The Lure of the Technological Quick Fix: Blockchain and the Case of Cobalt

New technologies have greatly increased global demand for cobalt from the DRC, where abuse of fundamental labour rights is a 'daily experience' for mine workers

We live in a time where new technologies seem to promise new solutions to old problems. One example of digitalisation that is very in fashion right now is blockchain technology. Blockchains are the subject of a lot of media hype: promising everything from the protection of privacy to its final destruction, from a new intrusion of artificially intelligent machines to the salvation of humanity.

As discussed in Industriall's research paper, *The Challenge of Industry 4.0 and the Demand for New Answers*, mining falls into the 'low' immediate impact category of Industry 4.0. However blockchain technology ranks high among pathways proposed to address and tackle labour abuses and other unsustainable practices in mineral supply chains.

What is a Blockchain?

Fundamentally, blockchain is an information security strategy. It provides a different level of security than, say, defending a database at the perimeter of the computer it resides on. Blockchain security is at the level of specific records or blocks of data, structured in what are called 'linked lists'. Each item on each list has identifying data and a pointer to the previous item and/or the next item. Each new block of data must authenticate itself at particular nodes by some kind of proof, for example performing a mathematical operation on the current block, in order to be added to the chain. This proof must be difficult to falsify but easy to verify, to discourage spammers and hackers.

This creates a data chain where one can be reasonably certain that each item was added in chronological order and not manipulated. It works fairly well with Bitcoin, for example. It is this property that makes blockchain seem attractive for the task of verifying the cobalt supply chain.

GLEN MPUFANE
is the Director of Mining and Diamond, Gems, Ornament, and Jewellery Production at Industriall

Cobalt mining and the DRC

New technologies such as smartphones and electric vehicles require batteries, and have greatly increased global demand for cobalt, a rare metal. It is estimated that over 60 percent of the world's cobalt resources are to be found in the Democratic Republic of Congo (DRC). Industriall general secretary Valter Sanches recently described the working conditions at some multinational mining companies' operations in the DRC as 'appalling and disturbing'. In a letter to DRC President Kabila after a fact-finding mission to Glencore's DRC mines, Sanches wrote that the global union was 'saddened and outraged' to discover 'the daily experience of abuse and violation of fundamental labour rights of Congolese mine workers at these operations are in total disregard of the laws of the country and collective bargaining arrangements. The testimonies of around 80 workers represented by the union, offer clear proof of the abuse and violation of their labour rights and human rights, extending beyond the mine operations into their homes, families, communities and the surrounding environment'.

A traceable and verifiable digital record of cobalt from its origin in mines in the DRC through to its installation in the battery of a Tesla would, proponents argue, enable anyone to know exactly when and in which mine – and potentially even by which miners – the particular cobalt in a particular battery was produced. This could provide assurance that environmental and social abuses, such as child labour, or abuse of trade union rights – were not used in the production of the cobalt, or if they were, enable tracing and tackling the abuses for remedy or punishment. Access to remedy is fundamental, and represents the litmus test for blockchain technology's utility in bridging the divide between abuse and remedy.

Technological Limitations

It is worth remembering that even though we use terms like 'blockchain', in reality there is no abstract entity called a blockchain, it is just a network of physical computers, owned by a variety of people, using an agreed-upon authentication protocol. Where are these physical computers, and what are their characteristics? Are they vulnerable to failure or compromise?

The application of blockchain to the cobalt supply chain raises the problem of capacity. It can be assumed that most small-scale producers, particularly so-called artisanal miners, will not have the resources or capacity to participate as a node in the chain. Artisanal mining, even though it is legal in the DRC and forms a large part of the country's mining landscape, presents a huge challenge for the supply chain of cobalt. The industry is forced to sell through bigger operators, creating new opportunities for corruption and questionable input data. Technology does not ensure trust in the human sense.

There are geopolitical boundaries within the internet, therefore public blockchains may be difficult to implement in some regions, as could possibly be the case with the Democratic Republic of Congo. Furthermore, there are developing countries to whom rich countries or multinational corporations will try to sell specific implementations of data infrastructure. This may lock a developing

country into one standard that is incompatible with others. Intercommunication and standardisation between potentially thousands of actors in different regions in a value chain may be a problem.

Immutability is one of the words frequently used to describe blockchain, and it is this characteristic that makes it suitable for cryptocurrencies. However, it remains vulnerable to fraudulent or misidentified data, particularly at the beginning of the chain. Given the lengths that some employers have gone to avoid or falsify social audits, and the resources that some corporate and government actors have to undermine any system that restricts their behaviour, it would be naive to assume that this will never be attempted.

It all comes down to ensuring the integrity of not just the technology, but also the data that is input in to the technology. The current players in the DRC cobalt mining industry do not, at least for now, inspire confidence towards ensuring that integrity. With the emergence of the supply chain sustainability standards, could blockchain technology be the bridge between abuse/violation and remedy? That possibility will remain only aspirational unless this technology can be fully adapted to the non-mathematical characteristics of sustainability's social dimension – and the quality of input data is assured. Blockchain technology does not alter the principle of 'garbage in; garbage out'.

Unintended Consequences

The traceability and verifiability of blockchain raises concerns about personal privacy. Granted, privacy is not an objective of its application to a value chain such as cobalt. However, it could be problematic if someone identified in the chain were to invoke the EU's 'right to be forgotten' legislation, for example. Removing one piece of data could potentially damage the entire chain. Businesses, too, have privacy concerns. How will these be addressed?

Is the proposal for a public blockchain, or a private one? If the former, who will set the rules and standards that govern it, and can they be enforced on a network of independently controlled nodes? If the latter, who would own it? There are at present different proprietary systems. Who will own the data?

Suppose that a particular lot of cobalt is identified as having child labour in its production and/or violations of the rights of workers, what then? Will blockchain help law enforcement? Will the cobalt itself be forever tainted, or will it be used nonetheless? A complication is that the metal can be melted and added to any other, becoming physically and chemically untraceable at that point – emphasising the importance of chain-of-custody (the 'paper trail') in sustainability reporting.

The proposal to use blockchain technology to trace a problematic raw material like cobalt emphasises the difficulty that those most expert in blockchain are data specialists, computer scientists, and cryptographers. Cryptocurrencies can be viewed as products of pure mathematics. However, the environmental and especially social dimensions of sustainability are not so neat and tidy. Social scientists, human rights lawyers, and ecologists are not typically experts in the technology. This gap would need to be bridged.

Is Blockchain a Credible Solution?

Blockchain is a technology. The problems in the cobalt supply chain are social, cultural, environmental, political and economic. We must always be wary of unintended and unforeseen consequences, for example an explosion in energy consumption to support the blockchain, or the confounding of certification with truth, or corruption. If evidence of human rights abuses arise after the initiation of a blockchain, will its immutability become a liability rather than an asset?

Much of present knowledge of blockchains arises from cryptocurrencies. In contrast, performance in the social dimension of sustainability is notoriously difficult to evaluate. Typically, the data will be qualitative rather than quantitative, and to a degree subjective rather than objective. This does not make these social indicators less important than economic or environmental ones that are easier to measure and track. However, the attempt to apply blockchain to this problem is to try to apply a solution worked out for an easily quantifiable item – a unit of currency – to a social problem. There are at least two concerns here. One is the assumption that something that has social value can be assigned a value that everyone would agree on. This is rarely, if ever, the case. Furthermore, even if we pretend that we are only assigning a numeric rating with no implied financial value, it becomes a 'hard' number that falsely suggests a degree of scientific certainty.

The conditions of production of a particular commodity can only be established by audit. There is an entire industry of people and organisations specialising in social and environmental auditing, some connected to the traditional financial auditing houses, many independent of them. Blockchain will not change that. It is the output of such audits that will become part of the digital signature of a particular lot of cadmium, an electronic tag on that lot. Unfortunately, it will prove easier to verify the authenticity of the tag, than the real-world conditions under which the commodity was produced.

In the case of cobalt, managing the value-chain data could also be accomplished with a database, or a distributed ledger, without blockchain. One question to ask is, what value does a blockchain add that these other approaches lack? Are blockchains the best solution to the problem of verifying behaviour in the cobalt value chain? Although there is promise in the use of protocols such as blockchain to verify or certify the value chain for cobalt, we should be cautious. It may not add very much benefit versus other, less complicated technologies. Finally, we should not confuse issues of traceability or certifiability with those dimensions of sustainability that will remain complex and difficult to quantify.

The utility of blockchains to record labour rights violations depends not just on the technology, but also on the data that is input. We should be careful not to confound certification with truth

BRIAN KOHLER
is Industriall's Health, Safety and Sustainability Director