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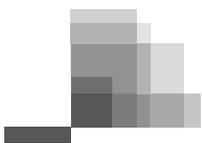


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# *Opinion paper Blockchain*

## **Five propositions to transform the financial services sector**

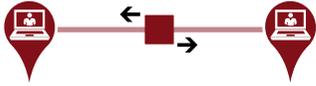
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**pwc**



Worldwide almost 400 billion transactions are made every year.



### Without Blockchain



We need intermediaries like banks to govern, execute and validate transactions.



These intermediaries record the trades in ledgers which are often closed to the public.

### With Blockchain



Blockchain is based on a peer-to-peer network of computers which maintain a collective online bookkeeping.

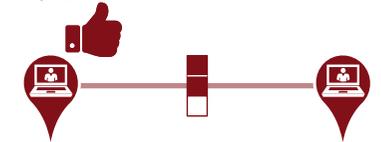


Each participant owns a copy of the same ledger. This is called a “distributed ledger” where all transactions within the network are recorded.

**1.** Within this network participants request a transaction with each other allowing the transfer of value (e.g. cryptocurrencies like Bitcoin) or data.



**2.** The transaction is authorised by other participants of the network.



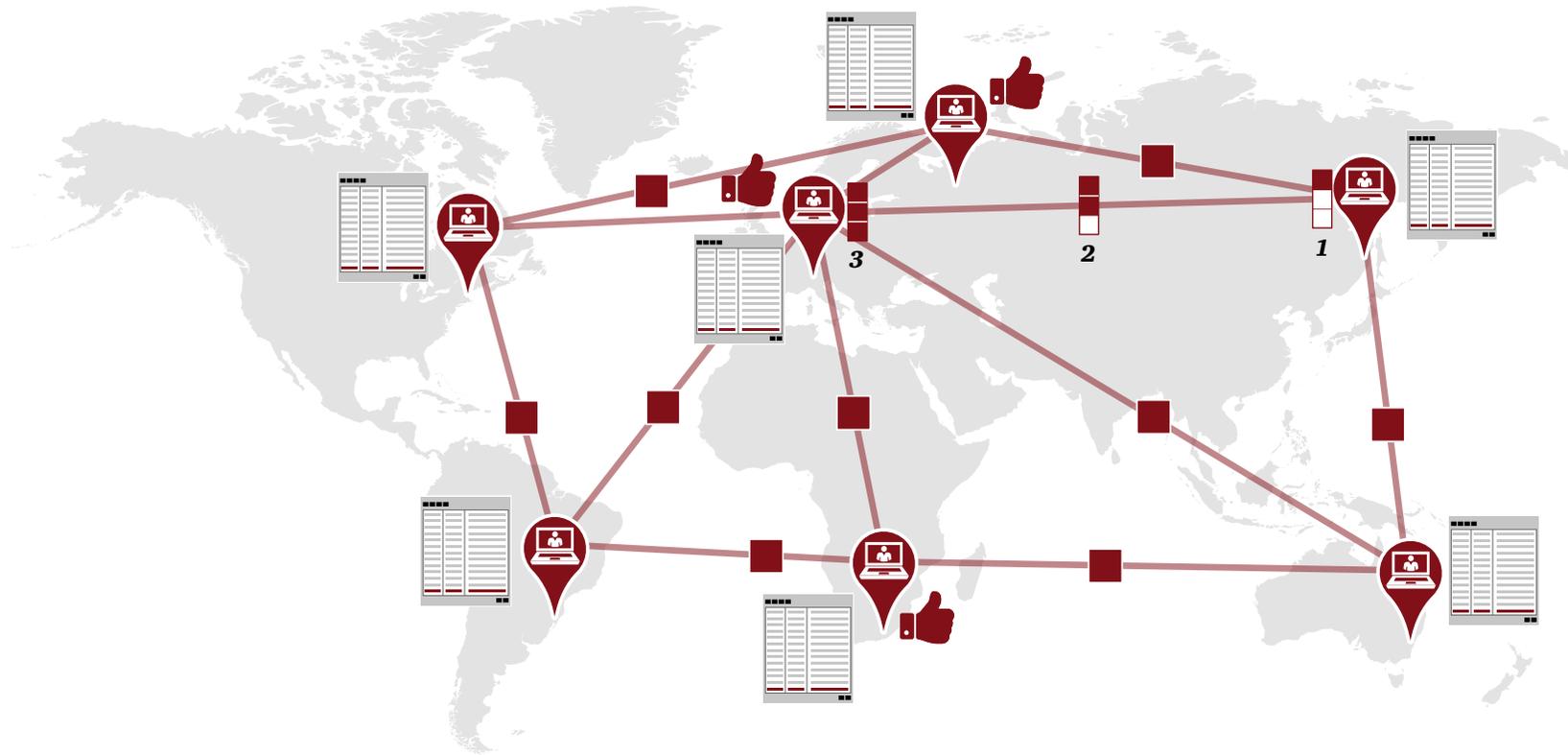
They review past transactions to conduct authorisation based on an algorithm or consensus verification.

**3.** Upon authorisation value and assets change ownership on the network.



The entire transaction including value and assets ownership are then cryptographically recorded in a data block. The new data block is added to a chain of already registered data blocks – the Blockchain. The transaction is thereby permanently recorded in the distributed ledger.

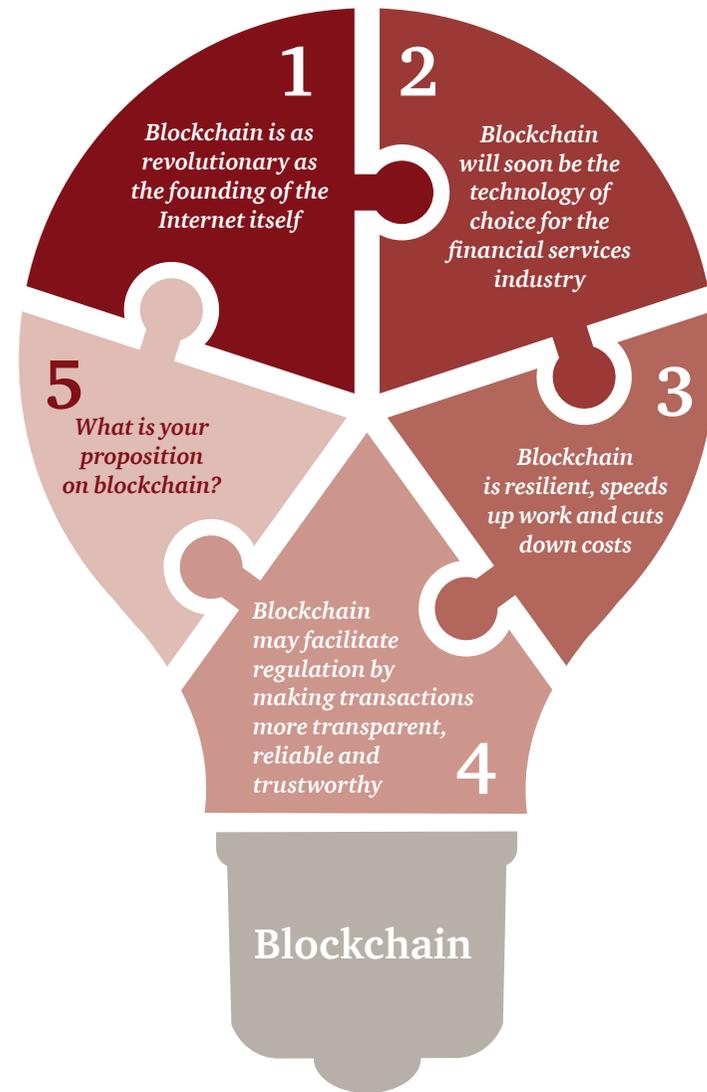
# How Blockchain works



# Five propositions to transform the financial services sector

It's been seven years since Bitcoin first appeared in 2009, when the digital world suddenly saw a very new way of doing business and transactions online. And while digital observers looked carefully at Bitcoin, many moved swiftly over the technology that was making it all happen. That technology, blockchain, is now taking centre stage. It's a technology so powerful that it's now seen as the next major change for the Internet. It has the potential to radically transform business, especially financial services. Could blockchain even be the long-awaited stimulation the financial sector has been looking for?

We put forward five propositions to show decision-makers what the blockchain revolution is all about and to provide a platform for further discussion.



## Blockchain is as revolutionary as the founding of the Internet itself



Imagine this. You have a wonderful art collection and need to share a list of your art pieces with colleagues all over the world. The collection is always changing. You're buying new paintings, or letting others go. So how do all your curators and your partners know which art piece is where and at what time?

Or imagine that you have to keep track of, and list, millions of trades a day, linked to many banks all over the world. What if you could keep track of these securely, at a low cost and in real time?

The answer is blockchain. A technology so powerful it's proving to be as revolutionary as the advent of open-source software or the foundation of the Internet itself. The Internet of the 90s and 00s was revolutionary because it changed the way we searched for data and shared information in online communities. Blockchain now goes a step further, allowing us to share and trade virtually all types of data, including ownership certificates, real and digital values and even identity-linked information.

Put simply, the technology enables electronic distributed lists to be created, updated and coordinated all in near real-time.

It's revolutionary because data is held not just by one server, one company or one person, but is distributed across vast peer-to-peer networks of computers, which maintain and safeguard collective online bookkeeping. Each participant owns a copy of the same ledger. We call this a "distributed ledger", where all transaction activity within the network is recorded. When a transaction takes place, a number of computers around the network note this and compare and confirm each other's bookkeeping. All key information – such as sender, receiver, time, asset type, and quantity – about each transaction is stored with the transaction in an ongoing chain – the blockchain. Blockchain can give equal access to data to thousands of users. Computer algorithms encrypt and police the system, and quickly notice if something is different or wrong.

Blockchain may be best known for creating Bitcoin. And vice versa. But the hidden genius of Bitcoin is the underlying protocol-based technology that creates a network of ledgers. It's a peer-to-peer database, a continuously growing shared ledger of every virtual currency transaction occurring in the system.

Joichi Ito, head of MIT's Media Lab in Boston, believes blockchain will be as disruptive as the Internet, writing in a LinkedIn Post in January 2015 that:

*"[...] Most people didn't have the imagination to see how the Internet would fundamentally disrupt commerce and media, because Amazon, eBay and Google hadn't been invented – just email and Usenet-news. Similarly, I believe that Bitcoin is the first "killer app" of the blockchain as email was the killer app for the beginning of the Internet. My hunch is that the blockchain will be to banking, law and accountancy as The Internet was to media, commerce and advertising [...]."*<sup>1</sup>

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1 Joichi Ito (18 January 2015) «Why Bitcoin is and isn't like the Internet». <https://www.linkedin.com/pulse/why-bitcoin-isnt-like-internet-joichi-ito>

## Blockchain will soon be the technology of choice for the financial services industry



The significance of blockchain for the financial services industry is huge. In fact, there are now over forty banks and financial institutions working together worldwide to see how this technology can transform the way they do business, not just individually but together.

Major banks from the United States, Europe and Asia have joined a consortium set up by the financial services company R3 to test and validate distributed ledger prototypes. UBS's CEO Sergio Ermotti announced, too, at the World Economic Forum in January 2016 that the bank's technology lab in London was exploring new technologies, including blockchain.<sup>2</sup>

What is unfolding in the industry is a once-in-a-generation opportunity to transform transaction processing, reduce reconciliation, avoid identification and verification issues, do away with redundant and error-prone databases of sensitive information and address many more systemic challenges.

### The technology could help in many aspects of financial services, including:

- *Greater access to financial services in emerging economies.* Billions of people around the world lack access to banks, payment systems and currency exchange. Blockchain-based distributed ledgers could change this by providing network and infrastructure.
- *Improved bookkeeping.* Companies can use the distributed, internally verified, and nearly real-time ledger of transactions for bookkeeping, data mining and records verification.
- *More flexible reserves management.* Faster settlement and immediate notification would reduce the amount of cash and other collateral (e.g., gold) that a counterparty needs to hold to mitigate settlement risk.
- *Improvements in common business functions.* Management processes for accounts payable and receivable could be automated. And automated exchanges might take on some of the communications, settlement and clearing functions that networks such as the Society for Worldwide Interbank Financial Telecommunication (SWIFT), central banks and payment networks perform now.

<sup>2</sup> Swissinfo.ch (20 January 2016) «Big banks test blockchain-based trading system». [http://www.swissinfo.ch/eng/bank-technology\\_big-banks-test-blockchain-based-trading-system/41907068](http://www.swissinfo.ch/eng/bank-technology_big-banks-test-blockchain-based-trading-system/41907068)

The blockchain technology has real potential in the financial services industry. We see a variety of different functionalities and applications:



<b><i>Complex Applications, e.g., Smart Contracts</i></b>	<ul style="list-style-type: none"><li>• Pre-IPO trading</li><li>• Governance solutions</li><li>• Derivative investment products, incl. WM of illiquid assets</li></ul>
<b><i>Authentication &amp; ID Management</i></b>	<ul style="list-style-type: none"><li>• Onboarding, KYC, AML applications</li><li>• Unique identifiers and IDs</li><li>• Authentication of digital content and proof of ownership</li></ul>
<b><i>Registry &amp; Custody</i></b>	<ul style="list-style-type: none"><li>• Registry and storage for cryptocurrencies, securities, digital content, contracts, etc.</li><li>• Physical asset registries (real estate, yachts, art etc.)</li></ul>
<b><i>Privacy &amp; Security Solutions</i></b>	<ul style="list-style-type: none"><li>• Encryption and storage of sensitive data</li><li>• Secure digital vaults (offline, online)</li><li>• Multi-location safe storage systems</li></ul>
<b><i>Information &amp; Value Exchange</i></b>	<ul style="list-style-type: none"><li>• Payments, remittances, FX</li><li>• Trading of securities, commodities, rare goods, etc.</li><li>• Token systems for loyalty, HR, etc.</li><li>• Prediction markets</li></ul>
<b><i>Networks &amp; Infrastructure</i></b>	<ul style="list-style-type: none"><li>• Trading, clearing and settlement infrastructure</li><li>• Alternative payment networks</li><li>• Community management and corporate intranets</li></ul>

## Blockchain is resilient, speeds up work and cuts down costs



Blockchain is run as a network, with information and data held not just on one server, where it could easily get lost or destroyed. Instead, blockchain data is held over multiple servers and computers and automatically updated in near real-time. So if one or even many servers crash, the data is still safe and easily accessible, as there are multiple “live” ledgers still in operation. The network also becomes automatically more resilient as it grows and gathers more users. That’s because as more users join, they create more copies of the data and that in turn creates more potential backups.

Blockchain records, like any digital data, can be encrypted, meaning that only users with a decryption key are able to look inside. When a blockchain is set up, rules and protocols are created and access is granted. Moreover, the system can be public or private, open or closed. In other words, you can control who does or doesn’t see data. What’s more, the algorithms also notice when something unusual is happening in the network and close it off to a user that is acting out of sync

to the rest of the infrastructure. Again, this could be an early sign of an attempted hack, but the technological mechanism potentially spots it and shuts it down quickly and efficiently. The network infrastructure creates a well-backed system that self-checks and self-corrects when things aren’t right.

In theory, all this makes blockchains difficult to hack. For example, the Bitcoin blockchain is so large, it would take a very big and coordinated hacking effort to break in. Our team estimates it would require an enormous amount of funds to launch and coordinate a series of attacks in order to hack the required 51% of the blockchain network. Some experts even say it is virtually impossible due to network latency.

Near real-time data could help administrative staff to process bookkeeping data mining or records verification more quickly by having all the information nearly instantaneous in one place, rather than having to reconcile information across different computer systems.

With direct party-to-party settlement, there’s less need for trusted third-party network operators to keep centralised ledgers. That means blockchain’s technology could vastly reduce the number of intermediaries and the costs associated with them.<sup>3</sup>

3 PwC Strategy& (11 January 2016) «A Strategist’s Guide to Blockchain». <http://www.strategy-business.com/article/A-Strategists-Guide-to-Blockchain?gko=0d586>

## 4

## Blockchain may facilitate regulation by making transactions more transparent, reliable and trustworthy

At the moment, the use of blockchain is not yet publicly regulated. But the technology itself is a great tool to help with regulation.

Blockchains can be closed and private, protected by encryption. But if an auditor or a regulator wants to peek inside and monitor the flow of financial data, it would potentially be feasible to provide them with any required decryption keys and give them access to the network, leaving them free to explore and look into the data. As all key information about the transactions is stored in the distributed ledger and never deleted, regulators will be able to trace the history and context of any transaction.

This makes blockchain technology not just a transparent and reliable system for regulators but is also very useful for internal compliance from an organisation's point of view.

So how soon will it be before blockchain technology becomes regulated?

There have been some moves to control bitcoin, both in the United States and in Europe. In New York, the Department of Financial Services granted its first BitLicense to a Boston startup. A month later, in October 2015, the European Court of Justice ruled that Bitcoin is exempt from VAT.

But it's still very early days for any regulation of blockchain technology itself.

In the report by the UK Government's Chief Scientific Adviser in January 2016, there was a call for ministers to get involved with the security and standards of blockchain when it's used in government.<sup>4</sup>

In February 2016, the Financial Conduct Authority (FCA) in London spoke of the need to balance regulation versus giving innovators opportunities to create new services. The FCA has taken the route of working together with new start-ups and innovators so that both sides can learn the risks and benefits of the new emerging business models. What's more, the FCA has also set up a "regulatory sandbox" concept, where innovators can test new financial services without the usual regulatory consequences. So, reduced regulation to some degree, in return for information sharing<sup>5</sup>. This could be a notable approach for Swiss regulatory authorities and financial institutions as well.

The Bank of England, too, has recently announced that it will look into the distributed ledger technology for real-time settlement in monetary and financial systems. Quoting Nemat Shafik, the deputy governor:

*"It may reshape the mechanisms for making secured payments: instead of settlement occurring across the books of a single central authority (such as a central bank, clearing house or custodian), strong cryptographic and verification algorithms allow everyone in a DLT (Distributed Ledger Technology) network to have a copy of the ledger and give distributed authority for managing and updating that ledger to a much wider group of agents."*<sup>6</sup>

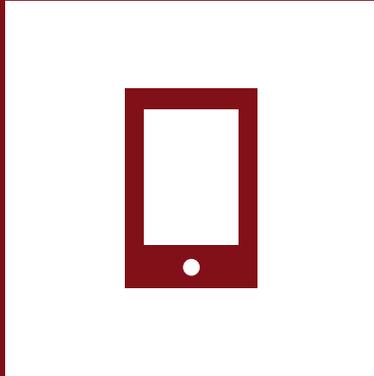
So perhaps for now, regulatory responsibility rests with industry consortiums themselves, as well as with the world's major banks, leading regulators and central banks. As banks research and develop their own blockchain technologies and use cases, regulators are defining the required regulatory frameworks to create secure platforms for the future of financial services.

<sup>4</sup> GOV.UK (January 2016) «Distributed Ledger Technology: beyond block chain». [www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/492972/gs-16-1-distributed-ledger-technology.pdf](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf)

<sup>5</sup> FCA (23 February 2016) «UK FinTech: Regulating for innovation». <https://www.fca.org.uk/news/uk-fintech-regulating-for-innovation>

<sup>6</sup> CoinDesk (28 January 2016) «Bank of England to Explore Distributed Ledger Tech for Settlement». <http://www.coindesk.com/bank-england-distributed-ledger-settlement>





# OUR CONCLUSION

The distributed ledger technology has gained momentum and financial services is just at the beginning of an industry-wide transformation. We believe that blockchain technology could be as transformational as the Internet itself or the protocols that led to today's World Wide Web.

The disruptive potential of eliminating financial market intermediates – combined with the ability to streamline network and transaction costs, free up capital and reduce market and regulatory risk – allows unprecedented business opportunities in financial services. Tech giants and blockchain startups have already joined forces to build new industry-standard-setting infrastructures. Banks themselves have teamed up to develop proofs of concept, and first-use cases have been successfully launched, e.g. in trade finance, commodity trading, equities or syndicated loans. We see 2016 and 2017 as a crucial phase, when the first larger applications will be rolled out and provide a broader validation of a new innovative concept.

At the same time, regulators and central banks around the world are looking intensely at both the opportunities from a regulatory angle, but also the challenges of regulating distributed transaction networks and digital currencies – such as Bitcoin – across national borders. In time, they will build the required regulatory frameworks and “sandboxes” for the industry. But as with other fundamentally innovative digital technologies, it may take several more years for the real breakthroughs and disruptive applications to emerge. Either way, there are exciting times ahead for financial services.

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