

# ESG Viewpoint




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## Blockchain solutions to ESG problems

- Cryptocurrencies have been surrounded by hype and controversy – but the technology behind them, blockchain, is rapidly demonstrating its potential as a powerful sustainability solution.
- Blockchain offers advantages where information needs to be accurately stored and shared amongst multiple parties, with uses already identified in ESG related areas including supply chain management, renewable energy distribution and proxy voting.
- At the same time, this relatively new technology has several issues to overcome. These include high energy intensity, lack of regulations and industry standards, and data privacy laws.

With their dramatic rise, and subsequent fall, in value over the course of this year, cryptocurrencies like Bitcoin and Ethereum have sparked heated debate in 2018. Unlike conventional currencies that are reliant upon a central banking system, these virtual currencies use encryption tools to facilitate financial transactions directly between users in a decentralized manner over a network.

Although the broader investor community remains skeptical of the speculative nature of these new currencies, the architecture that underlies them, namely blockchain technology, has got much more traction. Estimates put spending on blockchain at US\$2.1 billion in 2018, double of that in 2017, with the potential to reach US\$9.2 billion by 2021<sup>1</sup>. As part of this, we have seen several blue-chip companies now heavily investing in the technology with a view to developing a far broader set of applications. This includes providing solutions to many of the environmental, social and governance (ESG) issues that companies face every day.

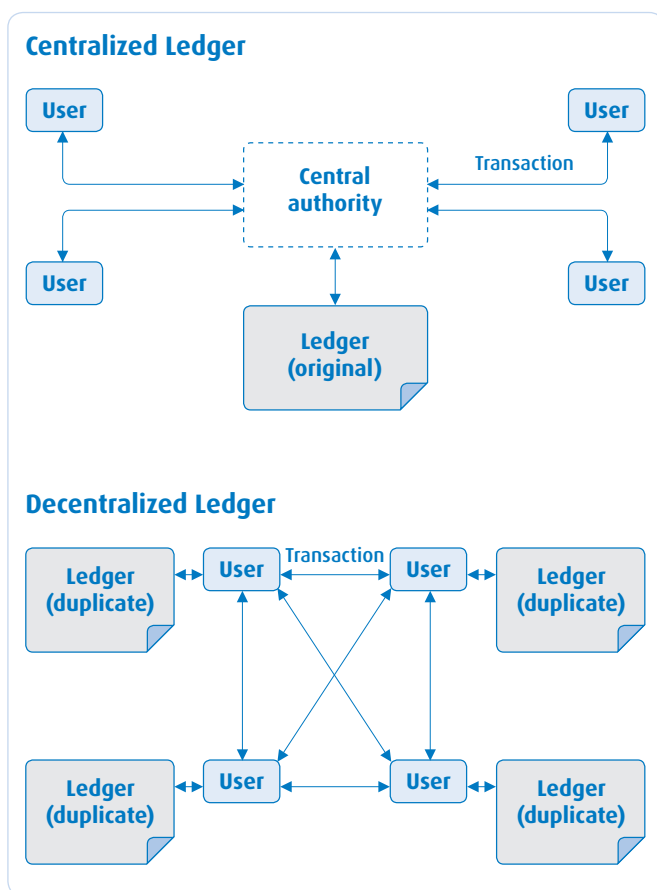
<sup>1</sup>Source: International Data Corporation (IDC) Worldwide Semi-annual Blockchain Spending Guide, 2017

### What is blockchain technology?

Having been invented over 10 years ago as part of Bitcoin’s development, blockchain technology is a method by which information is stored and shared between different parties.

In its simplest form it can be best described as a “distributed ledger” technology. A “ledger” is essentially a list that gathers in one place a collection of transactions or records of information. “Distributed” means that this ledger is shared between a network of peers rather than stored in a central location and administered by a single authority.

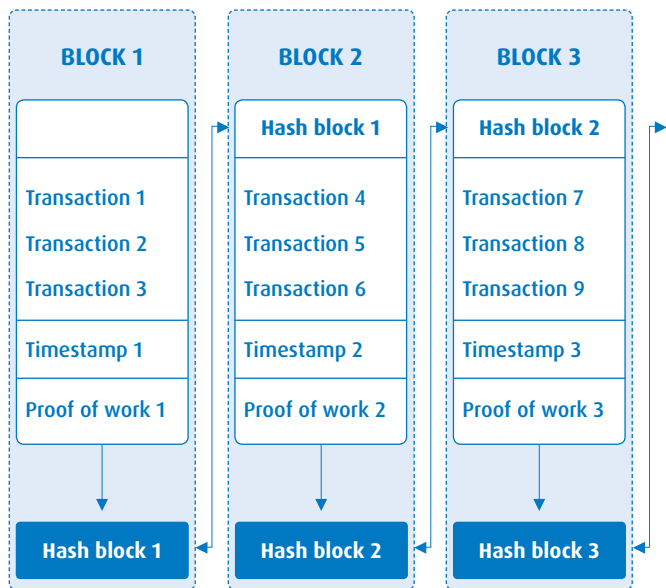
**Figure 1: Centralized vs decentralized distribution**



Blockchain technology achieves this by creating a continuously growing list of records, called blocks, which are linked together in a sequence to create the ledger. Each block is linked to the previous block using cryptography in a form that is virtually impossible to decode, and can contain information such as a location or other attribute. This means that inside every block is a complete history of everything that has ever happened in the chain before it. This information is packaged through “hashing”, which is a cryptography technique that takes an input and turns it into a fixed-size alphanumeric string of characters.

Whenever someone on the network wishes to make an entry, or create a new block, the proposed transaction is broadcast to everyone on the network, which is then evaluated by network users running a complex algorithm (“proof-of-work”), or solving a mathematical puzzle, to check it is valid against a pre-set criteria that evolves as the ledger grows. This is needed because anyone on the network, whether they are known to be trustworthy or not, can attempt to add information into the blockchain, making it necessary for all new information to be reviewed and confirmed before being accepted. Consensus amongst users is then required and achieved by a majority of those on the network individually concluding that the proposed transaction is valid against some pre-set criteria. The block is then created, time-stamped and given a unique identifier. Finally, each user within the network is provided with an updated version of the ledger, complete with this latest transaction.

**Figure 2: Illustration of a blockchain**



There are two main types of network in which blockchain systems operate. Cryptocurrency networks are public in nature, meaning that anyone can join the network and read the ledger, or use it to send transactions. Public networks typically allow users (but not transactions) to remain anonymous. Those on the network who are willing to contribute the processing power to build and verify blocks through the process previously described are rewarded through coins or tokens, such as Bitcoins, through an arrangement known as “mining”.

By comparison, private blockchain networks allow control over who can conduct transactions or access the ledger, and do not reward the processing of transactions through mining, but instead take on the cost of processing themselves.



### What makes blockchain technology useful?

Blockchain offers a new method by which to record information in a manner that is more open, but also secure, and share it with multiple users. While it was developed for cryptocurrencies, the potential applications go far beyond this, given that the accurate recording and distribution of information is central to a lot of how companies operate. The attributes that make it useful for other applications include:

- **More collaborative** – with no central authority needed to facilitate or control transactions, this means that two or more parties who do not know one another can work confidentially together without the need for middle-men, which can add inefficiencies and expense
- **More transparent** – the ledger provides an open and detailed list of every transaction or record of information, accessible by all in public networks, or a selected audience for private networks
- **More secure** – the ledger is not stored in one location, but rather duplicated across the entire network, meaning the ledger cannot be manipulated, stolen or corrupted from a single location
- **More accurate** – the blockchain is constructed by consensus of users in the network, with each new block automatically checked before it is added
- **More consistent** – users on the network have identical copies of the ledger as opposed to there being multiple individual copies that are stored locally and can become unsynchronized
- **More timely** – the blockchain updates at set intervals, with the ledger held by each individual user being updated near-instantly

### What ESG problems could it solve?

There are a number of areas that companies are trying to exploit this technology to the benefit of stakeholders:

- **Supply chain traceability**

It is commonplace for companies to have supply chains involving hundreds of suppliers, with individual products passing through multiple parties before reaching the end-consumer. This can lead to real challenges for companies who wish to ensure that their own expectations on conduct and quality, such as product safety, environmental or labour standards, are maintained throughout the supply chain.

Using blockchain technology, companies are able to record the journeys of their products more accurately and more cheaply. With all suppliers invited into the network, every time a product changes hands within the supply chain, its precise location and time-stamp is documented by creating a new block, with the ledger creating a permanent history of every product from its manufacture through to its sale.

Given the number of suppliers involved, a centralized process would be cumbersome and would need to involve intermediaries to liaise between parties. However, with a blockchain network each party is synchronized in the information it receives, with each transaction validated by other users on the network. Having an accurate record of where a product has come from and who has been involved can be invaluable for responding to product recalls or understanding the exposure from issues being found with a specific supplier.

Food giant **Walmart** recently described how adopting blockchain within its live food business reduced the time to track produce from six days to two seconds. Chinese e-commerce giant **JD.com** has also announced similar plans to use blockchain technology to monitor their meat supply

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chain against the use of illegal drugs by pig farmers, which is a real issue in the region.

- **Renewable Energy Distribution**

On an electricity grid, electrons generated from renewable sources are indistinguishable from those generated by fossil fuels, which is an issue for end-consumers who may have a preference for green energy. To keep track of how much clean energy is produced, a system based on tradable certificates works by renewable-power plants logging their output in a spreadsheet, which is then sent to a registry provider, where the data gets entered into a separate system and a certificate is created. A second set of intermediaries broker deals between buyers and sellers of these certificates, and yet another party verifies the certificates after they are purchased. This whole process increases inefficiencies in the system and reduces the attractiveness of investing in green power.

By comparison, blockchain technology offers the opportunity for smaller-scale energy producers to trade energy peer-to-peer with consumers in their local area, rather than submit their power into the grid. Such an initiative has been launched by the British energy company **Centrica**, within its local energy market program.

An automated system could take data on the amount of energy produced from renewable sources, record this, broker a price and then send it out to homes on the local grid while recording incoming payments for energy purchased. Through the use of smart contracts, which execute automatically when pre-set conditions are met, transactions can be made and recorded on the blockchain without a central distributor. This simplifies what is an otherwise complicated multi-layer system, with power producers, transmission system operations, distribution system operators and suppliers all contributing to transaction costs.

- **Anti-money laundering**

For financial institutions the current “Know Your Customer” (KYC) process, which involves performing a thorough background check on clients in order to detect fraud or suspected money laundering, can take days or even weeks to satisfy the increasingly stringent demands of regulators.

Using blockchain technology, the process of monitoring customer activity in real-time can be substantially improved by providing more timely information to all of those involved. Due to the shared nature of the ledger, a database of all client activity and background information would be available to those on the network, with any updates to a client’s status

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or fraudulent transactions communicated and updated in near real-time.

It also allows for better co-operation with different financial institutions, who can all join the same network, as cryptography can be used to ensure that only transaction information is shared without revealing confidential information on individual customers. To do so, financial institutions will need to think hard about how confidential information is shared, but with the right data governance and access controls, these concerns can be overcome. Ultimately, the risk of non-compliance due to delayed or inaccurate reporting would be greatly diminished.

- **Cybersecurity**

Protecting confidential data is more important for companies than ever before. By storing data across its network, the blockchain and its use of a distributed ledger eliminates the vulnerabilities that come with data being held centrally. Without a single point of entry, it is more difficult for hackers to either steal the data or corrupt it for ransom purposes.

The use of a distributed platform also adds resilience to a company’s operations against a Distributed Denial of Service (DDoS), being one of the most common types of attacks. DDoS attacks attempt to make online services unavailable by overwhelming servers with traffic from multiple sources, causing the infrastructure to become overloaded. As the infrastructure behind the blockchain is distributed amongst many users, it does not have a single point of failure, so if one user goes down then the integrity of the network is maintained, as long as at least one of the users remains connected.

- **Proxy voting**

Shareholders’ ability to exercise their voting rights is an important tool in fulfilling their stewardship responsibilities and holding companies to account. However, the current proxy voting system can be cumbersome and inefficient, with vote instructions being transmitted through a series of disconnected intermediaries. Currently proxy systems do not easily allow for auditing or reconciliation of votes at shareholder meetings, as many of those within the instruction chain, such as sub-custodians, custodians and company registrars, have separate record-keeping systems.

The 2018 voting season saw blockchain used at a shareholder meeting for the first time, with proxy distributor **Broadridge Financial Solutions** providing just such a service at **Banco Santander’s** 2018 AGM. By using blockchain technology a company can create a distributed ledger for each shareholder meeting, with all shareholders eligible to vote at the meeting added as members into the network. Each time a vote instruction is made, an additional block is added to the blockchain containing the specific instructions. The main advantage would be that it is tamper-proof and since there is only one record-keeping system, it removes the need to

reconcile different databases. Overall this can give more confidence in the integrity of the vote results from that meeting.

### Risks of blockchain technology

Despite the potential benefits that can come from implementing blockchain technology to address business issues, as an emerging technology there are still many risks connected to its deployment that need to be resolved before the full potential of blockchain can be realized:

- **High energy use** – with each user on the network required to individually process cryptographic calculations and the requirement for mining to power its operation, the processing power (and therefore electrical power) needed to implement a blockchain network is substantial. By means of illustration, one estimate suggests that the bitcoin network used just over 32 terawatt hours last year, which is more than the nation of Denmark over the same period.
- **Unregulated landscape** – as the technology is still relatively new there is still a time lag on regulation being introduced, which makes investment riskier as there could be substantial compliance costs on the horizon if today's architecture designs are not compliant with tomorrow's laws. This is particularly relevant given that blockchain is being rapidly integrated within financial services, which is a heavily regulated industry.
- **No internationally recognized standard** – although the overall concept of what constitutes a blockchain network is relatively fixed, the exact mechanics of how it works can vary widely. This can result in different blockchain networks becoming siloed and unable to cross-communicate, limiting their usefulness at scale. It also increases the cost of investment as development is more difficult, with an equivalent situation being having to build an operating system, such as Android or iOS, every time you wish to develop an app.

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- **Relatively slow** – applications that use blockchain technology need to process the entire history of that blockchain every time a change is made, meaning that transactions can be slow compared to normal computer processing. For example, Bitcoin handles seven transactions a second and Ethereum around 13, whereas payments company **MasterCard** is capable of handling more than 44,000 per second.
- **Compliance with data laws** – the 'Right to be Forgotten', which has most recently been enshrined in the EU's General Data Protection Regulation (GDPR), poses a challenge to a technology that guarantees that nothing will be erased within a blockchain.

Unlike the cryptocurrencies that gave birth to its underlying architecture, more companies seem to be taking blockchain technology seriously and reflecting that in their investment. On the face of it this seems to be for good reason, with what is promised being a fundamental shift in how we store and share information. There are already a wide range of applications currently in development, including many that address traditional ESG problems, with the initial results on improving efficiency looking promising.

That being said, investors should be aware of the scale of the task at hand in trying to integrate relatively early stage technology into long-established processes and business ecosystems. The issues identified can and probably will be overcome with additional research, development and co-operation, but this process will be expensive, take time and, as industry standards emerge, ultimately result in there being winners and losers.

What is clear is that, given the current level of investment and its wide range of potential applications, blockchain technology is not going away. It might not grab the headlines in the way that its cryptocurrency cousins have done so before it, but in the background (or rather back-office) and behind-the-scenes it could provide exciting opportunities in helping companies tackle the sustainability issues that their businesses face.

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