

A large, white wireframe map of North America is positioned on the left side of the page. The map is composed of a network of white lines connecting various points, creating a mesh-like structure that outlines the continent. The background is a dark blue gradient with small white dots scattered across it, resembling a starry sky or a digital network.

Unlocking supply chain benefits through blockchain technology

As the advantages of blockchain technology become clear among all organizations, it is poised to revolutionize supply chain logistics.

Paritosh Gambhir

Partner, National Lead, Blockchain, KPMG in Canada
416-777-3335 | pgambhir@kpmg.ca

Peter Bevan

Manager, IT Advisory and Blockchain, KPMG in Canada
416-777-3785 | pbevan@kpmg.ca

Frankie Davenport

National Program Lead, Senior Manager, Blockchain, KPMG in Canada
416-777-8047 | frankiedavenport@kpmg.ca

Jérôme Thirion

Partner, National Lead Supply Chain & Operations, KPMG in Canada
416-777-3074 | jthirion@kpmg.ca

Where did your product come from? How did it get here? What happened along the way? You may know your customer, but how well do you know your vendor? Once upon a time these were easy questions to answer.

Now, as concerns over product quality and ethical sourcing drive demand for greater clarity over a product's journey, organizations across all industries are challenged to derive clear answers for increasingly complex supply chains.

This is where blockchain and Internet of Things (IoT) technologies are poised to reshape the supply chain environment.

Complex times, sophisticated measures

Globalization and cost-reductions are among the forces adding complexity to modern supply chains. Organizations are going to great lengths to deliver their products at cheaper costs, and the pressure is on procurement managers to seek more cost-effective solutions either by sourcing materials and services overseas or enacting cost-cutting measures among their partners. As a result, supply chains are expanding to include touch-points across the globe, creating intricate manufacturing plans, shipping routes, and regulatory challenges – and that is before products even land in Canada for distribution.

Entire industries have risen up to help companies make sense of this complexity. Still, with stronger scrutiny over the source and quality of products – especially among global players – there is a need for capabilities that will allow companies to

not only track a product's complete migration from source A to shelf B, but disentangle our increasingly complex supply chain logistics.

Enter: Blockchain and IoT

Digital ledgers and peer-to-peer transactions are terms more commonly associated with the technology and finance sectors. Yet as the advantages of blockchain technology become clear among all organizations, it is poised to revolutionize supply chain logistics.

The technology would take a paper in itself to explain, but the concept is (relatively) straightforward. A blockchain unites all supply chain partners with a distributed ledger of an immutable 'chain' of events which contain real-time information pertaining to a product's journey. Partners participating in this 'chain' have the ability to both add their data to the chain as well as view what has already been uploaded by other partners, helping them keep better track of the process and their role within it.

Traditionally, companies have only had access to information about a product's journey after the fact. Working in tandem with key technologies, however, a blockchain can help organizations track every aspect of the product (e.g. volume, location, condition, and even temperature) and can be instantly recorded and uploaded to the blockchain's nodes.

Those technologies include IoT devices, which can inform the blockchain with the help of sensors and self-reporting devices at each step of the product journey (e.g. on a cart, in a factory, in a truck, etc.). Each device is connected to the blockchain with a unique identity, where it uploads



Securing the links

The strength of a blockchain is also determined by the trustworthiness of its tools. And while IoT sensors and related real-time devices play a critical role in unlocking the aforementioned benefits, their relatively minimal design can raise concerns over their ability to adequately uphold blockchain security.

More specifically, while there are many IoT and blockchain device solutions in the market that are made to uphold high levels of security, the possibility that some manufacturers may leave critical security features on the cutting room floor in order to save costs and simplify their designs is real. For this reason, implementing IoT sensors and related self-reporting devices benefits from a comprehensive IT strategy that includes a robust cybersecurity assessment of the IoT component.

real-time information to the blockchain regarding everything from sourcing locations to shipping updates, and product volumes to environmental conditions – information which can keep all partners in a blockchain informed about the product journey every step of the way. The key differentiator here is while the sensors track the movement of the product, help track inventory, and where applicable help with transportation logistics, the blockchain provides a real time view of data integrity (i.e. of the information being provided by such devices or sensors).

Enabling supply chains with IoT and blockchain has many advantages. Consider the following examples:



Operational efficiencies

The ability to track a product's journey from farm to fork (or mine to finger, factory to shelf) gives organizations the means to spot delays and logistical speed-bumps along the 'chain' and respond accordingly. Knowing where product is coming from, and the products condition as it travels through the value chain married with enterprise and manufacturing data, can provide greater peace of mind in regards to measuring product quality, and help determine the causes of delays and dysfunctions and react with appropriate actions to resolve as well as manage product recalls as deemed necessary.



Total recalls

The ability to better track, record and transfer parts across all manners of a production value chain with Blockchain can enable organizations to develop more efficient and cost-effective recall strategies. For example, the ability to trace the journey of a defective part from its origin to specific factories and to the consumption point can allow organizations to estimate the scope of recall and manage the recall procedures effectively and efficiently, saving both time and resources associated with less-informed recall strategies. This would also be extremely applicable in the pharmaceutical world, where drugs may need to be recalled due to regulations, new research or defects¹.



Negating reconciliations

The distributed nature of blockchain 'nodes' suggests that organizations may no longer need to spend time and resources conducting reconciliations, provided the proper controls are in place and monitored.



Minimizing losses

Consider a shipment of one million tomatoes that makes it to Canada with 10,000 fewer units than expected. It would normally take weeks to investigate and reconcile those losses. Using IoT sensors, organizations can record the handlers' interaction and track the impact of the various conditions, such as deviation from prescribed storage temperature setpoints, transportation issues, etc., encountered by the tomatoes to determine the cause of spoilage or damage. Combined with self-reporting devices, and it is possible to create a system wherein these incidents are automatically logged, tracked, and reconciled securely within the blockchain to be seen and validated by relevant parties. All told, these insights can help mitigate and reconcile product losses due to fraud or other unforeseen circumstances.



Ethical sourcing

A majority of customers want the peace of mind of knowing their products are coming to them by way of fair, legal, and conflict-free means. That can be difficult to verify for a procurement professional who may have hundreds of files on their desk and little leeway to visit every site in their chain. IoT sensors and blockchain technology can therefore help organizations track their products' origins to ensure they are being ethically sourced, and continue to do so on a consistent, real time basis.



Food safety

Being able to track products from their originating farms to their treatment on grocery shelves gives retailers the backing to certify their goods are being made according to the highest standards or, in the case of food, that they are verified 100 percent vegan, organic, kosher, etc. And as noted, these technologies can also make it possible for stakeholders to narrow the scope of food recalls by tracking corrupted products down to their originating factories or farms.



Maintaining product standards:

As with food safety, similar assurances can also be embedded in the non-food retail world, where organizations can use self-reporting, blockchain, and real time sensors combined with smart contracts encoded with specifications relevant to industry standards to automatically validate product conformance to industry standards and create immutable record for each product to allow easy traceability and reporting.



Stronger negotiations:

In a typical deal, a procurement team may sign a contract with their supplier, get their 20 percent discount, and assume all will go as planned. The challenge with this approach is they may be unaware of product delays or errors along the way. By embedding IoT sensors from the point of origination to the final drop-off, parties can leverage real-time blockchain data to gain insight into what is actually occurring throughout the product's transportation. And given the added assurances that blockchain can provide – especially in the event connected devices go dark at various stages – one can see why this data can be useful in informing an ongoing and reactive negotiation process.

¹ <https://institutes.kpmg.us/content/dam/institutes/en/healthcare-life-sciences/pdfs/2018/demystifying-blockchain-for-life-sciences.pdf>



Efficient trade financing: It is possible for consumers on a blockchain to include their bank as a node and give consent to provide details of their account to suppliers of their choosing. Doing so can help side-step lengthy transaction times and credit processes, and give suppliers the means to make real-time decisions based on their client's current resources and product journey updates via IoT sensors and self-reporting devices. The banks could be added as a participating node to settle payments as transactions are recorded (rather verified on a real time basis), increasing cash flows for all participants on the chain.



Smarter contracts: Blockchains can be set up with self-executing protocols that automatically link all support parties to the transaction, thereby saving time and process costs. Adding financial institutions to the chain, for example, enables parties to conduct timely transactions, while including insurance could enable real-time rate fluctuations based on any number of factors (e.g. weather, road conditions, regions), and service providers could equally adjust their conditions on the go based on up-to-date feedback.

Guarding the chain

Like all data-driven technologies, users must consider the 'garbage in, garbage out' principle; that is, the quality of a digital ledger is intrinsically linked to the security and effectiveness of its controls, protocols, and cyber security measures. *In addition, you need to be sure that the technology being used is the right solution to the right problem.*

Indeed, the value of blockchain governance cannot be overstated. The risk of uploading fraudulent, corrupt, or inaccurate data will always exist – especially as long as real people are part of the equation. That is why it is critical for blockchain technology to be embedded into supply chains alongside the proper controls and cyber security measures. Using the right technology to solve the problem is critical, including considering which sensors to use, and how to ensure they are not being compromised.

And as more and more industries become wise to the advantages of blockchain and IoT innovations², it is critical to ensure those controls are suitable, monitored, and ready for the challenges ahead.

What to do next

While the journey to blockchain adoption may seem complex, there has been an explosion of investment and vendor startups that is broadening the scope of choices available to organizations. Organizations need to develop roadmaps and strategies for blockchain that are tied to clear business benefits, as well as a solid vision of the technologies needed to quickly harvest the benefits. Four broad phases of an organization's blockchain roadmap are:

- 1 Begin with an adoption strategy that explores value potential across the business model.
- 2 Develop fast fail proofs of concept for specific areas to quickly prove the potential to realize value.
- 3 Utilize proofs of concept to learn the implications of blockchain for the organization and lay out the necessary architectural vision including on-chain and off-chain capabilities.
- 4 Consider other digital technologies such as mobile, smart devices, big data and analytics, intelligent automation, and cognitive analytics, which together with blockchain can open up strategic possibilities.

² <https://institutes.kpmg.us/content/dam/institutes/en/healthcare-life-sciences/pdfs/2018/demystifying-blockchain-for-life-sciences.pdf>