Blockchain: a catalyst for change?

Mark Legard believes that blockchain will be a catalyst for change, and we will all reap the benefits

The blockchain principle was initially proposed in 1991, where it uses a distributed database that autonomously maintains a continuously growing list of public transaction records in units of 'blocks', secured from tampering by time-stamping and encrypted hash links. Blockchain was developed further in 2009 when Satoshi Nakamoto proposed the cryptocurrency Bitcoin. This has led many to associate blockchain with Bitcoin.

However, the potential use of blockchain goes well beyond the world of cryptocurrencies. For some, it is a revolutionary technology that will change our lives, while for others it is a mere pipe dream. No technology has stirred up so much debate since the advent of the internet. However, despite the numerous headlines on blockchain, the technology remains difficult to comprehend for many.

At its core, the blockchain is a technology that permanently records transactions in a way that cannot be later erased but can only be sequentially updated, in essence keeping a never-ending historical trail. Blockchains also enable assets and value to be exchanged, providing a new, speedy rail for moving value of all kinds without unnecessary intermediaries.

A brief explanation of how blockchain works is needed. For blockchain to work a distributed ledger is required. Each block in a chain contains data, a hash of the block (a hash can be compared to a fingerprint, and is always unique), and a hash of a previous block.
The hash of a previous block creates the chain and makes the blockchain secure. If a block is changed all the other blocks are invalid. With todays computer power it is possible to change a block, and all hashes.

Therefore, a proof-of-work mechanism is used to slow down tampering. Blockchains also use a distributed P2P network, where all members of the network have a copy of the blockchain.

When a block is changed all members receive the change. This creates a consensus where all members agree on which blocks are valid. Tampered blocks will be rejected by other nodes (members) in the network.

So, to successfully tamper with a blockchain you will need to alter all blocks on the network, redo proof-of-work, and control more than 50% of the P2P network. Only then will your tampered block be accepted by everyone else. This is almost impossible to do.

There are various ways to categorise blockchains. There are public (no specific entity manages the platform), private (the platform is controlled by a single entity), or managed (by a consortium of companies) blockchains.

... blockchain technology presents an opportunity to fundamentally transform the way financial markets work

Another category that is sometimes used is permissionless (the blockchain is open to everyone – for example Bitcoin) or permissioned (restrictions can access the blockchain).

In practice there are many variants of blockchains depending on the objectives being sought. Many applications in the field of international trade fall into the category of permissioned/consortium blockchains. One thing to note is that though blockchain is only one type of distributed ledger technology the term is now often used to refer to distributed ledger technologies in general.

This seemingly simple functional description has massive implications. It is making us rethink the old ways of creating transactions, storing data, and moving assets, and that is only the beginning. In the trade arena possible applications of blockchain encompass a diverse set of areas including trade finance, customs and certification processes, transportation and logistics, insurance, distribution, intellectual property and government procurement.

Multiple consortia have been formed, comprising mixes of large-scale corporations and start-ups, to explore common open source blockchain technology solutions for particular industries. The biggest banks formed a group called R3CEV, for example, before expanding to a membership of greater than 100 that included many non-banks.

Hyperledger, which has been building private enterprise solutions, is similarly large and includes big players such as IBM, Cisco and Intel. Meanwhile, blockchain consortia have also been formed for the music, advertising, energy, Internet of Things (IoT), real estate and various other industries.

Government agencies, non-government organisations and international development agencies are also now exploring multiple use cases aimed at enhancing official information, streamlining government-citizen relationships and boosting financial inclusion.

The applications of blockchain technology and smart contracts are broad. Many have gone beyond merely proofs of concept. Blockchain-based peer-to-peer payments are the best-known examples. Bitcoins, Lightning, Ripples, LITEX, and others make value transfers on decentralised networks possible, without relying on trusted third parties.

Trade finance, an industry with a $10 trillion annual volume, in particular is suitable for blockchain applications. Large institutional players or consortiums such as Barclays, IBM, Walmart, and R3 CEV have all developed their own trade finance blockchains. The first global trade transaction, shipping butter and cheese between Ornua and Seychelles, was completed in 2016.

In general, blockchains interact with dispersed record keepers to reach a decentralised consensus. Similar to third party arbitrators or witnesses in the traditional economy, they receive signals on the true state of the world, and may have incentives to tamper with those signals, or manipulate them.

With the help of fast-developing real-time communication technologies, blockchains can mitigate individual misreporting incentives, allowing for better information aggregation and more efficient contracting. Nevertheless, to generate a more effective consensus, decentralised record-keepers need to be able to observe and receive greater amounts of information.

Consequently, blockchain applications feature a fundamental tension between decentralised consensus and information distribution. The impact on welfare and consumer surplus can be ambiguous.

One needs to ask what are the benefits of blockchain in global trade? International trade is a $16 trillion market that accounts for the exchange of capital, goods, and services across international borders or territories.

It is broadly split into two categories: a variety of goods, typically shipped by shipping containers or ground transportation, and commodities.

From a shipping and transportation viewpoint the trade and financing industry primarily suffers from a lack of trust and coordination between exporters and importers, particularly within emerging to developed markets.

Additionally, the industry maintains various operational inefficiencies due to the complex nature of operational processes in the international trade of goods and commodities.

For instance, shipping and trading still heavily rely on human resources and are affected by manual and paper-based processes which are very costly, slow and error-prone.

Exporters and importers face challenges to finance or guarantee their transactions, which stymies growth and limits the benefits from globalisation.

Over the past decade or so many start-ups and technology companies have attempted to develop products with mixed success— until the emergence of blockchain technology for which international trade is identified as a primary use case.

The potential impact of blockchain technology on international trade finance has spurred many companies and consortiums to update their outdated technology. Beyond ushering in the era of digitisation, blockchain enables the tokenisation of existing documents, letters of credit, and more.

Smart contracts will improve coordination between exporters and importers through the automation of agreements, business events, and other manually intensive processes. The global adoption of blockchain technology will create even greater benefits for cross-border coordination, trade settlement, and standardisation.

Commodities trading represents a quarter of international trade and is comprised of energy, base and industrial metals, agriculture and soft commodities. More than half of commodities trading is financed by banks and other financial institutions or funds. Software and new technologies have emerged to serve this industry over the past two decades with varied successes.

But like the international trade of container goods, commodities markets remain affected by operational inefficiencies and costs including:

- Fraud: the widespread use of paper documents increases opportunities for malicious behaviour (double financing, etc.).

- Delays: it takes 90-120 days to book the shipping of a commodity, request trade financing, collect documents, provision the documents to buyers, and facilitate payments.

- Loss of income and opportunity: these fractured processes and high operational costs hinder innovation for the entire industry and cause billions of dollars worth of annual losses in income and opportunity.

Blockchain technology can reduce fraud through a distributed and immutable ledger where information cannot be manipulated without notifying all parties involved. The entire history of transactions is easily accessible utilising the inherent properties of distributed ledger technology.

Additionally, blockchains native ability to create and transfer digital assets enhances various existing commodities trading processes outlined above. The real-time data and transactions enabled by smart contracts has the potential to reduce delays and automate manual processes.

The inefficiencies throughout the commodities trade industry result in a loss of income and opportunities for businesses. As blockchain technology grows in adoption, it will help firms, investors, and the other parties involved in commodities trading realise greater gains and increased profitability.

Based on estimates from $4.4 trillion commodities markets, approximately 30% of the benefit from trade financing is claimed by banks, financial institutions, institutional investors, or funds.

For example, the Asian Development Bank highlighted the potential for growth of the global trade finance market by identifying a $1.6 trillion gap between supply and demand for trade finance, particularly for trade flows to and from emerging markets. This gap stems from know-your-customer (KYC) and compliance issues as well as poor profitability due to labour-intensive costs (operational, KYC, due diligence).

Blockchain technology can be implemented to overcome the various issues that occur throughout the KYC and regulatory compliance process. The historical record and transparent ledger provided by blockchain networks provide near real-time monitoring of transactions for multiple parties involved.

Regulatory agencies can gain access to permissioned blockchain consortiums improving anti-money laundering or auditing. Finally, blockchain has the potential to facilitate greater access to trade finance on both the supply (alternative investors) and demand side (SMEs from emerging markets).

Blockchain could have a significant impact on business processes and supply chain management. Blockchain can digitise, secure, streamline, and ultimately accelerate operational processes and supply chains across global markets.

Transactions in international trade can take up to four months to complete. Moving away from paper-based processes towards digitally verifiable and legally enforceable documentation means more rapid industry operations and the reduction of fraud.

For gas and power, where problems center around reliable data sharing— blockchain will enable information alignment, quicker imbalance resolution and settlement processes, and also more efficient delivery practices.

For renewable energy, where problems centre around reliable reporting of industrial carbon emissions or energy produced through renewable assets — blockchain offers increased trust through network transparency and governance systems that connect all stakeholders.

The movement of huge volumes of basic materials that are needed to fuel and feed the world is complex. It requires multiple counterparties that lack effective coordination because many producers are found in remote locations and emerging economies. As markets become more efficient, commodity trading is evolving into a low-margin service business.

Increasingly, traders make their living by providing a solidly reliable logistics service between producers and consumers. These facets inherently raise the risk of transactions, contributing to the limited access for new or growing companies. Blockchain's cost-reducing capabilities will increase margins while its deterministic trust structure will drive accessibility within the market.

Blockchain will impact trade finance. As an extension of international trade, trade finance undergoes the same cumbersome operations processes. Most rejections of trade finance requests submitted by SMEs in emerging markets to financial institutions stem from compliance problems, lack of trust, and low profitability.

Blockchain solves many of these issues by authenticating documentation, streamlining operational processes, and facilitating coordination between multiple stakeholders. In addition, blockchain simplifies access to alternative investors through marketplaces, thereby increasing sources of funds for smaller players.

What happens when a trade is completed? Current practices around trading are commonly viewed as inefficient for having too many intermediaries involved (security trade brokers, custodians, and payment agents), for being prone to settlement risks, and for having settlement cycles that are unpredictable and time-consuming.

Blockchain technology has the potential to dramatically simplify the chain of post-trade operations, guaranteeing and facilitating the consolidation of securities registers, all while enabling a higher speed of execution, reducing transaction costs, and enabling real-time settlement.

Across supply chain management, commodities logistics, and post-trade settlement there is significant long-term potential to develop trade and finance-focused marketplaces in order to simplify access for both supply and demand parties, increase liquidity, stimulate competition, and heighten efficiency.

Blockchain technology offers greater transparency and a single source of truth for participants using supply chain networks. Intelligent track and trace of orders, goods, and delays via blockchain could expedite the sending and receipt of goods. In particular, blockchain provides the following benefits:

- Digitisation. Most non-integrated supply chains still rely on insecure and inefficient physical processes. By using blockchain, stakeholders digitise physical processes with smart contracts to address these issues and enhance productivity.

- Authenticity. Producers, manufactures, retailers and customers all face difficulties in verifying product' authenticity. This boosts counterfeiting. With blockchain, products may be linked with non-fungible tokens at the moment of creation. These tokens may then be used as digital certificates. A non-fungible token is a special type of cryptographic token which represents something unique; non-fungible tokens are thus not mutually interchangeable by their individual specification.

  NFTs are used to create verifiable digital scarcity, as well as digital ownership, and the possibility of asset interoperability across multiple platforms. NFTs are used in several specific applications that require unique digital items like crypto art (rare art), crypto-collectibles and crypto-gaming.

- Distribution control. Most brands and retailers cannot control distribution outside of their own channels. With blockchain, they can use smart contracts to define specific rules to manage distribution across multiple channels.

- Post-sale services. Many retailers are not able to provide comprehensive after-sales services— including recall, warranties, and maintenance— because they lack information about a product's provenance.

  With blockchain, they can use product life-cycle information secured in smart contracts to develop additional after sales services.

- Transparency. Customers expect to have transparent information about products' raw materials and manufacturing processes. With blockchain each stakeholder across the supply chain can provide verified information.

- Verified ownership. Customers face difficulties in proving product ownership. This boosts theft and counterfeiting. With blockchain, customers can collect and manage NFTs, associated with physical products, and use these tokens to prove product authenticity and ownership, enabling safe secondary markets.

Despite its infancy, blockchain technology presents an opportunity to fundamentally transform the way financial markets work.

The challenge is to reduce the cost of trust, to protect against criminal interference – money laundering and terrorism, for instance – to ensure that the technology is appropriately adopted, utilised and governed.

When and if these problems are solved, blockchains could provide enormous economic, social, and political benefits to society.

While the technology opens interesting opportunities to enhance the efficiency of a number of processes and cut costs in these areas, it is not a panacea. Carefully weighing the costs and benefits is essential.

Nevertheless, blockchain will be a catalyst for change, and the public, blockchain technology and the financial system will all reap the benefits, sooner rather than later if the stakeholders take advantage of the opportunities that blockchain offers. ■