

## Digital Banking

# Blockchain Technology: The Ultimate Disruption in the Financial System

Nathaniel Karp

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- **Blockchain ledgers bypasses centralized financial infrastructure**
- **This leads to the development of new businesses and the overhaul of existing ones**
- **For the financial sector it could imply the biggest disruption to date**

*"I have now no doubt whatever that private enterprise, if it had not been prevented by government, could and would long ago have provided the public with a choice of currencies, and those that prevailed in the competition would have been essentially stable in value and would have prevented both excessive stimulation of investment and the consequent periods of contraction."*

–F.A. Hayek

*"... the key innovation of digital currencies is the 'distributed ledger' technology that allows a payment system to operate in an entirely decentralized way, with no intermediaries such as banks."*

–Bank of England

## What is Blockchain?

Blockchain is a peer-to-peer public ledger maintained by a distributed network of computers that requires no central authority or third party intermediaries. It consists of three key components: a transaction, a transaction record and a system that verifies and stores the transaction. The blocks are generated through open-source software and record the information about when and in what sequence the transaction took place. This "block" chronologically stores information of all the transactions that have taken place in the chain, thus the name blockchain. In other words, blockchain is a database of immutable time-stamped information of every transaction that is replicated on servers across the globe. This technology is the foundation of bitcoin, a crypto currency.<sup>1</sup>

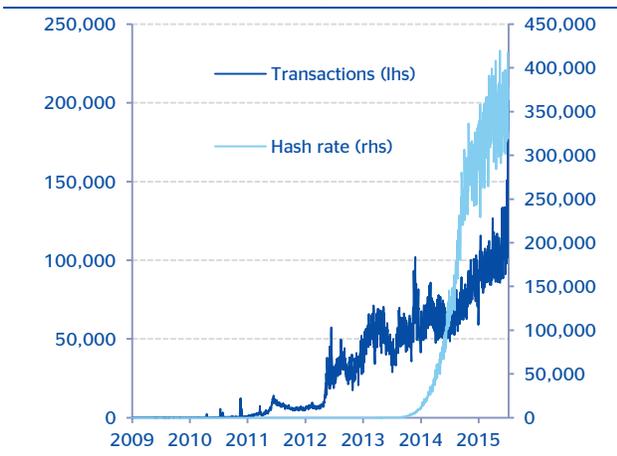
In traditional transactions such as money transfers or foreign currency, there is usually an intermediary or a centralized entity that records the transmission of money or currency that exist apart from it. In blockchain, the token or digital coin itself is what has value, which is determined by the market. This is what makes the system a truly decentralized exchange. When people buy or sell bitcoins, a secret key or token is broadcast to the system. "Miners" use nodes, computers or devices linked to a network, to identify and validate the transaction using copies of all or some information of the blockchain. Before the transaction is accepted by the network, miners have to show "proof of work" using a cryptographic hash function –a special algorithm- that aims to provide high levels of protection. Miners receive some form of compensation for their computing power contribution, avoiding the need to have a centralized system. New protocols such as Ripple rely on a consensus process that does not need miners nor proof of work and can agree on the changes to the blockchain within seconds.

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<sup>1</sup> For more information on Bitcoin see [Bitcoin: A Chapter in Digital Currency Adoption](#)

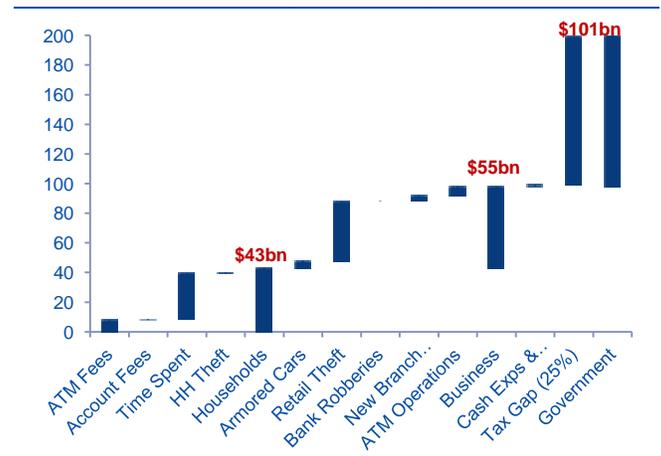
In any case, the blockchain offers an inherent level of trust for the user, eliminating the need for the middleman and mitigating the risk of human error. In this public ledger, the data is protected against tampering and revision, and individuals cannot replace parts of the blockchain as the cost of doing so is significant – hypothetically one would need to control more than half of the “nodes” to surreptitiously alter the block chain. This ensures no double-spending. However, some research shows that defrauding the system by creating false transactions may be possible depending on computing power, position of the attacker and the timing of the attack.

Chart 1  
Bitcoin: transactions per day & hash rate (TH/s)



Source: blockchain.info

Chart 2  
Cost of cash in the U.S. (\$bn, annual)



Source: BBVA Research and Fletcher Institute

## The Disruption

While bitcoin itself has received a lot of criticism, the blockchain technology is thought to offer great potential, attracting the attention of governments, businesses and venture capital at a rapid pace. Some ideas developed in recent years include a pay-as-you-go system that allows users to stream live video; a structure that allows sharing space-program information; or ways to record business information such as audits. In most cases, these options are thought to offer greater security, speed and reliability at a fraction of the cost of more traditional infrastructures.

Other ideas include the possibility to rent out excess storage capacity; create digital identities that could substitute dozens of usernames and passwords while offering greater security features; and “smart contracts” with self-executing properties that would make the contract “unbreakable”. In addition, there have been significant advances in creating a highly secure digital voting system. Voters register online and receive a unique electronic vote or vote-coin. The electronic votes are recorded in the blockchain, reducing the possibility of fraud while allowing quick and reliable verification by the network. This could be attractive considering that significant anomalies have occurred even in well-established democracies (for example, the 2000 U.S. Presidential election), as each voter would be able to verify its decision. This could increase participation and reduce costs.

In the financial industry, institutions were slow to recognize the potential of blockchain technology; however, dozens of large banks have now invested significant amounts of money in this technology. The attention is likely the result of how disruptive this technology is to the financial sector, particularly if it allows massive simplification of banking processes and significantly reduces costs.

The first levels of disruption seem more likely in the payments space where traditional transactions such as money transfers, credit and debit card payments, remittances, foreign currency and online payments, require an intermediary such as a clearing house or a financial institution. In these cases the transaction would occur directly between the buyer and the seller without any intermediary and the validation of the transaction would happen in a decentralized way or “distributed ledger”. This would result in significant infrastructure savings for banks by allowing them to bypass payment networks that are oftentimes slow, cumbersome, and expensive.

However, the biggest potential impact of a public ledger may extend beyond the payment system. Given that the majority of financial assets such as bonds, equities, derivatives and loans are already electronic it may be possible that someday the entire system is replaced by a decentralized structure. In fact, the latest innovations are using tokens to store and trade assets like shares, bonds, cars, houses and commodities. These so-called “colored coins” attach additional information on the asset, generating “smart property” or the ability to record and transact these assets using “smart contracts”, which are enforced by complex algorithms, through distributed platforms without a centralized register, thereby increasing efficiency. In this environment, the current system where financial institutions record individuals’ accounts in a centralized fashion and the banks’ reserves are stored by the central bank (i.e. Federal Reserve) would be replaced by the “internet of money” or the “internet of finance” –a fully decentralized financial system.

## Risks and Challenges

The likelihood of a decentralized system to become commonplace is not obvious as it would have to offer the same or higher level of trust and protection than the current one. For this to happen, the system would have to possess a massive amount of computer power and efficiently cope with the enormous energy consumption required to support it. In addition, it is not clear how this system would deal with legal and regulatory concerns, as well as with matters of national security, such as money laundering, fraud, tax evasion or terrorism. Moreover, digital currencies would not be exempt from potential crashes; like the current system, if their usage reaches substantial levels, these shocks could generate systemic risk and severe economic downturns. In this scenario, monetary policy would not be able to respond effectively if it fails to boost demand among a large share of economic agents that use digital currencies.

Nonetheless, improvements and modifications in blockchain technology could overcome some of these obstacles and lead to broader acceptance. Therefore, the key question is not how, but when the disruption will become far-reaching. As other industries that have been transformed by new technologies and digitization, blockchain technology could reshape the financial industry well beyond the payments system.

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