INTERNATIONAL BUSINESS

Global Supply Chains Are About to Get Better, Thanks to Blockchain

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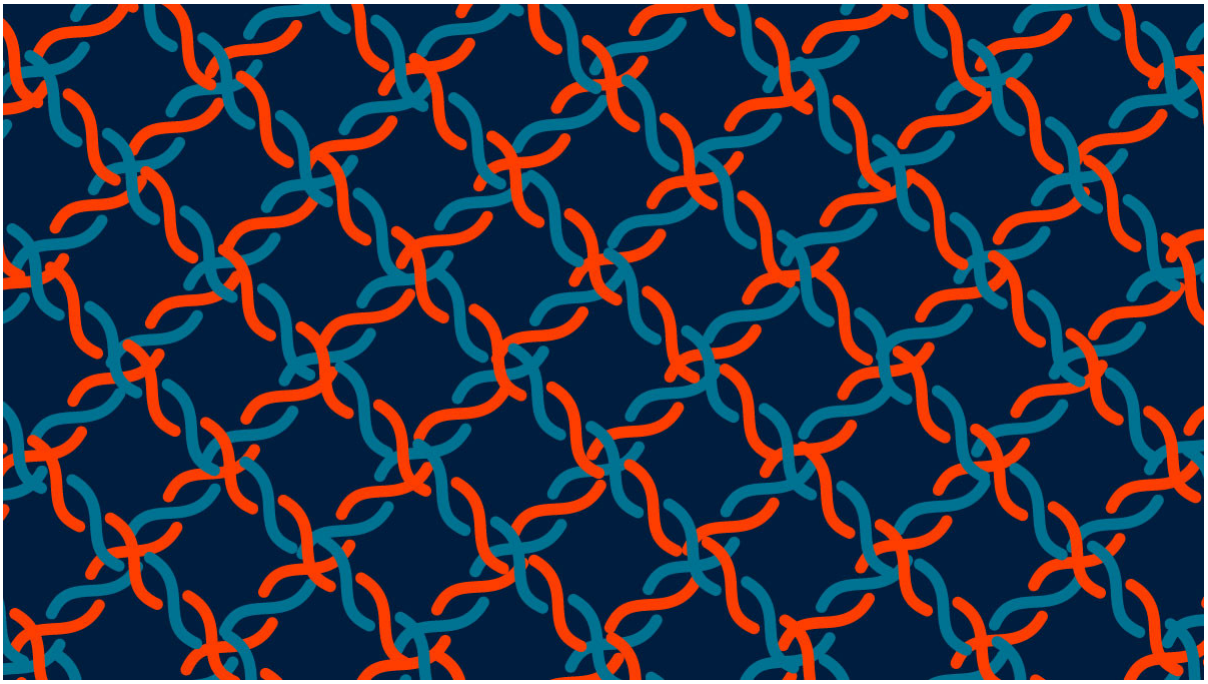

When an E.coli outbreak at Chipotle Mexican Grill outlets left 55 customers ill, in 2015, the news stories, shutdowns, and investigations shattered the restaurant chain's reputation. Sales plummeted, and Chipotle's share price dropped 42%, to a three-year low, where it has languished ever since.

At the heart of the Denver-based company's crisis was the ever-present problem faced by companies that depend on multiple suppliers to deliver parts and ingredients: a lack of transparency and accountability across complex supply chains. Unable to monitor its suppliers in real time, Chipotle could neither prevent the contamination nor contain it in a targeted way after it was discovered.

Now, a slew of startups and corporations are exploring a radical solution to this problem: using a blockchain to transfer title and record permissions and activity logs so as to track the flow of goods and services between businesses and across borders.

With blockchain technology, the core system that underpins bitcoin, computers of separately owned entities follow a cryptographic protocol to constantly validate updates to a commonly shared ledger. A fundamental advantage of this distributed system, where no single company has control, is that it resolves problems of disclosure and accountability between individuals and institutions whose interests aren't necessarily aligned. Mutually important data can be updated in real time, removing the need for laborious, error-prone reconciliation with each other's internal records. It gives each member of the network far greater and timelier visibility of the total activity.

How Blockchain Works

Here are five basic principles underlying the technology.

1. Distributed Database
Each party on a blockchain has access to the entire database and its complete history. No single party controls the data or the information. Every party can verify the records of its transaction partners directly, without an intermediary.

2. Peer-to-Peer Transmission
Communication occurs directly between peers instead of through a central node. Each node stores and forwards information to all other nodes.

3. Transparency with Pseudonymity
Every transaction and its associated value are visible to anyone with access to the system. Each node, or user, on a blockchain has a unique 30-plus-character alphanumeric address that identifies it. Users can choose to remain anonymous or provide proof of their identity to others. Transactions occur between blockchain addresses.

4. Irreversibility of Records
Once a transaction is entered in the database and the accounts are updated, the records cannot be altered, because they're linked to every transaction record that came before them (hence the term "chain"). Various computational algorithms and approaches are deployed to ensure that the recording on the database is permanent, chronologically ordered, and available to all others on the network.

5. Computational Logic

In a nutshell, this is a global system for mediating trust and selective transparency. Its advocates say it will take the internet's empowering potential to its next level. Although much attention and money has been spent on financial applications of the technology, an equally promising test case lies with global supply chain relationships, whose complexity and diversity of interests pose exactly the kinds of challenges this technology seeks to address. The technology can reveal hitherto hidden information and allows users to attach digital tokens – a unique, negotiable form of digital asset, modeled on bitcoin – to intermediate goods as they progress along the production, shipping, and delivery phases of a supply chain and as title to them passes between different players. This could give businesses far greater flexibility to find markets and price risk, by capturing the value that they have invested in the process at any point along the chain. What we end up with are dynamic *demand* chains in place of rigid *supply* chains, resulting in more efficient resource use for all.

Various endeavors have already started. Provenance, a UK-based startup, tells prospective clients they can use its blockchain-based technology to "share your product's journey and your business impact on environment and society." Walmart is working with IBM and Tsinghua University, in Beijing, to follow the movement of pork in China with a blockchain. Mining giant BHP Billiton is using the technology to track mineral analysis done by outside vendors. The startup Everledger has uploaded unique identifying data on a million individual diamonds to a blockchain ledger system to build quality assurances and help jewelers comply with regulations barring "blood diamond" products.

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Business in the Era of Blockchain

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Advances in chip and sensor technology, which can translate data from the automated movement of physical goods, should greatly enhance these emerging blockchain systems. It could be especially powerful when combined with “smart contracts,” in which contractual rights and obligations, including the terms for payment and delivery of goods and services, can be automatically executed by an autonomous system that’s trusted by all signatories.

But this technology’s potential traceability and automation benefits don’t just pertain to things; it could also keep human beings in check. Staff and supervisors from different vendors can be granted special, cryptographic permissions, which, when placed into a blockchain environment, would appear as unique, traceable identifiers – preferably encrypted, to protect the employee’s personal information. This would allow all members of a supply chain community to monitor the activity of each other’s credentialed staff. Chipotle, for example, could see in real time whether a properly credentialed person in a facility owned by one of its beef suppliers is carrying out appropriate sterilization and disinfection procedures.

This kind of provable, transparent credentialing will be especially important for additive manufacturing, which is central to the dynamic, on-demand production model of the so-called Industry 4.0 movement. A team from precision parts manufacturer Moog Inc. has launched a service it calls Veripart, which seeks to overcome a challenge that the director of its additive manufacturing and innovation unit, James Regenor, described to us in these terms: “How can the maintenance crew on a U.S. aircraft carrier have absolute confidence that the software file they downloaded to 3D print a new part for a fighter jet hasn’t been hacked by a foreign adversary?” This underscores one of the most compelling arguments for blockchain technology: Without its solution to the trust problem, the sophisticated, decentralized, internet of things-driven economy that many are projecting might well be impossible.

These potential efficiency improvements, enabled by hitherto unavailable information, suggest blockchain technology could deliver vast savings for companies everywhere. But there are formidable obstacles to overcome first.

One challenge lies in the development and governance of the technology. Ideally, to encourage free access, competition, and open innovation, global supply chains would have the option to anchor to a public blockchain that no entity controls. In other words, data extracted from commercial and production activity would be cryptographically recorded in open ledgers. But, inevitably, private, closed ledgers run by a consortium of companies will also arise, as their members seek to protect market share and profits. Both imperatives pose challenges. For one, achieving global economic capacity for the most significant public blockchains, digital-currency service bitcoin and smart contract platform Ethereum, is constrained by divisions in their open-source communities, making it difficult to agree on protocol upgrades. Second, there needs to be interoperability across private and public blockchains, which will require standards and agreements.

Another big obstacle: the law. A complex array of regulations, maritime law, and commercial codes governs rights of ownership and possession along the world’s shipping routes and their multiple jurisdictions. Marrying that old-world body of law, and the human-led institutions that manage it, with the digitally defined, dematerialized, automated and denationalized nature of blockchains and smart contracts will be difficult.

Even before governments can be convinced to support this effort, and to do so in a globally coordinated way, industry must agree on best practices and standards of technology and contract structure across international borders and jurisdictions. In Hong Kong, the recently formed Belt and Road blockchain consortium seeks to bring order to this process by adopting internet governance approaches pioneered and tested by ICANN (Internet Corporation for Assigned Names and Numbers), the organization that manages domain names. As an international, private sector-led body, ICANN has already proven itself to be an effective global administrator and adjudicator.

These challenges must be weighed against the demands of a global economy that hasn’t properly recovered from the financial crisis of 2008 and is fueling disintegrating, isolationist forces in the U.S. and Europe. Any system that promises to counter those trends by removing the intercommercial frictions that curb trade while also enhancing transparency and control for businesses and their customers is inherently worth exploring. It’s why an increasing number of investors, businesses, academics, and even governments are starting to view blockchain technology as a much-needed platform for economic renewal.

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