Focus on blockchain

What is blockchain?

'Blockchain' has found fame as a technological buzzword within the last few years, and continues to be used with increasing frequency.

At a very basic level, blockchain is a means of storing data. A blockchain utilises distributed ledger technology ('DLT") to record the transfer of data between users within a peer-to-peer network on a ledger. Each blockchain will be subject to the rules stipulated by its developer.

Blockchain was initially invented in the context of cryptocurrency, starting with Bitcoin. Since then countless coins and tokens have emerged. Within cryptocurrencies the data recorded on a blockchain is a transaction involving something such as a digital currency or a representation of a physical asset.

In order to authenticate transfers of data on a blockchain, each transfer is validated using cryptographic technology (commonly public-key cryptography). Each user has (and must keep secret) a private key from which they can generate a public key. The private key is used to ''sign'' data and this can then be verified by the corresponding public key.

Once validated, transfers are grouped into ''blocks''. A block can be added to the blockchain's ledger of previously-validated transfer after being subjected to a method which determines the accuracy of each transfer within that block. This is known as ''consensus'' and there are several models of consensus, including proof of work and proof of stake. A combination of cryptography and consensus help to maintain the integrity of the data within a blockchain.

Each user within a blockchain's network can maintain a copy of the ledger and will be aware of the addition of new blocks. This keeps each copy of the ledger identical and up-to-date.

Whilst many blockchains are decentralised (anyone within its network can update the ledger) and public (anyone can view the ledger), they may also be configured in such a way as to grant central control to a specified party/parties and/or make the ledger private.

Advantages and disadvantages of blockchain

As a store of information, blockchain technology has several noted benefits. It is prized for its immutability as, once data has been added to a blockchain, it cannot easily be altered or removed (the common claim that

data added to a blockchain is permanent and cannot be altered or removed is incorrect, although it is very difficult in large public blockchains). This rigidity is strengthened further as more and more blocks are added to a blockchain. This immutability is in part because of the nature of a decentralised blockchain: no copy of it kept by one user is any more or less legitimate than that kept by another.

Another important advantage of blockchain technology is the previously-mentioned use of cryptography. Provided a user keeps their private key safe, no one else can access the data protected by that key.

For users who require an accurate and permanent record of data transfers, this feature of blockchain technology is invaluable. It is this factor which has set imaginations running in consideration of blockchain's many use cases (see further on this below).

However blockchain also has its disadvantages. As the ledger of recorded information increases in size, each user's computer must process more and more data to validate transfers and store a copy of the ledger. This can result in the vast use of resources such as electricity which has both a financial cost to the user and a wider environmental cost.

In addition the immutability and long-lasting nature of blockchain is at odds with a number of widely-accepted data protection rights. Under the General Data Protection Regulation 2018, data subjects have, among other things, the right to be forgotten and the right to have data about them rectified where it is incorrect. It remains to be seen how blockchain technology can be reconciled with data protection laws and, if personal data are held on a blockchain, then the entity that is deemed to be the controller of that data may find itself in breach of its data protection obligations.

Blockchain use cases

Blockchain technology may be used for a variety of purposes. Whilst it has previously hit the headlines for its role in cryptocurrencies, it could theoretically be applied to a wide spectrum of industries which require accurate record-keeping.

One deployment of blockchain in the completion of 'smart contracts'. A smart contract uses a blockchain to validate and record the transfer of data (which could relate to any range of goods, services or other assets) once certain criteria are satisfied within a coded version of a contract. The difference between this and the ordinary contracting process is automation: there is no need for a human being to confirm that the criteria in question have been satisfied before moving forward with the contract.

Public bodies such as HM Land Registry are exploring how blockchain could be used to simplify and speed up the land registration process, harnessing the benefits of a smart contract framework. In future it is possible (and perhaps even highly likely) that the entire process of transferring and registering land will be conducted using blockchain infrastructure.

In the fintech world blockchain could be applied to numerous existing process, from the digitisation of real world assets to the real-time gross settlement system operated by the Bank of England (which facilitates the settling of intra-bank payments).

There are many other example use cases: for a look at blockchain in the advertising sector, see our note on adtech.

Blockchain has great potential to affect and improve many aspects of business, as well as our day-to-day lives. As awareness and understanding of this technology grows, it will shed its close association with cryptocurrency and become integrated into more and more industries and solutions.

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