SourceToday
Thought Leadership Series
Digital Transformation & Best Practices

Issue 02.2018

Is Blockchain Inevitable?

It's hard to make it through the day without encountering breathless headlines about blockchain. It's the biggest thing since the internet—the present-day equivalent of sliced bread. It's going to revolutionize supply chains, transform financial transactions and contracts, and be the ultimate security solution for IoT networks. Whether it's banking, healthcare, electronics, or real estate, blockchain working groups and pilot projects are springing up like mushrooms.

But cutting through the hype, there are legitimate reasons for the blockchain frenzy. Indeed, some pundits argue that for some use cases, blockchain—or some version of distributed-ledger technology—is the only viable technology for managing increasingly complex digital transactions.

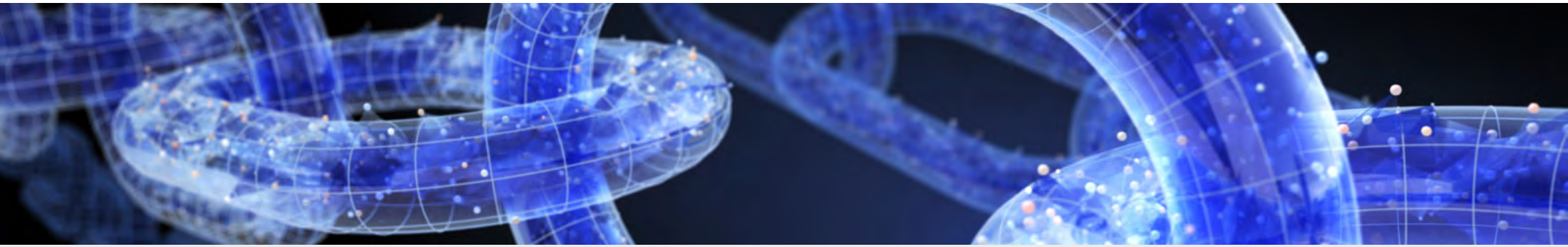
It's a red-hot phenomenon and getting hotter by the day. Technology leaders such as IBM and Microsoft have launched blockchain services, proof of concept, and pilot projects in recent months. And Google is one of many companies that have participated in over 140 equity investments totalling over $1 billion in the blockchain sector in the last five years. San Francisco tops the list of cities with the most blockchain development projects at 1,380, followed by New York and Beijing. Even the 2018 U.S. defense budget includes provisions for funding research into offensive and defensive cyber applications of blockchain.

What Is It?

Blockchain is a distributed chain of transactions connected to each other by cryptographic hashing. It's a database that maintains a continuously growing set of data records. Each transaction is stored with a timestamp, transaction data and a cryptographic hash that points to the previous block. All participants—called nodes—have full and equal access to the complete transaction record.

When someone wants to add a transaction to the chain, all the participants in the network will validate it by applying an algorithm to the transaction that verifies its validity. It is then up to the participants—at least 51%—to agree that the transaction is valid. A set of approved transactions is then bundled in a block, which gets sent to all the nodes in the network. The nodes, in turn, then validate the new block. Each successive block contains a hash, which is a unique fingerprint that connects of the previous block.

There are three reasons blockchain is generating so much interest: it's secure, public and distributed. This means there's a validated and immutable record of past transactions. There's no central control or single computer that manages the record of transactions; all participating nodes have the same copy of the chain. And no one participant can override or set special rules for accepting transactions. It could be the ultimate "trust machine" for a distrustful world.



Use Cases

Blockchain is being advanced as a viable mechanism for managing contractual relationships and buying a selling. It's also relevant for collaborative projects, such as software and product development, where intellectual property is shared between contractors and design changes need to be validated at each step. Applied to procurement, supply chain management and logistics, blockchain can be used to reduce or even eradicate counterfeits and manage theft of goods in transit.

In some emerging use cases, blockchain is considered a foundational technology. A case in point is the Internet of Things (IoT), which faces a laundry list of security challenges from limited or no physical security to secure operation in multi-party networks. The proliferation of billions of networked IoT devices manufactured by countless companies and incorporated into applications sold around the world requires a level of security that is hard to image could be delivered through traditional mechanisms.

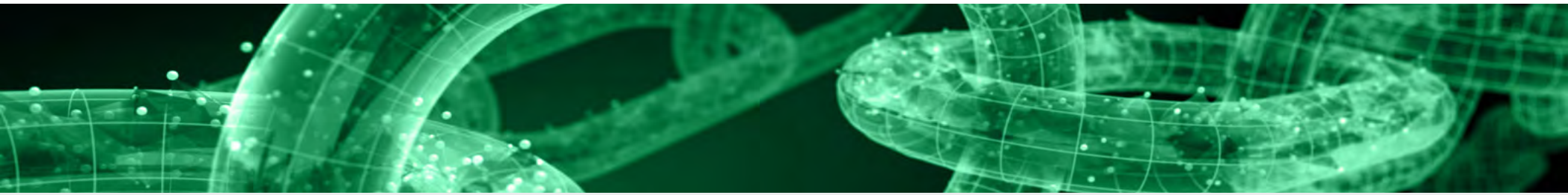
It's suggested that blockchain will enable secure messaging between devices in an IoT network by treating the exchanges like financial transactions. For instance, IoT devices can leverage smart contracts—self-executing contracts, in which the contract terms and conditions are written directly into lines of code—which provide the basis for how the devices interact. In this way, blockchain would enable industrial IoT applications to conform with compliance and regulatory requirements without the laborious process of standards organizations and government agencies testing and authorizing them.

Blockchain can also help head off cyberattacks. Consider an IoT device like a baby monitor that has been hijacked by hackers for use in a distributed denial of service (DDoS) attack. In one research project, blockchain was harnessed to authorize new IoT devices that had been added to a home network. The system was capable of disconnecting any device that was trying to do something malicious. For example, if a connected lightbulb was captured by a botnet, the system could detect if the light bulb is trying to attack an outside server and so block its signal from leaving the home. Such a system could potentially eliminate the need for a centralized authorization process for IoT devices.

It's been reported that Cisco filed a US patent application last year entitled *Blockchain Based IoT Device Identity Verification and Anomaly* that may be a step in this direction. The process Cisco seeks to patent could potentially improve the authentication of devices operating on an IoT platform while also detecting anomalies in device sensors.

One potential limitation of blockchain as an IoT safeguard is the hypothetical 51% attack problem. Because blockchain works through consensus, if 51% of the processing power in a network colludes to change a transaction, that change will be accepted.

Having a wide diversity of nodes, physically distributed around the globe, lowers the risk of 51% attacks. But a small, private IoT network, say, in a home, office building or factory is not very well physically distributed. Consequently, a determined hacker could potentially subvert 51% of the processing power in a single location.

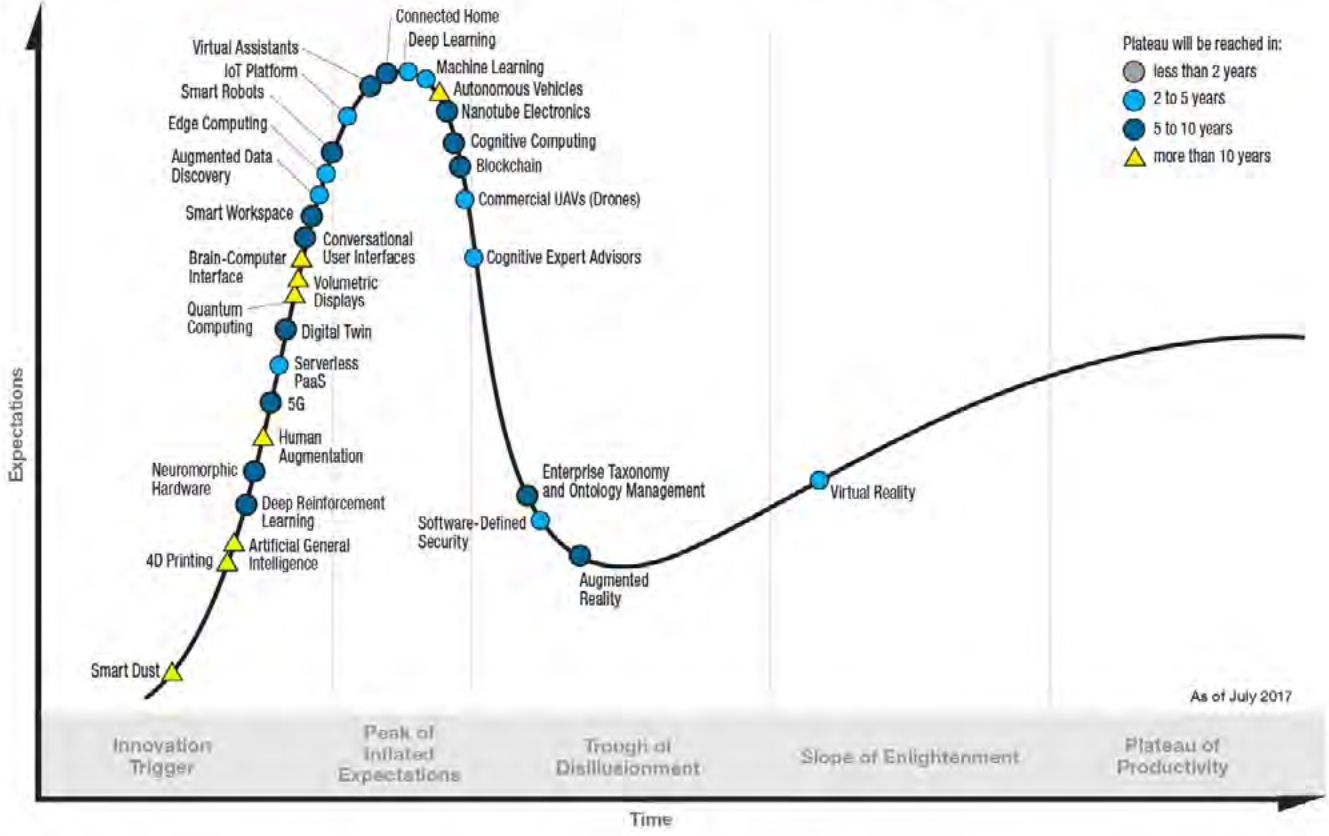


From Pilot to the Real World

While there is a growing acceptance of the business value of blockchain and a groundswell of frenetic activity, there's also evidence that the market will mature slowly. In July 2017, Gartner placed blockchain on the downward side of the "peak of inflated expectations" heading for the "trough of disillusionment" on its Hype Cycle curve. (See Figure 1.) Gartner projects it will be five to ten years before blockchain becomes a productive tool for business, which will lead to the reformation of whole industries.

Market researcher Forrester tends to agree. According to it's 2017 Top Ten Technology Trends to Watch report, Forrester ranked blockchain, cryptocurrencies and distributed ledgers at number two. These technologies are still in the dawning phase, with the expectation of a slow, 10-year development cycle, according to the report. This year, Forrester sees distributed trust systems entering a phase of early pragmatism. In 2019, it expects the

Figure 1. Blockchain is heading for the Trough of Uncertainty



Source: Gartner, Inc.

first viable commercialized blockchain-based market to launch. And 2020 will herald at least one exchange market adopting a distributed-trust model, probably in the supply chain domain.

Recent announcements from logistics and supply chain organizations and companies tend to support Forrester's prediction. In 2017, the American Productivity and Quality Center (APQC), in collaboration with the Digital Supply Chain Institute (DSCI), conducted a survey that found that one third (35%) of respondents are currently exploring the use of blockchain. The top five blockchain opportunities identified were in logistics, contracts, supplier compliance and product tracking, and billing and payments. (See Figure 2.)

Logistics leads the way

Indeed, logistics is already a hotbed of blockchain activity. The Blockchain in Trucking Alliance (BiTA), a forum for developing blockchain technology standards, is focused on standards development for the shipping industry through the implementation of a secure blockchain system. BiTA counts close to 100 companies as members including UPS, FedEx, J.B. Hunt, Landstar, SAP and Salesforce. One of the most recent members is JD.com, one of Asia's largest internet retailing companies, which joined BiTA on February 1. The Chinese company has a massive logistics arm that serves e-commerce consumers all over the world.

Figure 2. Supply Chain professions see opportunities for blockchain

Source: APQC

UPS is another recent member, joining BiTA in November. The company views blockchain as a disruptive technology that has the potential to change many facets of global commerce. A focus for UPS is blockchain applications in its customs brokerage business with an eye to improve transaction accuracy and replace existing paper-intensive, manual processes. Such an application would be highly secure and generate valuable efficiencies for shippers who rely on UPS for customs brokerage, according to UPS.

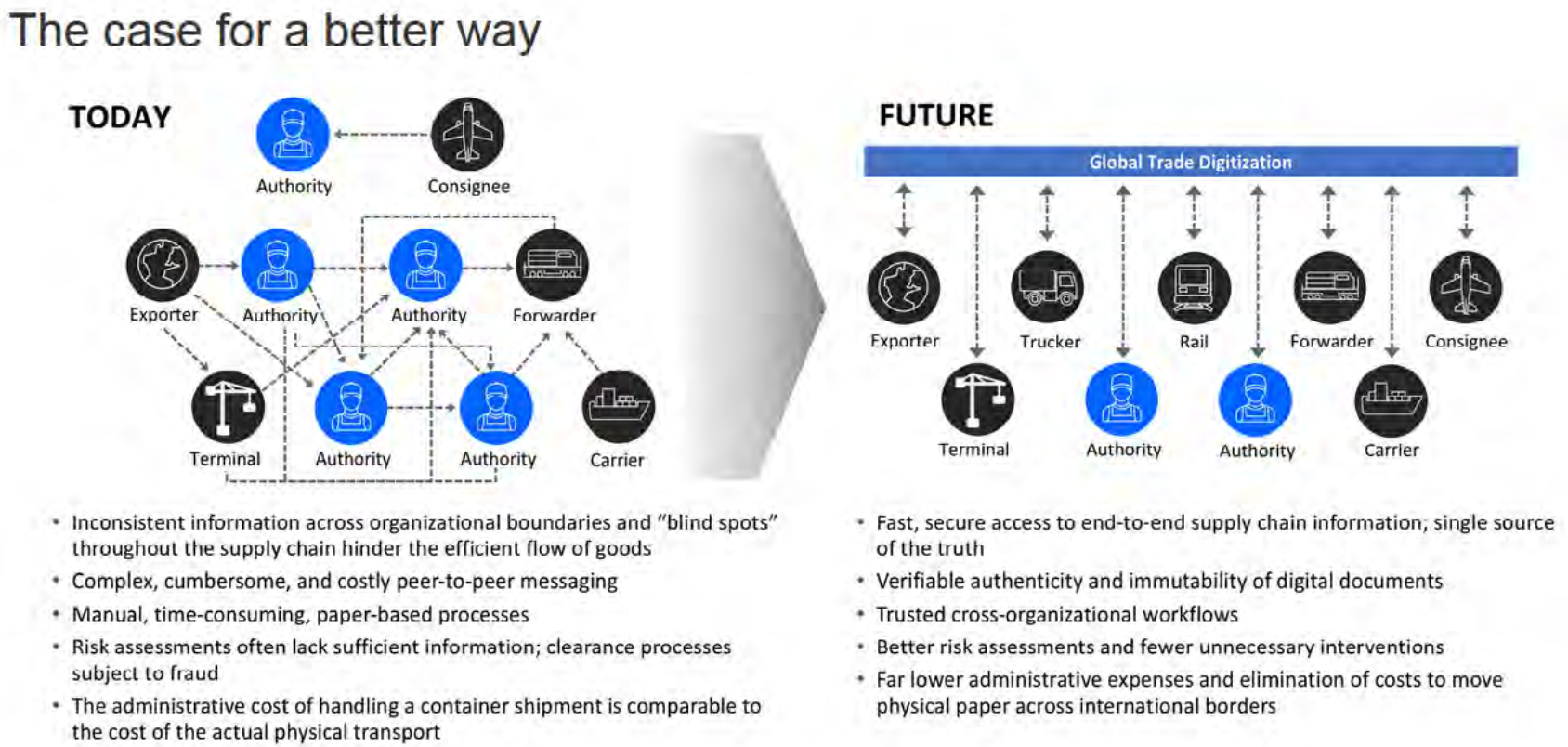
Other logistics use cases BiTA is focusing on include fraud detection and theft prevention. The transparency of blockchain transactions would remove the opportunity for fraud at many points along the supply chain and eliminate double brokering. As part of the transaction record, Blockchain can include photos and instructions for the pick-up and delivery of freight that would increase security and reduce the possibility of theft.

There are also real-world blockchain solutions in the works. In January, IBM and Maersk, the Danish transport and logistics company, announced plans to establish a joint venture to develop a blockchain-based platform to provide

more efficient and secure methods for conducting global trade. Blockchain is uniquely able to provide special control for the logistics industry, since it can replace tedious and insecure paperwork with secure, transparent digital records, according to IBM.

The two companies expect blockchain to lower administrative costs and eliminate the cost of moving paper across international borders. Today, the administrative cost of handling a container shipment is estimated to be equivalent to the cost of the physical transport. (See Figure 3.) That would be a monumental cost savings given the global seaborne container trade is estimated to account for approximately 60% of all world seaborne trade, which was valued at around $12 trillion in 2017. The two companies expect the joint venture to start offering software solutions in the third quarter of 2018.

Figure 3. IBM and Maersk plan a blockchain-based logistics platform



Source: IBM

Blockchain for electronics

There is considerable interest in blockchain within the electronics supply chain community, according to Bill Bradford, president and CEO of the Electronic Components Industry Association (ECIA). ECIA is planning to launch an initiative to explore blockchain use cases and applications as part of the organization's Global Industry Practices Council and also plans to convene an executive forum in the Spring, according to Bradford.

Among the many areas where blockchain could improve the electronics supply chain ECIA plans to focus on two related initiatives: battling counterfeit components and improving the digital traceability of components from the factory floor to the OEM. Another blockchain use case ECIA is looking to explore is the demand creation process, which impacts sales compensation, according to Bradford.

About 15% of all spare and replacement electronics components purchased by the US Department of Defense are counterfeit. Overall, the annual total cost of counterfeit parts in the U.S. is estimated to be about $200 billion in brand damage and product replacement or repair, of which $7.5 billion a year is borne by the semiconductor industry, according to IHS Markit. Add to that the need for a traceable paper trail of all transactions across the global supply chain and the value of a distributed ledger system like blockchain becomes obvious.

Challenges ahead

Whether it's bananas, cars, financial transaction or semiconductors, blockchain initiatives for logistics and supply chain operations, IoT security, contracts and financial transactions are showing that the technology has the potential to create more efficient, transparent and secure global business networks that could lower cost dramatically. Cost overruns, waste, theft and cyber attacks are the natural consequence of the inadequacy of legacy systems. Testing and then replacing those systems is a focus for the next few years.

Of course, there will be challenges. For supply chain and logistics applications, there is a need for more pre-competitive, association-led pilot programs that involve participation from companies across the extended chain. Competing companies don't have to trust each other, they just have to show up. Not participating places the no-shows at a distinct disadvantage in terms of gaining the necessary experience and understanding of blockchain that will be required.

Active early participation in these initiatives will shed light on the type and size of investment required to implement a blockchain-based business model as well as the legal or compliance issues the company will face. It also provides insight into the potential return on investment as measured by the potential for both cost savings and new market opportunities.

Participation also reveals the new skill sets that will be needed. The number of professionals that understand how blockchain technology works is growing, but demand outpaces supply. In fact, blockchain developers rank second among the top 20 fastest-growing job skills in the U.S. Job postings for workers with those skills more than doubled in 2017. Today, the median income of a blockchain developer is $130,000 a year and could well rise in the short-term.

Also, there are the technical challenges that need to be assessed, some of which may limit the potential of blockchain over the long-run, specifically in the IoT market. These include scalability of blockchains and the amount of storage and compute power required. Power consumption is also an issue. It's been estimated that Bitcoin, which runs on a blockchain, consumes as much electricity annually as Nigeria.

While a healthy dose of skepticism is prudent at this stage in the technology's evolution, there's little doubt that blockchain is gaining momentum. Is a blockchain future inevitable? Perhaps not yet, but there's little doubt it has the potential.

By Bruce Rayner, Contributing Editor