry to build a system of verifying goods and provide quality assurance for all parties.

[Dynamis](#) is a smart contract for peer to peer insurance running on the Ethereum platform. It provides supplementary unemployment insurance by using the LinkedIn social network as a reputation system. Applicants for a new policy can use LinkedIn to verify their identity and employment status. Claimants can use their LinkedIn connections to validate that they are looking for work.

Another example is delay insurance, where smart contracts could automatically refund travellers when their flight/train has been delayed. [InsurETH](#) lets you insure your flight directly with an ethereum smart contract. The contract is resolved automatically on the Ethereum blockchain.

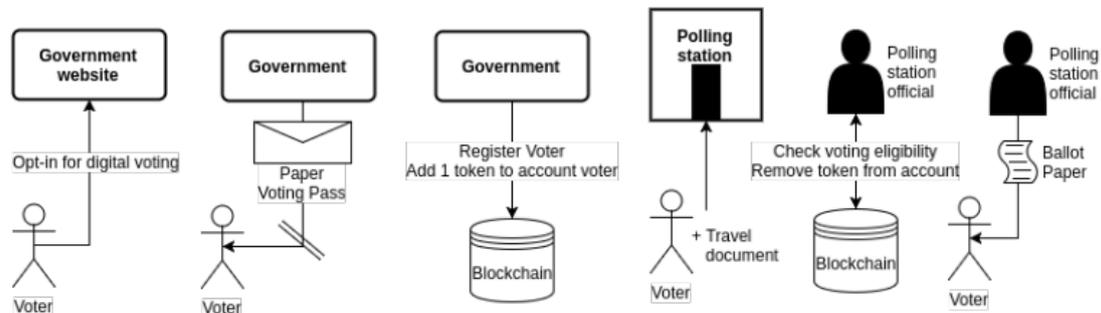
Government

There is a strong believe that blockchain based voting systems are able to deliver society a trustworthy voting mechanism capable of increasing transparency in an election's process, and in consequence enhancing voter confidence. Follow My Vote, VoteWatcher, Australia's Postal service, Ballotchain and BitCongress are some of the most prominent projects that already implement Blockchain as a core piece of their technology stack.

The blockchain could be used for gathering, in a transparent and publicly verifiable way, citizens' votes <http://www.reply.eu/en/content/ballotchain>. For example, Ballotchain tries to match a Bitcoin transaction to a vote cast by an elector in support of the candidate selected by the voter. Every vote therefore benefits from the characteristics of a Blockchain transaction, namely: It is non-modifiable; It is non-repudiable; It cannot be registered in

multiple ways; All nodes possess a valid copy. Votes could be casted on any device still maintaining the guarantees of anonymity, uniqueness and unchangeability.

The figure below demonstrates an example of implementation of blockchain technology in the Dutch electoral voting system (Report “[Digital Voting Pass: One step towards the digitalization of the entire voting process](#)”)



One of the mentioned initiatives to implement blockchain voting is [FollowMyVote](#). FollowMyVote envisions that they “want every voter to have faith in the democratic process, trust in their government, and feel like their voice matters.” It proposes a voting platform that exists entirely online. In this system, a voter would cast their ballot via a downloaded application.

United States law requires valid identification in order to vote in public elections. Therefore, the voter would submit their relevant identification to the application to verify their identity as a United States citizen. The voter would have the option to print a receipt of their transaction and ultimately to audit the ballots cast. An additional feature of the FollowMyVote platform is the ability for a voter to vote early and modify their vote should they change their mind in the days leading up to the election.

Another example second of currently proposed blockchain voting platform is called [BitCongress](#). BitCongress gives a nod to Bitcoin in the introduction of their proposal, acknowledging that “The advantages of this system shows how a peer to peer system running a decentralized node network can become the most powerful computer network on the planet in under a decade.” BitCongress relies on the amalgamation of four existing platforms: Bitcoin, Smart Contracts, Counterparty and Blockchain technology.

Like FollowMyVote, BitCongress proposes a system in which every vote is hashed into the blockchain. However, in some ways, BitCongress looks to extend its impact beyond just a voting system, describing the platform as tool for governance and legislation, and stating that they hope to re-structure the governing bodies that use the platform.

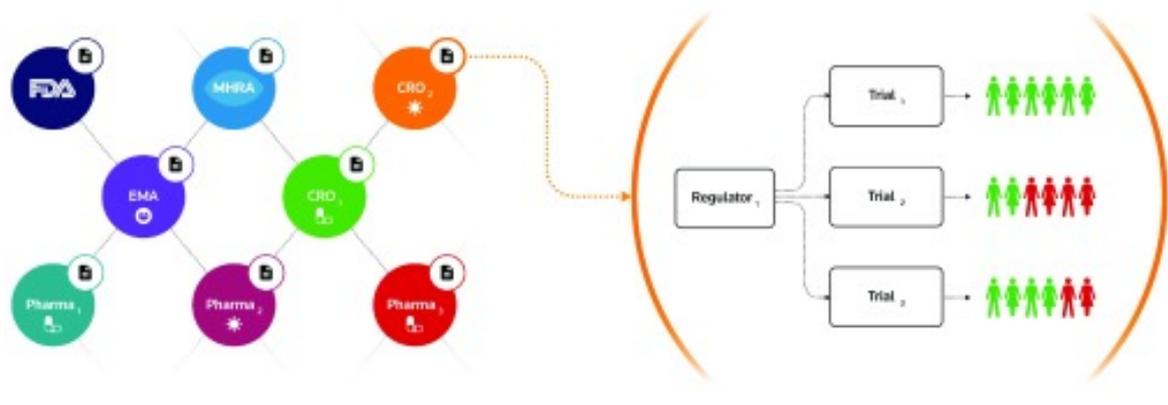
The BitCongress platform centers on the integration of an application called AXIOMITY. AXIOMITY is the BitCongress wallet that allows users to participate in every aspect of the democratic process. While FollowMyVote uses EEC to generate private keys, BitCongress

utilizes individual tokens, called VOTE tokens. These tokens are used to vote for candidates and legislation, and are returned to the individual when the election has ended, limiting unnecessary inflation of private tokens.

Healthcare

In the healthcare sector, for example, blockchain-based solutions are used to collect vital data and location information and eventually send an alert in case of danger. The advantage of relying on the blockchain is a guarantee that the system would not stop working.

Case: [Improving data transparency in clinical trials using blockchain smart contracts](#)



A private blockchain network consisting of regulators, pharma and contract research organisations.

The system is composed of a hierarchical arrangement of two core types of smart contract - regulator contracts and trial contracts - with subjects and their associated clinical measurements appended to a container within the trial contract. The logic within the trial contract effectively enforces aspects of the trial protocol, ensuring that neither subjects nor measurements are appended outside of the predetermined trial timelines, while the tamper resistant characteristics of the blockchain prevent data manipulation.

Sources:

1. A cautionary tale of blockchain standards
https://works.bepress.com/tyrone_berger/26/
2. Blockchain technology and decentralized governance: Is the state still necessary?
<https://ssrn.com/abstract=2709713>
3. BLOCKCHAIN FOR DEVELOPMENT – HOPE OR HYPE?
<https://opendocs.ids.ac.uk/opendocs/ds2/stream/#/documents/3516211/page/1>
4. Blockchain technology: Beyond bitcoin <http://scet.berkeley.edu/wp-content/uploads/AIR-2016-Blockchain.pdf>
5. The truth about blockchain
https://enterpriseproject.com/sites/default/files/the_truth_about_blockchain.pdf
6. Blockchain or not blockchain, that is the question of the insurance and other sectors
<http://ieeexplore.ieee.org/abstract/document/7950836/>
7. A review of existing and emerging digital technologies to combat the global trade in fake medicines <http://dx.doi.org/10.1080/14740338.2017.1313227>
8. Beyond bitcoin enabling smart government using blockchain technology
9. Regulatory issues in blockchain technology (P Yeoh, <http://dx.doi.org/10.1108/JFRC-08-2016-0068>)
10. A Block-Chain Implemented Voting System: The Benefits and Risks of Block-Chain Voting <http://www.cs.tufts.edu/comp/116/archive/fall2016/fcaiazzo.pdf>
11. Blockchain Voting and its effects on Election Transparency and Voter Confidence (Teogenes Moura; Alexandre Gomes)
12. Digital Voting Pass: One step towards the digitalization of the entire voting process <https://repository.tudelft.nl/islandora/object/uuid:4d2f0eb6-d94d-426d-9152-e3df75f26b8d?collection=education>
13. The March Of Financial Services Giants Into Bitcoin And Blockchain Startups In One Chart <https://www.cbinsights.com/research/financial-services-corporate-blockchain-investments>