



# Can blockchain live up to the hype?

28 JUL 2016

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Is blockchain the revolutionary technology that will rewrite the rules for the finance industry, identifying authenticity and verifying payment flows that arise at a business-to-business level or between business and consumers and peer-to-peer? The consequences of the blockchain evolution would significantly open the field for technology platforms and reduce operational costs. This would also be a major challenge to the established institutions in the consumer finance and business finance sectors. In order to be successful, this technology will need to overcome a number of legal and regulatory issues.

## What is blockchain?

Blockchain provides a new approach to holding and authenticating data. It is a database operating through distributed ledger technology in which data is recorded on computers, by way of a peer-to-peer mechanism, based on pre-agreed consensus algorithms in the applicable participating network. It is a form of database where data is stored in the chain in either fixed structures called 'blocks' or algorithm functions called 'hashes'.

Each block includes unique features such as its unique block reference number, the time the block was created and a link back to the previous block. Each block is reviewed by a number of nodes and the block is only added to the database if the node reaches consensus that the block only contains valid transactions. Content includes digital assets and instructions which reflect the transactions and parties to those transactions. The ability to track back through previous blocks in the chain makes it possible to identify transactions back to the first ever transaction completed, enabling parties to verify and establish the authenticity of the assets in the latest block. This makes blockchain exceptionally accurate and secure.

The blockchain is based on specialist users of the system being able to apply advanced computing software to identify time stamped blocks, verify the accuracy of the block using sophisticated algorithms and add the verified block to the chain. As the number of participants increases, the replication of the data over a wider base makes it harder for any person to alter the data in the chain. Any attempted addition or modification to the information on a block needs to be approved by all users in the network and verification of any block can only happen through a 'proof of work' process.

As a result, the data is identified and authenticated in near real-time, providing a permanent and incorruptible database sufficiently robust to operate as a store of value (eg in the case of cryptocurrencies such as Bitcoin) or providing an indisputable record for example relating to securities transfer and partnership. If the above description holds true, blockchain provides a revolutionary technology that could save the finance industry billions of dollars (for example, in settlement and reporting costs) but may impact the need for certain types of trusted third parties.

## Important features

One of the most important features about blockchain is that it is a decentralised system, created and maintained by users of the network rather than being dependant on any central or third party intermediary. The blockchain may be public and open ('permissionless' or 'unpermissioned') or structured within a private group ('permissioned').

Permissionless blockchains include Bitcoin and Ethereum, in which anyone can set up a node that validates, observes and submits transactions. The identities of the participants are not known (other than the unique and random identities known as an 'address'). Permissioned ledgers restrict participation in the network and only the specific participants are given access and are known within the network. The network is private, and only organisations that have been authorised can participate and view transactions. Permissioned technologies include the Hyperledger Fabric project and the JPMorgan Juno project.

The development of blockchain technology enables parties to establish and transfer assets or information securely without the need for a trusted third party such as a bank or registrar. Verification is provided within the electronic system rather than based on, for example, a bank to bank identification number. Blockchain is best known for its role in establishing electronic currency such as Bitcoin. As a means of creating and securely transferring value on a fast and cost-efficient basis, it is viewed as a disruptive technology that could replace major aspects of the banking system. Blockchain may be used to improve various functions such as currency exchange, trade execution, peer-to-peer transfers and even enhance the application of and compliance with anti-money laundering rules.

## Smart contracts

Developments in technology, through blockchain, are also providing an ability to transfer and rely on instructions verified within the electronic system in the form of so called "smart contracts". These contracts have been converted into code and are then executed and enforced by the blockchain network on the occurrence of an event. This reduces the need for intermediaries to collect, store and act on communicated information.

Smart contracts are essentially pre-written computer codes which are stored and replicated on distributed ledger platforms such as blockchain. Execution takes place over the network, eliminating the need for intermediary parties to confirm the transaction, leading to self-executing contractual provisions. These contracts can be as simple as moving a balance from one account to another or advanced interacting with the outside world using so called 'Oracles'. With Oracles the contract code consults with a service outside of the block chain network to make a decision. This may entail confirmation has occurred, such as payment, which automatically executes a further step in the contract, such as the transfer of an asset, which might be in digital form or by delivering instructions to a person or warehouse to release the asset for delivery.

Moving towards the use of smart contracts, and essentially the non-physical execution of contracts, raises significant legal questions in relation to applicable regulation, leaving a sense of uncertainty as to their legal enforceability and implications.

Considered in conjunction with electronic execution only of contracts, this opens up significant opportunities for more complex online and paperless transactions. The introduction of the EU Electronic Identification Regulation<sup>1</sup> which came into effect on 1 July 2016 recognises 'qualified electronic signatures' as having expressly the same legal status as handwritten signatures. This new cryptographic approach to finance and law, further powered via blockchain, creates numerous potentials for innovation for business within finance.

## The impact on finance

Numerous financial institutions and entrepreneurs are now actively engaged in developing or looking at ways to develop blockchain technology in relation to traditional systems and service deliveries.

Many banks are individually experimenting with blockchain technology and a number of consortium activities are already looking at alternative ways of holding and transferring financial assets through this new technology.

With the Payment Services Directive II<sup>1</sup> (PSD2) broadening the definition of 'payment services' to include 'payment initiation services'<sup>2</sup> and calling on banks to open up their application programming interfaces (APIs) to

third parties, there are likely to be more opportunities for FinTech start-ups to challenge existing bank architecture and data management, with the possibility of introducing competing technologies and platforms providing more efficient use and a better customer experience.

The R3 CEV Consortium has brought together 42 leading financial institutions to develop blockchain technology relating to banking and financial products. Tests have already been completed to establish digital assets having characteristics similar to commercial paper certificates.

The development of finance technologies such as blockchain provides both threats and opportunities to the banking and finance sector. Major operational advantages will include faster completion of financial transactions such as securities transfer and settlement, cheaper services and reduction in errors. Examples of potential cost savings include the ability to automate and verify large scale data pools such as the reporting requirements brought in by EMIR and similar regulatory requirements. ISDA is already looking at how the technology might ease the burden on the industry of certain aspects of the regulatory regime. This will make dealing with reporting requirements more efficient and less cumbersome but also more effective from a regulatory perspective.

## Legal and regulatory issues

As with any major new technology, and particularly given its possible impact on a heavily regulated sector such as the finance industry, blockchain raises a number of legal and regulatory issues that would need to be addressed. The UK Government has published an extensive report, Distributed Ledger Technology: beyond block chain, as prepared by its Chief Scientific Advisor on Distributed Ledger Technology, which outlines some of the challenges that blockchain creates and faces.

- **Jurisdictional application of the law**

The basis of legal analysis with regard to the implementation of blockchain which will be based in principles of contract and title. These principles differ across jurisdictions and therefore identifying the appropriate governing law is key to both contract and property rights. In a decentralised environment, such as a global computer network, it may be difficult to identify the appropriate set of rules to apply. Similarly, in relation to assets which typically apply the jurisdiction of where the register is held, having no register and not being able to identify a single place on which the data is held presents some difficult legal questions, even at the level of which law to apply.

Due to its decentralised nature, pinpointing which jurisdiction would apply in the occasion of a breach or fraud within the blockchain could be challenging. This will require analysis of specific enacted legislation as well as relying on treaty agreements and principles of public and international law. The recent vote of the UK to leave the European Union will further complicate these issues.

- **Decentralised Autonomous Organisations (DAOs)**

DAOs are essentially online, digital entities that operate through the implementation of pre-coded rules. These entities often need minimal to zero input into their operation and they are used to execute smart contracts, recording activity on the blockchain. DAOs can be particularly challenging to regulate due to their undefined legal status, which may be open to interpretation depending on their software engine, the nature of transactions they are completing or other unique features. Questions of ownership and responsibility for DAOs can also be brought to question if any technical issues arise with their operation.

- **Smart contract enforceability**

Since smart contracts are prewritten computer codes, their use may present enforceability questions if attempting to analyse them within the traditional 'contract' definition. It remains unclear whether the elements of capacity, including the ability to rely on apparent or ostensible authority would apply. In dynamics contracts involving third party issues such as offer and acceptance, certainty and consideration would need to be considered.

- **Transparency, data protection and privacy**

A significant feature of open or permissionless blockchain is that of anonymity – users on specific distributed ledger platforms can enter the network and perform transactions by using a pseudonym. As such, transparency and in particular compliance with anti-money laundering rules as well as taxation regulation can be particularly difficult issues for regulators as well as enforcement authorities. It is likely that whilst matching users on the network with individuals could be complicated, this may be a minimum requirement for regulated activities.

At the other end of the spectrum, where data on individuals is required or made available, the parties will have to

provide comfort that data protection and individuals' privacy rights are not being breached. It is likely that technology itself will not be able to secure certain financial information, and contractual waivers and consents are likely to go some way to providing data to be processed within a blockchain architecture.

## Response of the regulator

The report Distributed Ledger Technology: beyond block chain examines the challenges posed by blockchain to different industries such as government management (or the conversion to 'smart government'), information and telecommunications, financial markets and other uses are examined. The Government Office for Science sees blockchain as a catalyst for innovation and growth and has initiated collaborative projects with private institutions for exploring the opportunities.

Within Europe, the European Parliament appears to be supportive of avoiding pre-emptive regulation around blockchain, as published in the ECON committee's report <sup>3</sup>. In the report, Members of the European Parliament expressed the view that imposing regulation on blockchain would hinder its development, as its uses and potential benefits are still being discovered. MEPs are, however, conscious of treating blockchain with the usual level of suspicion that surrounds new technology – particularly in the financial markets – and this willingness to give the technology some time to develop is a welcome angle to allow for its development.

Speaking at the Experts Panel hosted by the London office of DLA Piper on 13 May 2016, 'Blockchain and the practical implications of revolutionary technology for financial markets', MEP Dr. Kay Swinburne commented that the EU is currently fostering a constructive debate on the developments around blockchain and it remains high on the financial services agenda, as set by the European Parliament and Commission presidents.

Despite blockchain's negative association with cryptocurrencies such as Bitcoin in certain respects, this distributed ledger technology is believed to have the ability to develop into a mainstream product which could have widespread implications, even as far as being a means to solve developing countries' problems, which Brussels is particularly fascinated by. By eliminating the need for middlemen, blockchain empowers the movement of funds directly from the sender to the receiver, ensuring that cross-border foreign aid is distributed in a more targeted and efficient manner, reaching its intended beneficiaries directly.

In dealing with financial assets authorisation for certain types of activity will be required from the regulator and passporting or multi-jurisdictional authorisations may be given but identifying which entity is responsible for which function becomes increasingly complex.

The ability to establish an authenticated indisputable record in close to real time will also have the potential to revolutionise the methods we have of reflecting ownership of physical assets, ranging from the land registry to car registrations, intellectual property rights, or shared ownership amongst other things.

## Conclusion

It is likely that blockchain will have a significant impact on the finance sector, providing it resolves the current legal and regulatory concerns. The most powerful implications of blockchain will however, not simply be in providing the technological basis for faster payment systems and the development of electronic currencies such as Bitcoin, but as a means of delivering secure information and instruction which when combined with the development and adaption of a range of technologies including artificial intelligence, robocontracts and other technologies will see powerful advances in interactions between individuals, businesses and governing authorities.

*We are trialling our own blockchain solutions for paperless closings on transactions against other uses. If you would be interested in taking part, please contact Martin Bartlam.*

BLOCKCHAIN LANGUAGE	
Ethereum	Ethereum is an example of blockchain that supports smart contracts. In the Ethereum network users can create arbitrary contracts which can be used in a permissionless or permissioned group of users. Through the Ethereum Virtual Machine users can execute smart contracts that may also have 'Ether' digital

DAO	<p>currency attached to their execution.</p> <p>Decentralised Autonomous Organisations are pre-coded entities that complete transactions within a network through the implementation of pre-written rules. They may require minimal to zero human input for their operation.</p>
Hyperledger 'Fusion' Project	<p>This is a project by Linux Foundation and it consists of code contributions from a number of companies such as IBM, JP Morgan and Digital Asset Holdings. As part of that project IBM has released Open BlockChain which is an open source permissioned ledger that also supports smart contracts.</p>
Proof of Work	<p>This is the consensus protocol system followed by blockchain nodes where users in a network agree on the next valid block to be added to the chain. The system follows a computational algorithm that verifies nodes before they are validated and added to the blockchain. Most permissionless blockchains such as Bitcoin use a Proof-of-Work system.</p>

<sup>1</sup> Directive (EU) 2015/2366 of the European Parliament and of the Council of 25 November 2015 on payment services in the internal market, amending Directives 2002/65/EC, 2009/110/EC and 2013/36/ EU and Regulation (EU) No 1093/2010, and repealing Directive 2007/64/EC

<sup>2</sup> As referred to in point (3) of Article 4 of PSD2

<sup>3</sup> Report on Virtual Currencies by the Committee on Economic and Monetary Affairs of the European Parliament, 3 May 2016

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