Infosys®
Navigate your next

VIEWPOINT

BUILDING RESILIENT SUPPLY CHAINS WITH BLOCKCHAIN

The gaps and inefficiencies in global supply chains are once again being exposed as COVID-19 and the subsequent economic lockdown pile the pressure on consumer goods, manufacturing and logistics companies. The case for improved visibility, automation and provenance through blockchain has never been clearer.

Infosys® | Knowledge Institute

As governments try to contain the spread of COVID-19, industries are scrambling to mitigate the impact on their supply chains. The pandemic has affected the supply chains of 94% of Fortune 1000 companies, according to a study by Dun & Bradstreet.[1] Even companies considered to be technology and supply chain leaders are struggling. Apple is unable to receive the next batch of iPhones, and Tesla has temporarily shut down its factory in China.[2]

It's not the first time the weaknesses of global supply chains have been exposed by unexpected disasters. The 2011 tsunami that struck Fukushima, Japan — and created one of the world's worst nuclear accidents — exposed the fact that 60% of critical auto parts were sourced from that devastated area. Eyjafjallajökull, the Icelandic volcano that cast a thick ash cloud over Northern Europe, disrupted the supply of many high-value components and forced Nissan and BMW to temporarily suspend production.[3] The SARS epidemic in 2003, caused by a different coronavirus, sidetracked parts of the electronics supply chain.[4]

While these previous experiences have resulted in some changes, the crisis of COVID-19 is once again uncovering risks and unreliability inherent in the global supply chain model. But this time, the scale is much larger.

Companies worldwide are dependent on supplies from 12,000 factories located in COVID-19 quarantined areas in China, South Korea and Italy.[5] It has been difficult for industry leaders to identify the affected suppliers in time and take quick countermeasures.

Shipping and ground logistics have been severely impacted, due to the high amount of human intervention involved. In measures to contain the outbreak, ships are being allowed to enter ports only after their crews have been tested and deemed safe. A look at the U.S. Customs import shipments indicates a sharp decline of imports at all the major ports within the U.S. Fears of the coronavirus have some concerned drivers staying off the road. COVID-19 has the potential to disable a sizable portion of trucking capacity in the coming weeks.

Businesses also struggle with the provenance of components and ingredients moving throughout their networks. This is a highly important factor when dealing with a crisis such as COVID-19. Increasingly, consumers demand evidence of the origin of their products and the exact route they have taken, especially food, consumables and baby products.

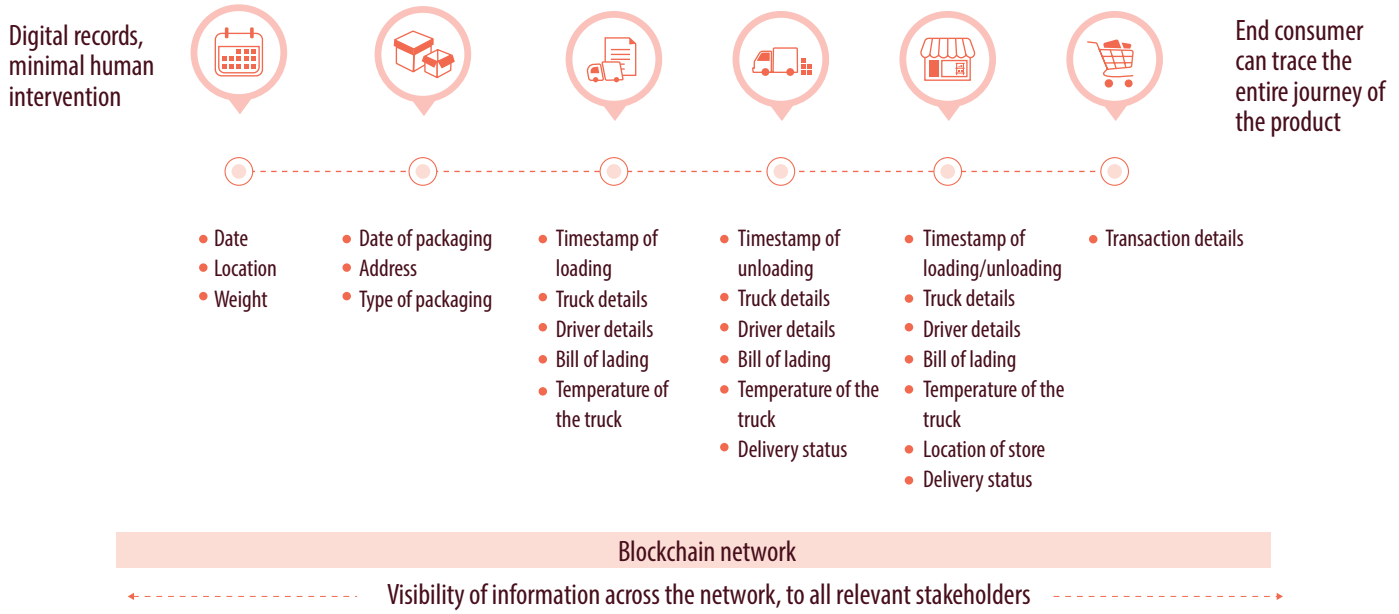
The problem is that supply chains have become highly distributed, complex and lean. This works to the benefit of all when times are good. Even then, however, tracking and traceability, agility, and visibility are limited. But when things go wrong, they really do go badly — and the cumulative effects can cause havoc globally. Pandemics such as COVID-19 give the opportunity to think outside the box about how to be more robust and sustainable, and better serve humanity.

Blockchain benefits

Global supply chains are crying out for a systematic approach to organize data in a trusted way, and that can help in creating a tool for assessing risk and mitigating disruptions. Such a risk-based model can be built using blockchain.

Initially designed to support the Bitcoin cryptocurrency, blockchain in essence is a distributed ledger, in which the transactions are shared with multiple computers instead of being stored in one central location. The visibility of transactions that have multiple parties provides transparency and security. Once information is uploaded on blockchain, it cannot be changed, assuring immutability and trust. This becomes the keystone of a trustworthy digital supply chain. When transactions are stored in blockchain, all relevant information is visible to the entire supply chain. The immutability, traceability and transparency establish the provenance of the products throughout the supply chain.

Figure 1: Blockchain reduces human intervention through digitization, and ensures visibility and provenance



Source: Infosys

Visibility

The supply chain visibility of most enterprises will be tested during 2020 due to COVID-19. At times like these, business sustainability will be a function of how well enterprises know their value chain. An archaic supply chain system may buckle under the immense pressure of these latest global developments. Many businesses still lack a view of upstream and downstream inventory levels to cater to rapid changes in demand.

After previous disruptions, firms made efforts to have multiple suppliers in order to distribute the risk. But they did not have enough visibility into the network to know that their new tier 1 suppliers were dependent on the same old tier 2 suppliers. And many of those firms are located in the Chinese epicenter of the current outbreak. These "invisible" suppliers are now under temporary lockdowns or understaffed due to quarantine restrictions.[5] Firms waiting on the other side of the Atlantic are struggling to assess the enormity of this shutdown.

Blockchain-based supply chains bring all the participants to the same network, untangling the complex global system and providing visibility each step of the way. The firms can see all layers of suppliers and subcontractors, their locations, and the production capacity. This allows them to assess their risks, simulate scenarios, perform what-if analyses and take preventive action. This also helps companies fast-track their responses when conditions are changing rapidly.

Knowing the exact location of products in real time also gives companies greater flexibility in managing orders. In one hypothetical example, a router company has ordered 100,000 devices, half of which are being manufactured in Japan and half in Wuhan, China. On blockchain, the company can see that production in Wuhan is slowing. This enables the company to take corrective actions and minimize the impact.

Digitization

Due to the effects of the pandemic, bulk freight shipments have decreased by 70% since January. Forty percent of China's trucking capacity remains offline due to quarantine regulations and the fear of infection. Countries are taking many preventive measures at ports of entry to slow the virus' spread, such as restricting crews from disembarking.[6] At some ports, ships also have to provide declarations of crew health. And if there are suspected cases of COVID-19 aboard, the ships are not allowed to dock there.[7] Even with these precautions, port workers and truck drivers are at greater risk of infection because of their frequent interactions with people from other regions or countries.

A fundamental challenge of global trade is its inability to function in the absence of physical interactions, which stems from the lack of complete digitization of various documents and processes across supply chains. The

Transporting a single sea container requires 28 parties, each with its distinct record-keeping system

human layer of interactions provides the trust needed for these documents/processes. Individuals, businesses, countries and the world should adopt a measure to augment the existing digital capabilities for supply chains with trust — trust that is not a function of relationships, physical contact or some other archaic means. Trust has to be intrinsic to the systems and therefore scalable to support supply chains in any situation. Blockchain is the best-suited technology to help organizations leapfrog to trusted digital supply chains.

On average, there are 28 parties involved in transporting one sea container, and all have their own record-keeping systems. Blockchain, which is a trustworthy digital database at its core, stores the digital records of transactions among all the parties. Thus, blockchain provides the single source of truth for all parties involved. Even before a ship arrives at a port, authorities get all its details — the owner, content in cargo, crew members and route — without having to sift through loads of documents. Port authorities can then decide whether the ship needs to be inspected, quarantined or cleared. This reduces both uncertainty and the need for human interactions.

The benefits are great and are already employed in many parts of the world. The Port of Rotterdam, one of the busiest in Europe, is developing one such blockchain-based solution for port logistics. The entire shipping process is paperless, tracked up final to final delivery.[8] Shipments and orders are visible to all stakeholders in real time and financial transactions are instantaneous, decreasing risk and increasing reliability and interoperability.

The U.S. government's use of blockchain in its customs management has allowed many of its employees to work from home in order to control the spread of COVID-19. All documents are processed virtually, so customs officers are not tied to their desks or even the ports.[9]

> Smart contracts automate digital transactions and trigger events upon the fulfilment of certain conditions

Reconciliation is another process that takes up a lot of time, especially during periods of adversity. This puts a financial burden on transport companies, which might already be losing business due to government restrictions and low volumes. Smart contracts can prove worthwhile in such circumstances. Smart contracts are protocols that automate digital transactions and trigger events when certain conditions are fulfilled. With smart contracts, as soon as the truck delivers the goods to the warehouse, the bill of lading is digitally countersigned and verified, after which the money is immediately transferred to the transport company. Transactions can be instantly verified by all the parties — the bank, Walmart and the transportation company.

Provenance

The past decade has seen increasing pressure on corporations to ensure trusted transparent supply chains. This philosophy is now a necessity with the rapid spread of COVID-19. Consumers fear that merchandise might have come from or traveled through a virus-infected area. Consumers, carers and governments are now obliged to prove not only the origin of products, but also where they have been throughout the supply chain — and whether they could have been contaminated, tampered with or mistreated on the way.

Consider meat being transported in a cold-storage container. Once the meat arrives at a warehouse, the company receiving it needs to take a few samples and test them in the lab to check quality. Even if the results are positive, the receiving company can never be sure about the origin of the meat or how the whole batch was transported. The only assurance is the logistics company's word that the chain of cold storage was maintained throughout the journey as promised.

These concerns can be put to rest with blockchain. The various parties — producers, shipping firms, ground transportation, wholesalers and retailers — are all part of the same blockchain network. While aggregating the meat produced, the company records this information and loads it onto blockchain network. The meat is then packed and moved to cold storage containers and shipped to various destinations by sea. Once it reaches the port, it is transported by cold-storage trucks to the wholesaler's warehouses. It is then distributed to retailers.

Throughout this journey, tamperproof "internet of things" devices in the storage containers and trucks can record the temperatures and transmit them to blockchain. Smart contracts can be written so that if the temperature moves above or below the specified range, an instant notification is sent to the parties, alerting them of this breach. They can then immediately decide how to handle the presumably damaged products. When consumers finally buy the product, they can understand the entire journey just by scanning a QR code.

Provenance becomes even more relevant in cases of foodborne diseases. The products from affected areas can be quickly discarded, while the products from safe areas can continue to move on unaffected.

Areas blockchain can help:

1. **Verify History and Record of the Supplier:** A single original equipment manufacturer (OEM) product can have components or services from dozens of suppliers, and an effective failure monitoring system must look deep into the supply chain. Each layer must be closely scrutinized and processes put in place to ensure accuracy of reports. Many OEMs rely on a core group of suppliers to ensure the integrity of their products. These suppliers are often listed on an approved vendor list. This list is continually evaluated, with new players added and older ones removed as necessary.

2. **Stay Abreast of Rules and Regulations:** Environmental and other compliance requirements have ballooned in recent years and across multiple geographies. Failure to comply with these regulations or the U.S.-driven regulations on "conflict minerals" is guaranteed to result in product recall.

3. **Ensure Tighter Collaboration Between Distributors, Suppliers, OEMs:** All segments of the supply chain must work tightly together to avoid product recalls, but harmonizing the relationship is the main task of the OEM.

4. **Secure the Shipment:** Some product recalls occur because of damage suffered after production rather than as a result of defects in parts or problems on the manufacturing floor.

Time to chain(ge)

Technologically, blockchain could be the ideal solution to provide necessary transparency, visibility and trust. It is easy to integrate with existing Enterprise Resource Planning systems and can form the basis for the creation of highly complex yet easy-to-use supply chain planning systems.

Yet its adoption will cause significant disruption — and it will likely face pushback from some supply chain players. Many might not appreciate the transparency, being wary that it will expose the fragile and risky areas of their network to their customers. Blockchain also levels the playing field, creating an open market and decentralizing power away from those who may have enjoyed it in the past.

Change is always painful. But if firms use this opportunity to create better systems, the global supply network will emerge stronger and better suited to the needs of our modern world. The drive for this change must come from buyers — consumers, retailers and consumer packaged goods firms. But measures should be taken with participants further upstream to highlight the long-term benefits, while initial projects must quickly prove their worth in the short-term to all involved.

The creation of blockchain consortiums can help here, bringing together players within a network to take the journey together. In a world where supply chains and markets are global, so are adversities. There are no guarantees that this will be the last pandemic of this scale. And other unforeseen disasters are inevitable, making it particularly vital to take bold steps now to rebuild a more resilient base for the future.

References

1. "94% of the Fortune 1000 are seeing coronavirus supply chain disruptions: Report", Erik Sherman, February 21, 2020, Fortune.com
2. "Coronavirus And The Remaking Of Global Supply Chains", George Bailey, March 6, 2020, Forbes.com
3. "Nissan and BMW car production hit by volcano disruption", April 10, 2010, Theguardian.com
4. "How Is The SARS Virus Infecting The Supply Chain? WIll You Be Affected?", Mark David, May 11, 2003, Electronicdesign.com
5. "Coronavirus Is Proving We Need More Resilient Supply Chains", Tom Linton, Bindiya Vakil, March 05, 2020, HBR.org
6. "Coronavirus outbreak: Measures and preventive actions by ports", March 26, 2020, Ship-technology.com
7. "Coronavirus - Update 9 March", March 09, 2020, portofantwerp.com
8. "How Rotterdam is using blockchain to reinvent global trade", September 12, 2019, Port of Rotterdam
9. "More US customs broker, forwarder employees work from home", Chris Gillis, March 17, 2020, freightwaves.com

Author

Gopikrishnan Konnanath

SVP & Global Head - Oracle Services and Blockchain
Gopikk@infosys.com

About Infosys Knowledge Institute

The Infosys Knowledge Institute helps industry leaders develop a deeper understanding of business and technology trends through compelling thought leadership. Our researchers and subject matter experts provide a fact base that aids decision making on critical business and technology issues.
To view our research, visit Infosys Knowledge Institute at infosys.com/IKI

For more information, contact askus@infosys.com

Infosys®
Navigate your next