BLOCKCHAIN FOR BREXIT

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In August 2017, the British government released a position paper on future customs arrangements with the EU following Brexit. Among other things, the paper suggested that new technology would address some of the challenges of maintaining trade "as frictionless as possible". In his report, the BBC technology correspondent mentioned number plate recognition, artificial intelligence, and of course blockchain.

In this paper, we are looking at what blockchain can and can't do to address this challenge.

First, let's understand the nature of the challenge. When goods cross a customs border, they have to be declared. Some shipments are inspected to check that these declarations are accurate. This process has three objectives:

- To ensure that the goods don't exceed some import/export quota, and to levy customs duties if necessary.
- To ensure that the goods satisfy applicable standards and regulations - for example food safety.
- To identify contraband or counterfeit goods.

Importers should be able to submit customs declarations electronically before the shipment reaches the border. This should enable customs officials (or algorithms working on their behalf) to select shipments for casual or close inspection, thus reducing delays at the border.

Note that these processes already exist for goods entering the European single market. But the potential impact of Brexit is a massive increase in the volume of cross-border shipments, and current systems and procedures are not expected

to be able to handle these volumes. Goods will be delayed, with implications not only for cost but also the quality of fresh produce. Just-in-time supply chains will be disrupted.

The primary contribution of blockchain here is establish a robust and watertight data trail for goods. This means that if goods are properly labelled, the blockchain can deliver a complete history. This doesn't remove the need for customs declarations, but under certain conditions it could reduce the need for inspections at the border. For example, instead of being located at the border, a plain clothes customs inspector might visit retail outlets with a hand-held label reader, verifying the blockchain record associated with the label, with the power to seize goods and instigate prosecutions.

The blockchain can tell you about the provenance of the item identified on the label, but what's to stop someone switching labels, reusing old labels or even cloning labels?

For some goods the stakes are very high. The lost revenue from the smuggling and counterfeiting of cigarettes alone is estimated at €10bn a year. So a Europe-wide system is being implemented to track cigarettes: by May 2019 all tobacco products within the EU are required to be "marked with a unique identifier" and security stamp. So that's just one high-stakes product, with a relatively small number of manufacturers.

For diamonds, the stakes are even higher. The Kimberly Process Certification Scheme (KPCS) was introduced in 2003 to control trade in "conflict diamonds", but there are many flaws in the scheme.

"If a consumer went into almost any jeweller in the UK and asked for the origin of a diamond on display, staff would most be most unlikely to be able confirm which country, let alone the mine, it was sourced from."

Guardian, March 2014

At Reply, we are working on some interesting innovations for specific high-value products. One possibility is to inscribe a unique identifier into the product itself. For example, diamonds can be etched with a laser, expensive shoes can have the identifier embedded in the heel. And with 3D printing, it may be possible to manufacture each item with its own unique identifier.

Another possibility is to create a detailed description of each item. Everledger, which describes itself as a permanent ledger for high-value assets, uses more than 40 features, including colour and clarity, to create a diamond's ID. It is now moving on to other high-value products such as fine wine. In future, such schemes should make it more difficult to pull off the kind of criminal sleight of hand for which Rudy Kurniawan got ten years in prison.

To prevent cloning, you need more than blockchain. Just as number plate recognition fails if people can use false number plates, so blockchain labelling fails if people such as Kurniawan can easily reuse or copy the labels. At a wine auction in 2006, he offered eight magnums of 1947 Château Lafleur. This immediately aroused suspicion, because only five magnums were ever produced. If he had sold each bottle separately, would anyone have noticed? Yes perhaps, if every sale had to be recorded in the blockchain.

If criminals have access to such technologies as etching and 3D printing, they may be able to create exact copies of labels and products that would appear valid when checked against the blockchain. So to guard against this, the blockchain has to have sufficient visibility of the supply chain to detect any duplicates.

In other words, to use blockchain properly, it's not enough to maintain a record of the origin of an item. You have to have a complete record of all transactions involving the item, including inspections. This means adding to the blockchain at every link in the supply chain. As the industry body BIFA observes in relation to blockchain generally,

> "this technology … can only reap its full benefits if all stakeholders/members of the supply chain make use of the technology and can access it".
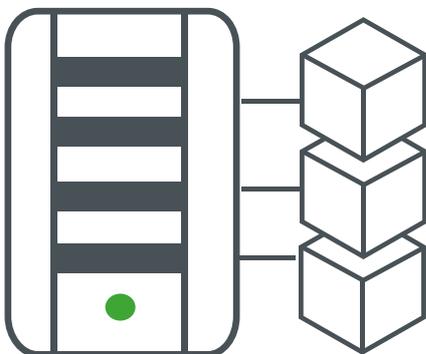
Further difficulties arise where goods are processed. For example, when a large animal or fish is cut up into pieces, to be sold to multiple consumers. Blockchain can be used to check that the total weight of the pieces is consistent with the original weight of the whole, but again this assumes that all the pieces are tracked. However, there is considerable interest in getting this kind of scheme to work effectively for products where sustainability is a major issue, such as tuna.

Where there are transformation points in the supply chain - such as cutting a rough diamond into jewels or cutting a whole tuna into steaks – these points can be subject to special monitoring and certification, and this can itself be written into the blockchain for further reassurance.

As well as providing a robust and watertight data trail, the blockchain can also provide improved supply chain visibility, as well as triggering predefined events and transactions via the use of Smart Contracts, typically based on the Ethereum blockchain. For example, this could include automated payments and automated updates to trade/ tax databases as soon as the goods arrive in the UK. There may also be opportunities for insurance companies to underwrite customs delays, similar to the scheme currently being trialled by French insurance giant AXA for flight delays with their 'Fizzy' product, triggering automatic compensation payments when the specified conditions are met, based on specified parameters (hence the new term 'parametric insurance'), in this case the actual landing time of an aircraft, for whatever reason. No more time-consuming arguments with the airline about the cause of a delay and the wording of an insurance policy. You get paid as soon as you land if the delay is greater than that stated in the smart contract.

A similar approach could be used for transporting fine wine or foods; via IoT sensors feeding into a blockchain smart contract, has the item been transported at the correct temperature or humidity? If not the contract could be annulled or reductions to payments automatically enforced, or penalty fees paid.

Or instead of triggering a payment, a delay could trigger a differentiated service. For example, if your fresh produce is delayed at the ports, a faster but more expensive transport service (motorbikes? helicopter?) is deployed to deliver the produce to your stores. You could then have an agreed formula that shares out the cost of the helicopter between the affected parties, including insurance underwriters if appropriate. (For very large importers, such as the major supermarkets, it will probably be cheaper to self-insure.) One of the key factors here is the automation in the smart contracts which makes these approaches viable, by cutting out manual processes and decisions which would otherwise need to be enacted by humans, and would often take longer than the window of opportunity is to act.

Is there evidence that this is happening in industry today? Well, we see movement in traditional industries in the topics described above, such as by the Port of Rotterdam, who are looking into Blockchain applications for the tracking of cargo, which shows that blockchain technology is beginning to be both understood and applied in this area.

We see Reebok embedding 3d-printed tags in their shoes to avoid counterfeiting. We see WalMart trialling blockchain in their supply chain for food safety. We see Maersk investing heavily in the subject for Marine Insurance. At Reply we track over one hundred of these examples around the world in our Blockchain Observatory book.

In summary, there are significant opportunities for blockchain in supporting the supply chain for selected high-value or time-critical products, provided certain assumptions are met. Blockchain is not necessarily the whole solution, but works when appropriately combined with other innovations.

But even these schemes will take years to get up to speed. We started with the problem of massive increases in the volume of shipments crossing customs borders. In the examples we've discussed here, customs facilitation is not the primary motive for introducing blockchain, but may be an additional benefit. However, it is hard to see a sufficient number of these schemes being operational in time for Brexit, let alone a universal schema for all categories of goods.
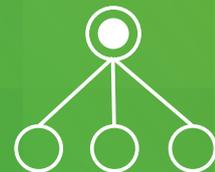
ABOUT REPLY AND BLOCKCHAIN

Reply works with a number of customers across multiple verticals including Finance, Telco and Retail around the possibility of incorporating blockchain solutions in their business. Our offerings in this area range from Exec briefings about blockchain technology and its application, Blockchain Innovation Labs which are 2-3 day guided workshops utilising Design Thinking approaches to identify suitable applications within a business, to distinct Proofs of Concepts called 'Blockchain Accelerators', built by our team of Blockchain designers and coders, which are ready to be customised for a particular customer and need.

Our twelve Blockchain Accelerators are designed to reduce the time to market for our customers when choosing a blockchain solution in order to give a commercial edge, and one of these accelerators – called "4Retail" touches upon the subject of this white paper; giving the ability to register and track an item from Manufacturer, to Distributor, and on to an end Customer, with every step recorded in the blockchain.
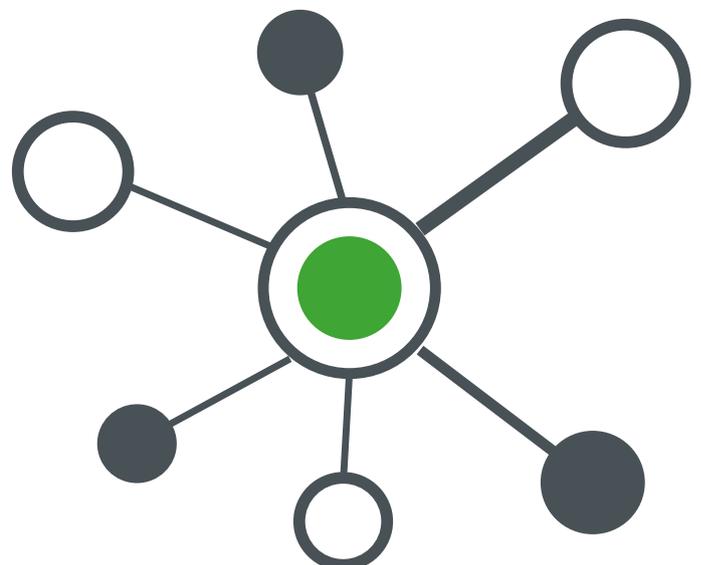
Why do this on a blockchain? It allows different actors (for instance Raw Material Suppliers, Semi-Finished and Finished Goods Producers, Test Laboratories, Employees and Global End-Consumers) to collaborate in a trustless context, benefiting from the following functionalities:

Full supply chain tracking: every actor is able to get the supply chain status related to a specific item by fetching blockchain-registered information.

Advanced proof of authenticity: beyond tagging each item with a non-removable tag, items' authenticity and certified distribution can be publicly audited by inspecting their history directly on blockchain.

Smart provision of after sales services: manufacturers could embed after-sales services functions (e.g. item verification) inside a smart contract logic, which is promptly activated as retailer sells a customer the item.

Post-sales benefits including automated loyalty points, automated warranties, all enabled and recorded on the blockchain.

If you are interested in exploring blockchain, or other alternative approaches to your business model, Reply can guide and provide support for customer-centric strategy, planning and delivery.

REPLY specialises in the design and implementation of solutions based on new communication channels and digital media. Through its network of specialist companies, Reply supports some of Europe's leading industrial groups in Telco & Media, Industry & Services, Banks & Insurance, and Public Administration to define and develop business models, suited to the new paradigms of Big Data, Cloud Computing, Digital Media and the Internet of Things. Reply services include: Consulting, System Integration and Digital Services.

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