

## *Insight*

### **BLOCKCHAIN: ENABLING THE NEXT STEP CHANGE IN SUPPLY CHAIN MANAGEMENT**

You will not find it difficult to prove that battles, campaigns and even wars have been won or lost primarily because of logistics.

*Dwight D. Eisenhower*

#### **Vast and complex ecosystems**

In September we hosted a presentation by Bettina Warburg and Tom Serres, technology entrepreneurs, thought leaders, and co-founders of blockchain consultant and investor *Animal Ventures*. They gave us a deep insight into modern trade flows, the challenges that global supply chains face and how emerging blockchain technology can offer solutions. For us as long-term investors, it is part of our continuous quest to identify disruptive forces that can fundamentally change business models, challenge incumbents and give rise to new winners. This article touches on some of our key takeaways from that discussion as well as some of our own research and conclusions about where the technology is in its development and what its impact could be.

Supply chain management lies at the heart of any large global corporation and the complexity of these networks is hard to overstate. Within the consumer space, food producer Nestle sources inputs from over 700,000 farmers scattered across the globe. Within pharmaceuticals, a typical US wholesale distributor delivers 1.5 million different drug SKUs to more than 50,000 healthcare facilities to support patients. Within IT, Apple uses a global network of over 770 suppliers to produce its iPhones and iPads. To tackle that complexity companies invest billions of dollars in enterprise resource planning and supply chain management software. From connected manufacturing floors to digital shipping forms and RFID scanning, products are tracked on computerized systems from their production to the point of sale and beyond. Yet despite this huge investment in digital infrastructure, analogue gaps still exist between systems within each company and across company boundaries, translating into lack of transparency, higher costs, inventory obsolescence and in many cases fraud.

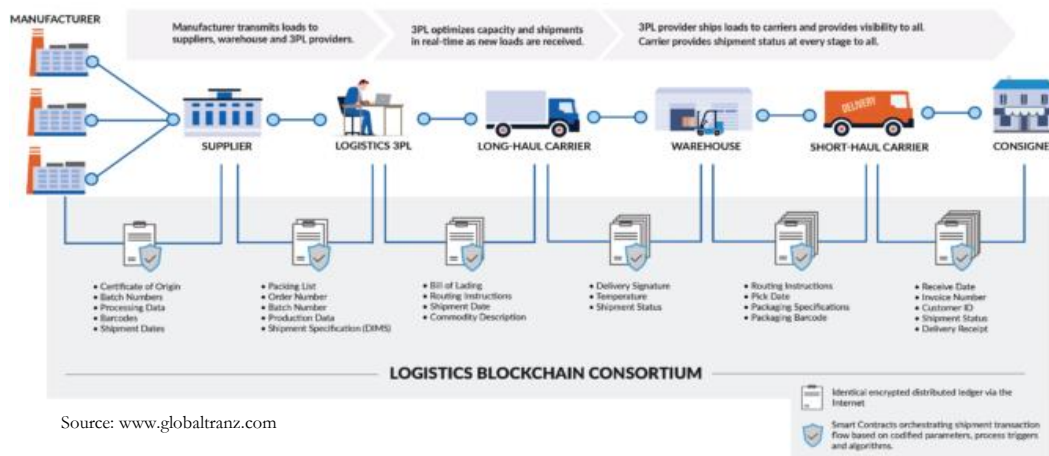
This issue has become more acute in the past decades as global supply chains have been transformed, becoming increasingly dynamic amidst shortened product lifecycles and an accelerated time to market for new product launches. At the same time, supply chains are no longer a linear network of OEMs and suppliers, but rather vast, complex ecosystems, with different product variants moving across multiple parties, all trying to work together. And every time a product crosses a national border, a whole array of intermediaries will be involved: shippers, shipping lines, freight forwarders, port and terminal operators, customs authorities and inland transportation operators.

#### **Blockchain as the solution**

Blockchain, the technology behind the much-hyped bitcoin, has the potential to transform industry and supply chains. It offers a potential solution, with the promise of increasing transparency, reducing cost and mitigating risk across the supply chain. Blockchain is effectively a digitally distributed ledger, a record of transactions or executed events that are shared across the participating parties. Each transaction in the system is time stamped and verified by participants in the system. The technology effectively digitalises physical assets

and creates a decentralized, immutable record of all transactions, making it possible to track an asset from production to delivery and providing greater product history and transparency. Its distributed verification method promotes data integrity and transparency, enabling “trustless trust,” meaning that parties don’t need to know or trust each other to participate in exchanges of value with absolute assurance. Removing the need for expensive intermediaries, blockchain also does not have a central point of failure because all participants will have a copy of the ledger, making it theoretically more durable than a centralized system.

Blockchain can help participants record price, date, location, quality, certification, and other relevant information to effectively manage the supply chain. The technology can also be programmed with embedded instructions, to carry out actions when certain conditions are met. These instructions can be used to program “smart contracts,” which link the information in a blockchain to consequences (e.g., automatic digital invoicing and payments, bulk discounts or penalty fees) when agreed terms are met or not.



The benefits could be tangible. Businesses can improve their supply chain management through more transparent and accurate end-to-end tracking. And transparency is becoming increasingly important for consumers. In fact, in recent surveys over 90 percent of those questioned list food product transparency as a critical factor impacting their purchase, expecting manufacturers to provide the necessary information. Ensuring traceability and proactively managing the supply chain can safeguard public trust and protect a brand’s image, especially in today’s social media landscape, where a single post can result in a public relations disaster.

Blockchain’s enhanced transparency may also help reduce fraud for high-value goods such as diamonds and pharmaceutical drugs. According to the OECD, counterfeit goods account for over \$450 billion in trade annually. In addition, an estimated 10–30% of medicines sold in developing economies are counterfeits, leading to countless deaths and billions of dollars in revenue losses. Blockchain can help companies understand how ingredients and finished goods are passed through each subcontractor and reduce losses from counterfeit and grey market trading, as well as increase confidence for end users.

At the same time blockchain can help businesses maintain more control over outsourced contract manufacturing. And by providing all parties within a respective supply chain with access to the same information, the technology can streamline administrative and audit processes, reduce transfer data errors, bringing down costs and improving quality of service. It is interesting to note for example that the average U.S. Fortune 100 company has

receivables of 60 days of sales outstanding. That is effectively how long it takes for it to get paid in the real world, even though typically companies interact with each other in contracts that specify payment within 30 days. This gap arises because invoices have to be generated and emailed to customers, who in turn must process them and decide when and how to pay them and it is a prime example of the still rife ground of corporate inefficiencies that can be eliminated.

## **Testing the technology**

As blockchain technology gains acceptance, we have seen in the last two years numerous players along the supply chain starting to implement projects that test its potential.

One of the most notable examples has been shipping giant Maersk, which in collaboration with IBM, conducted in early 2017 a trial seeking to replace existing paper-based systems with a blockchain application for tracking in real time critical data about shipments. Given that a container traveling across borders requires review and approval from up to 30 parties before arrival, this is an obvious area to reduce paperwork and costs as well as eliminate maritime fraud. Following the initial trial, which claimed to reduce shipping times by up to 40%, Maersk and IBM announced recently, the commercialisation of the platform under the name TradeLens, with 92 other organisations participating. The network includes more than 20 port and terminal operators, including Singapore, Hong Kong, Halifax, Rotterdam and Bilbao, customs authorities in the Netherlands, Saudi Arabia, Singapore, Australia and Peru as well as freight forwarders and transportation and logistics players.

Other pilot projects have been focused on food safety and provenance. China most notably has suffered numerous damaging episodes of food safety violations in recent years. In 2016, Walmart started one pilot in China exploring the use of blockchain to track the provenance of pork (expanding in 2017 to mangoes in Americas), while Chinese internet giant Alibaba is leading another project, alongside Fonterra and New Zealand Post, to pilot food supply chain tracking. Beyond Chinese borders, The Food Trust, a collaboration between IBM and major food industry players including Walmart, Unilever, Kroger, Dole, Tyson Foods and Nestlé confirmed in June this year a food safety and contamination tracing pilot using blockchain technology.

Another obvious area for the application of blockchain is within the pharmaceutical industry. Tracking active pharmaceutical ingredients during the manufacturing process is difficult and faces increased challenges from counterfeit drug operations around the globe. Blockchain solutions can provide a basis for traceability of drugs from production to end consumer, identifying where the supply chain breaks down and ensuring compliance with regulatory requirements. There is potential not only to reduce the \$200 billion in annual lost sales for the industry from counterfeit trade but also to increase public safety and prevent some of the estimated one million deaths per year. Among numerous projects, the MediLedger Project, a working group between Pfizer, Roche's Genentech, and US distributors AmerisourceBergen and McKesson is looking for industry specific solutions that will help the industry comply with the upcoming implementation of the Drug Supply Chain Security Act which requires the industry to adopt by 2023 an "interoperable system" to track and trace prescription drugs across the whole chain.

At the same time, start-up innovators such as Provenance and Everledger, have gained significant media and investor interest. UK-based Provenance uses blockchain technology to enable secure traceability of certifications and other pertinent information in supply chains. It enables every physical product to come with a digital 'passport' that proves authenticity and origin, creating an auditable record of the journey. Provenance markets its

solution as empowering companies to authenticate brand “stories”, as well as highlighting a positive ecological dimension, given that opaque supply chains often mask a negative environmental impact. Everledger has a more specific application within high value asset identification and tracking. It offers a global digital ledger that can track and in turn protect valuable assets throughout their lifetime journey. An asset’s defining characteristics are digitised to create a permanent record store on the blockchain. That digital ID, like a fingerprint, is used to track the asset across the supply chain and to verify authenticity. Everledger’s flagship application has been as a database to register diamonds. The company states that over 2 million diamonds are now registered on its blockchain ledger, with more than 40 characteristics such as cut, quality, colour, and clarity digitised in the form of an immutable and cryptographically secure blockchain record. The company’s diamond registry has expanded to include uncut diamonds, enabling it to play also a role in monitoring global conflict diamonds. Additional applications for Everledger include other types of precious goods, fine wine and art, in short everything of high value which can be represented in the form of a digital fingerprint.

### **Plenty of challenges still to overcome**

Despite this rich weave of initial stage experimentation, scepticism remains, with few projects moving to the next phase of large-scale implementation and the technology is still facing challenges in doing so. Indeed, it is important to remember that supply chains are inherently long and complex and typically involve numerous actors. They take time to put together and are not easy to change. The cross-border nature of modern commercial arrangements adds to that complexity. Any new application will be required to take account of different modes of operation, local rules on import and export, customs and excise, labour arrangements, and different technological standards. At the same time the costs and benefits of any network redesign do not accrue equally to all stakeholders, making some more eager than others for change. And the investment requirements for any large-scale implementation will be meaningful, as linking digital signature data with physical goods will require tamper proof hardware and sensor interfaces and a redesign of legacy systems.

Beyond these supply chain specific issues, blockchain faces broader technical challenges. It is inherently a fragmented technology, it could require compromises regarding security and privacy, it can be energy inefficient and it is costly per transaction. At the same it would be challenging to implement not only because of skills shortages, but also because it will require reformatting existing databases whilst maintaining platform interoperability.

In short, like with any new transformational technology the promise is there, but the challenges to any implementation will be significant.

Tom’s and Bettina’s website is [www.animalventures.com](http://www.animalventures.com). You will find extensive information on blockchain and its applications, from TED talks explaining it to anyone from five-year olds to experts, to deep insights and commentaries like their article on the [emerging decentralised economy](#), which is required reading in our view.

*Katerina Kosmopoulou, CFA  
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