Adgetec

Blockchain technology as the scaffolding of accountability, efficiency, transparency in all aspects of society, governance and institutions.

An approach for AFRICA?

Overview & Discussions Starters

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Blockchain is a **transformational technology** with the potential to take **digital transformation** beyond company's walls and enhance and evolve the processes it shares with suppliers, customers, and partners.

Blockchain for Afrika?

Trust and **transparency** are the key promises the blockchain technology, a tool to promote accountability, is delivering in more and more areas and industries every day.

Global leaders are asking, why don't we apply this revolutionary technology to improve areas like transparency, accountability and security which, when addressed, can have considerable impact and both the economy but society (human life, living conditions, conflict avoidance etc.) as well?

The tools exist today: The technology solutions are not futuristic or even difficult anymore and a highly motivated and innovative global community is ready to help applying Blockchain technology to multiple areas, like elections and in tracking and trading of rare metals and other commodities. Blockchain technology can be the scaffolding of accountability, efficiency, transparency in all aspects of society, governance and institutions.

Tech giant Intel announced in early 2014 that its entire line of microprocessors would be free from so-called "conflict minerals," making them the first in the rare mineral-heavy industry to completely phase out their use in one of their products.

Intel CEO Brian Krzanich was speaking at the annual Consumer Electronics Show in Las Vegas on the company's strategy and new products to be released over the coming year when he revealed the culmination of their efforts. The tantalum, tungsten, tin, and gold that Intel purchases — all of which play heavily into the manufacturing of microprocessors and other electronics — will all be guaranteed to not have come from mines that pass their profits on to armed groups in the Democratic Republic of the Congo and other mineral-rich areas of Africa.

"The minerals are important, but not as important as the lives of the people who work to get them," Krzanich said. Enough Project senior researcher Sasha Lezhnev told ThinkProgress that Intel's step was a "huge breakthrough to defund the warlords" that operate in the Congo. "It really does help **move the supply chain from being opaque and turning a blind-eye on its sourcing to being more transparent**."

Recommendation:

1. Commit to building an accountable, efficient and transparent government and governance structure
2. Identify government project owner at the top level to supervise the strategy development
3. Engage / build an expert team to create detailed blueprint for e.g. governance, regulation, processes and technical architecture
4. Engage and leverage the global blockchain community
5. Implement solutions quickly for specific scenarios and agile leverage the infrastructure, learnings and increased trust to build a blockchain based governance structure

Why do organizations implement blockchain based solutions?

They key areas where organization using blockchain technology are finding value in implementations are:

- Increase efficiency, transparency and security
- Lower cost
- Increased Compliance
- Less graft
- Increased scrutiny of supply chain
- Digital identities (of people and things ("IoT"))

Feasibility and timing

The authors believe that a government determined to implement the blockchain based scaffolding of accountability, efficiency and transparency and is leveraging the global pool of experiences and examples from commercial and non-profit organizations, open source and cloud-based solutions, can implement both a voting as well as the mineral tracking and trading solution within six months or less.

Our team can front-end the country's efforts; create and manage the work-plan as well as the collaboration with the global expertise community to bring the best possible knowledge into a country AND to share the insights from one project with the rest of the world as examples.

Trust is the key

The key issues in many societies and institutions is a lack of "trust". Blockchain technology facilitates "trust" in a "trustless environment". The technology creates an environment where information cannot be changed after it has been recorded. Blockchain technology allows for secure and auditable record keeping. Security starts at data collection and with blockchain can be managed end to end. However, for the records to be meaningful they must be based on the real world. A question to address is who controls the input data and how secure is it? As guidance, the more machine centric a system is, the less open to fraud of data input or manipulation.

When a center of trust is identified (an individual, a small group; we call them "trust islands"), the information provided by that trusted entity and then recorded on the blockchain cannot be changed anymore and the information provided by many "trusted sources" can be consolidated.

For all processes discussed here, to tie the records to the real world, trust boundaries would need to be identified. These boundaries (persons, processes, devices or sensors) will be responsible for record creation and insertion. Once the records are in the system they can be tracked and processed without reliance on additional trust. Thus, blockchain acts as a transporter of trust, transferring it from the boundary and across the usage chain.

Ones the trust boundary is identified (meaning you understand what happens within the trust boundary); trust in the system can be established by removing or at least keeping the middle men accountable.

There will be an increase of the trust boundary over time, as through auditability the bad actors are found out (quite easily) and can be removed from the system.

Immutability

The immutability of the blockchain means that records on the blockchain cannot be tampered with. Modifications are only allowed according to fixed, predetermined rules and can only come from authenticated sources. For every value, there is perfect information on the set of prior modifications leading up to it. This gives blockchain strong auditability which plays a crucial role in facilitating and improving trust.

Transparency

Discrepancies within records on the blockchain are easily identifiable or can even be ruled out completely a priori. Discrepancies between the blockchain and the real world can be identified through physical checks and audits. Blockchain technology cannot, by itself, prevent these discrepancies. Instead, it provides auditors with a strong tool to locate the sources of discrepancies and could even reward those "good guys" for exposing issues with a "bounty" in crypto currency.
Over time, processes can be improved, and bad actors can be removed. Thus, the auditability of the blockchain combined with real world audits maintain and strengthen the trust boundaries.

The war economy has set the standard for working conditions in mines throughout the DRC.

Children as young as six years old still make up an estimated 40 percent of the mining workforce.

https://www.dissentmagazine.org/article/beyond-conflict-minerals-the-congos-resource-curse-lives-on

Blockchain technology is making a difference

There are many scenarios for blockchain technology usage. To address the key challenges of "elections" and "mineral trade", there are the following application scenarios to consider:

1) Identification: create an immutable record for a person and their information
2) Census: authentic and trusted population record based on immutable, (potentially) authenticated, "trusted" individual identity
3) Election: create an immutable record of votes cast within an "island of trust" and immutable and auditable record of consolidated votes on consolidated (national) level (ensure local votes are recorded as submitted and counted). Additionally, provide an audit trail to
4) Supply Chain (from mines to exchange): create immutable and auditable record from "first inventory" to "exchange trade" with full immutable provenance record
5) Exchange for mineral trading: create immutable and efficient trading platform for "provenance guaranteed good"

Opportunities for Africa

To arrive at potential scenarios, it's always important (if not mandatory) to align vision and the overall policies with the available or prospective technology in the blockchain domain; complemented by insights gathered from best practices in the enterprise, government and engagement in industry bodies.

While we can provide insights into the technology part and the ongoing application of it, it will be rather an exploratory effort together with the respective government bodies and agencies to identify new scenarios.

Ultimately, we strongly believe that Blockchain technology can offer many African Nations a platform to support/extend existing scenarios (business processes etc.); but will also allow the leadership team to go beyond new scenarios and opportunities.

The (icon) chart to the right is testimony to the rapidly evolving application of blockchain. While there were only a few scenarios beyond crypto-currencies just 1 or 2 years ago, the breadth of the applications using this new technology is staggering and growing every day.

Elections with Blockchain

An area where blockchain technology could be applied quickly are elections.

With blockchain technology, an immutable ledger or records can be created. And it can be created in a decentralized way. Meaning individual voters, or at least individual polling stations can submit their votes to the "immutable ledger" as they come in and can be transparently audited in nearly real time.

In a voting system, anonymity is a necessity to avoid voter intimidation. A voter should be able to audit their own individual vote as well as be the only person that could identify their own vote on the blockchain.

In the US state of West Virginia, voting in the primaries was first the first time made possible for overseas stationed residents through a blockchain powered voting system with a mobile app (and a people powered backup system).

Auditable and trusted elections: This allows international community (like the UN or the WEF) to have high confidence in election process and results.
Combining the blockchain technology elements of trusted data management with ensuring the original data has been "not tampered with" is critical. "crowdsourced initiative has been successful e.g., in Zimbabwe in the 2008 election (won by the opposition). https://markturrell.files.wordpress.com/2011/10/zimbabwe-election-project-2008.pdf https://markturrell.wordpress.com/2011/10/12/the-zimbabwe-election-monitoring-project-2008/

You will find more detailed information later in the document that also address how Blockchain based election systems can be complemented with "crypto-economics" based incentive systems, in which rewards or bounties (in crypto currency) are given to those people, who discover fraud or irregularities. Those people might be "in country" or anywhere else in the world.

Questions to be addressed include:

- "identity" is needed, if the local central (voting) authority "trusts" the people voting
- "Identity" might not be needed if we "trust" the community that holds vote and combines the local result

In short: a Blockchain powered election solution provides:

- Proof that every vote gets counted as cast (cryptographic proof possible)
- Proof that votes are not "created from thin air"

Blockchain tech in Minerals business:

Many countries in sub-Saharan Africa have a tremendous amount of natural resources (from gold, diamonds and oil, to the materials needed for our modern , electronic technology driven like lithium, cobalt etc.), but only a fraction of the value stays in the country as much of the mined materials find its way through black market channels, enriching only a few people, creating price pressure on legitimate markets and therefore removing a key wealth contributor to the societies. Even worse for the societies are the instability and violence the "conflict minerals" create.

Blockchain technology is already used in many supply chain scenarios today and could quite easily be implemented to have a significant impact on tracking and selling the nation's resources. And every day, more organizations digitalize their supply chain to improve efficiency, accountability and transparency.

Blockchain technology, as a way to immutably store records of data, can provide great value to applications that can benefit from the application of trust and reliability that blockchain can bring. In this review, we will examine some of ways in which blockchain can benefit mining concerns, with a view to examples that can improve all aspects of the process, from the mine to the exchange.

As a mining product (ore) exits from the mine, data on the operation of the mine and the product can be captured and stored on the blockchain. The information about the total output of the mine and any available quality / assay data can be recorded on the blockchain for later reference.

The data about outgoing shipments when persisted on the blockchain, provide a non-falsifiable record of the shipments exiting a given mine through a shipment portal and all the way through to an exchange were (exclusively) "certified conflict free minerals" are traded. The exchange itself can blockchain technology based and be available 24/7 for global trading and price finding (comparable to today's crypto exchanges like Coinbase or Binance).

"Conflict free materials" require:

A. Chain of custody and provenance

B. Trading on efficient exchange(s) - trust, transaction transparency, legality, market participation and price transparency (maybe even price stability)
    a. More efficient and transparent markets for selling the materials.
    b. Tokenization of many asset classes is just beginning today, but the software exists to create these marketplaces (exchanges) already today in both centralized as well as even de-centralized ("no central control / authority") models
    c. Buyer can be confident to have purchased "legal" materials

For the process definition, we need to understand and decide / implement where the trust boundaries are. The "Trusted Reality" then needs to be reflected in the digital record; then a blockchain solution can track. At a minimum, with a blockchain solution, we can create a "trail of blame" for audit (and accountability; exposing bad actors on the way).

But the benefits of the blockchain solutions are more as they will address both positively the supply chain as well as the exchanges; providing "proof of conflict free provenance" and a efficient and transparent market for these conflict free minerals.

Technology transfer and education:

Building initial technology infrastructure and processes would likely require international assistance and expertise initially and would need to scale through local resources. The good news is, that there is a large pool of highly motivated experts available globally to build the infrastructure and applications required for a government. No country today has "enough" blockchain experts. The best way to learn a new technology is to build with the new technology.
Countries with high literacy would provide a pool of talent, that could be likely trained quickly and take over leadership positions as their expertise and connection within the global technology community grows. Such technology driven transformation provides a tremendous opportunity for the people in the country to build expertise that eventually could be exported and create and modern technology educated middle class and maybe even a global center of blockchain technology expertise and entrepreneurship.
With often over 50% of the population being children and teenagers, to potential of unlocking the human intellectual capital through education is critical and can empower the population quickly to make a global and sustained contribution. New "Blockchain enabled business models", especially around financing and the supply chain are emerging. With "Tokenization" everything can be turned into a marketplace and populations with an understanding of the technologies can have a lead in the global competition.

Local centers of education (e.g. in collaboration with local universities and vocational schools) could manage the curriculum and produce the human intellectual capital and expertise for a modern society with a scaffolding of accountability, efficiency and transparency through blockchain technology.

Resources:

Commercial as well as Non-for-profit organizations and NGOs are looking for stability, prosperity and peace. Many realize the potential of blockchain technology to create and sustain functioning and transparent systems. These include:

- Rockefeller Foundation
- Blockchain Trust Accelerator
- WEF
- One World Blockchain
- Digital Assets Trade Association
- Coca Cola

- Intel
- Government of Gibraltar
- Enterprise Ethereum Alliance
- Dragonchain Foundation
- (to be continued)

Next steps:

Finalize this think paper, identify owners and team and create a workplan!

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Appendix:

- Blockchain technology foundation information
- Blockchain leadership discussions
- Additional links on economic impact
- Blockchain Voting Framework
- Blockchain Mining and Mineral trade Framework

Blockchain and Cryptocurrency foundations

Blockchain technology might be more revolutionary than the internet and for business and governance models on-par with the invention of writing inventories (early human civilizations) and double entry accounting (global commerce, banking).

Blockchain technology is not Bitcoin (but it was invented for the "Bitcoin token")

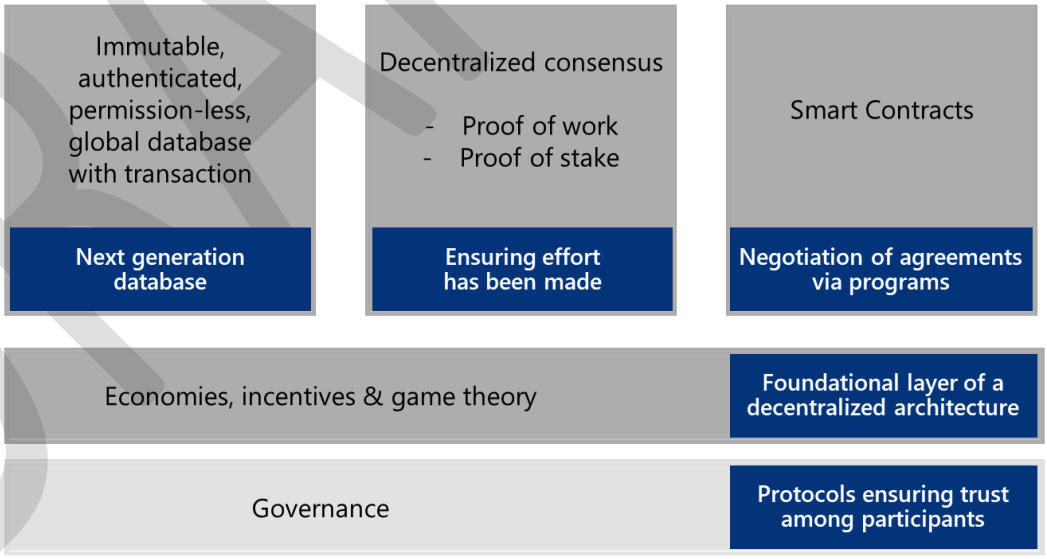
A Blockchain is a **global, digital, decentralized,** and **immutable** database (ledger) that records transactions.

The current leading public ledgers (e.g. Bitcoin and Ethereum) are real-time public ledger that can record practically anything that can be put on record, including contracts, financial transactions, information on supply chain, physical assets, etc.

Key concept of **public** blockchain technology is that there is no one central organization or person who oversees keeping this ledger. Instead, the ledger is open for everyone to see every detail of every record. Each of the records in this chain of records is referred to as a block.

The chart to the right outlines the 5 core concepts or principles "defining" blockchain; each requiring a separate discussion.

A cryptocurrency – build on blockchain technologies - is a digital medium of **exchange** using cryptography to secure the transactions and to control the creation of new units. Bitcoin (as the leading example for a cryptocurrency) and blockchain are often used interchangeably, but, although related, they are different.



Blockchain Technology details:

A more detailed recent study on blockchain technology was published in April 2018 by the Fraunhofer Institute https://www.iml.fraunhofer.de/content/dam/iml/de/documents/OE260/Fraunhofer-Positionspapier_Blockchain-und-Smart-Contracts.pdf)

Every leader is talking about Blockchain Technology

Similar to the Davos event in January 2018, also at the recent Global Horasis meeting, the topics of Blockchain technology and how to improve the human existence in general, dominated the discussions.

During the cross disciplinary panels, the question was raised, if Blockchain technology could be the technology solution for many of the challenges experiences in sub-Saharan Africa.

I believe the short answer is **No** – none technology alone can solve all problems, but **yes**, Blockchain technology is uniquely positioned to support systems and processes that would make a very big impact on some of the biggest issues the population in many countries are facing, especially around elections and keeping the generated wealth from national treasures and resources within the broader population.

This paper does address basic blockchain technology questions and how the combination of the technology with e.g. mobile and social technologies and processes can bring trust into a society.

This paper is drawing on information on challenges many countries experience. This paper is not for a specific country (but can be developed into a technology roadmap for a country or region). Countries like Gibraltar, are proactively supporting the developing blockchain industry, by drafting regulation.
http://www.gibraltarlaw.com/dlt-regulation-gibraltar/

Our collaboration goal is to provide a vision of quick and easy to implement solutions, a roadmap and maybe even a rough blueprint on which leadership can model systems, that will improve a countries economic and social stability, reduce graft and provide transparency.

Why graft and corruption are bad for the population

There are many studies from e.g. the world bank and the WEF, outlining, that graft is removing tremendous amounts of wealth from a population (https://www.weforum.org/agenda/2015/05/how-does-corruption-affect-economic-growth/), and that countries with low graft and corruption are outperforming on economic output, stability and even education and population health and life expectancy.

Further Reading:

Blockchain Voting Framework – Joe Rots, Dragonchain CEO

Components to consider

- Anonymity and Secret Ballot
- Auditability
- Proof of Eligibility
- Identity Framework
- Activity Measure

Anonymity and Secret Ballot

In a voting system, anonymity is a necessity to avoid voter intimidation. A voter should be able to audit their own individual vote as well as be the only person that could identify their own vote on the blockchain.

This can be implemented in several ways, however, a modern identity framework that respects self-sovereignty of data can provide anonymity combined with proof of eligibility.

Proof and Accountability

In a blockchain voting system, it will be possible for the individual voter to check not only that their own vote was counted, but also that it was counted correctly.

With some data component (either a subordinate key mechanism or simple transaction id), a user can search and find their transaction on the blockchain, and validate personally that the vote was cast, counted, and counted appropriately. Without knowledge of this data component, no other user can check another's vote.

This also makes it possible for a user to prove that they voted if they so choose.

Auditability

It is fundamental, that the system should provide a capability for anyone with access to the system (ideally worldwide on the Internet) to execute an automated audit of vote tally as well as the eligibility of each vote. Given their storage on the blockchain, all information is available to anyone to count the votes independently. This audit would likely include software tools to automate the process, but the auditing user would also be able to manually validate every individual vote or some random sampling therein.

Components may be added to provide risk measurement and statistical analysis to identity possible fraud in the vote.

Activity measurement, registration or census numbers checked against actual votes, and even an imbedded, cryptocurrency based bounty to incentivize audit of polling locations, etc. could be implemented and reward "the good guys" for "good behavior".

Proof of Eligibility

In order to provide proof of eligibility, the used identity will need to be capable of selectively exposing identity information necessary for determination of eligibility such as age, citizenship, and residency location or voting district information. This is necessary to allow validation of vote in an audit whilst also retaining some level of anonymity.

With proof of eligibility, anyone may audit the system by evaluating eligibility during the vote tally.

Identity Framework

Necessary to the implementation of the above described eligibility is a modern Identity Framework (see e.g. "Dragon Factor Identity Framework"), which would allow users to independently develop and track key portions of their identity to the system.

There are multiple blockchain based identity solutions already in the market. One is in production in Jordan for 100,000 refugees and currently expanded to cover 500,000 individuals.
The identity framework would work ideally with independent 3rd party identity providers that would validate information and provide cryptographically signed documents which would be stored on a blockchain. The documents would be standardized and only expose non-sensitive information on the blockchain, whereas full information would be stored by the 3rd party identity provider or ideally by the user themselves.

The user may then build a certificate made of selectively chosen identity components and selectively chosen sensitive data to expose.

For voting, this identity certificate could either capture voting eligibility directly, or what components necessary to prove eligibility requirements are met. This eligibility check would need to function in a way that observes the anonymity requirements as well as some level of transparency in the check itself.

Activity Measure

If sufficient information is stored on the blockchain (e.g. registration, identity, voting), it can be used as an additional measure of trust. That is, organic and natural activity can often be differentiated from automated or software bot activity that is sufficiently inexpensive. While fraudulent activity may be automated in a manner that may randomize actions, in order to simulate natural human activity, the development of software will become more complex and expensive. Any such activity will also be frozen perpetually for all to see and analyze.

Combining this measure of activity with the application of bounty or frozen value provides a further expense to fraudulent activity, as well as an ability to measure risk of fraud. If a bounty is applied to every action, then spam or fraudulent activity will become costly, as well as provide an incentive to anyone to find and prove that data is fraudulent or otherwise ineligible. The auditor that finds an error or improper activity can claim that bounty, and the longer a bounty survives in the system without successful challenge, the more likely it is proper activity.

Blockchain and Mining

Prepared 5/24/2018 by Paul Sonier, Dragonchain, Inc.

Blockchain technology, as a way to immutably store records of data, can provide great value to applications that can benefit from the application of trust and reliability that blockchain can bring. In this review, we will examine some of ways in which blockchain can benefit mining concerns, with a view to examples that can improve all aspects of the process, from the mine to the exchange.

As a mining product (ore) exits from the mine, data on the operation of the mine and the product can be captured and stored on the blockchain. The information about the total output of the mine and any available quality / assay data can be recorded on the blockchain for later reference.

Data recorded on a private blockchain can be maintained in a private state, so that only approved personnel can access the data; at the same time, a record of the storage of that record can be made on a public blockchain without exposing any of the data that must be kept private. In this manner, information about (for example) the continued operation of a mining operation can be assured (as public blockchain records are created to represent private blockchain records), without exposing potentially sensitive information (such as mine output, or efficiency). At the same time, if such data is desired to be exposed, it can be selectively included in the set of data to be published to the public blockchain.

Once the ore is extracted from the mine and assay information on it is taken, it must be entered into the shipping chain to get to its eventual destination. Blockchain can be used at this point to track the entry of each shipping unit into the shipping chain; a small, inexpensive and disposable RFID tag can be included with a shipment. The information on the RFID tag cannot be falsified, and the information of the RFID tag and the information about the individual shipment, including source, shipment information, date, and other important information can be recorded to the blockchain.

The data about outgoing shipments when persisted on the blockchain, provide a non-falsifiable record of the shipments exiting a given mine through a shipment portal. For example, information on RFID chips which were associated with shipments and which have no other entries in the system can be considered as likely evidence of theft. These records can be correlated with previous records on the blockchain, in this case about mine output, to identify any potential fraudulent activity (by comparing the quantity mined to the total quantity of outgoing shipments).

RFID tags included with shipments can be scanned remotely at the exit point of shipments from the mining facility. This scanning of the RFID data associated with a shipment can be associated with other remote sensing data, such as weight sensors, or photographic data of an individual shipment. This data can be captured effectively silently and put into the blockchain remotely.

The silent capture and remote, unchangeable storage of data about individual shipments can be used to detect fraudulent activity. For example, a captured photograph of an ore shipping car which is only half full, but which has a recorded weight that would otherwise indicate a full car can help identify fraudulent activity in the operation of the scales. When the data is captured and stored on the blockchain remotely, the actual set of data which is being captured does not need to be exposed to the operators at the shipping locations, which helps to reduce the ability for fraud and theft to occur.

Once the individual shipment is on its way, it can be tracked at various points along its journey by scanning the RFID sensor included with the shipment; this data can be correlated with additional information about time of transit through the supply chain, condition of the shipment, and other information about the shipment.

The information about individual shipments as they pass through these “checkpoints” along the shipping chain can be used not only to track individual shipments, but since the data about the shipments is persisted immutably to the blockchain, such data can be used to diagnose critical information about the status of the

segment of the shipping chain, and even critical information about the overall health of the general shipping chain. For example, information about shipping times over a long period of time can reveal degradation in section of rail track along a shipping segment (necessitating a slowdown by rail drivers). Such information can lead to an ability to re-route subsequent shipments along different routes to improve delivery times and reliability.

When a shipment reaches its destination, such a sea shipping terminal, it can be scanned in again and the data added again to the blockchain. At this point, individual shipments may be re-aggregated into larger bulk shipments; these larger shipments can be tagged with new RFID chips which have all the information about which smaller shipments made up their total.

Information about incoming individual shipments to a bulk processing or shipping facility can be correlated with outgoing individual shipments from various mines to identify not only any losses that may have occurred along the shipping route (due to theft or other processes), but also to identify precisely the makeup of the composite shipment. For example, if a shipment from one mine is known (by assay at the mine) to have an ore content of 15% and a shipment from another mine is known to have an ore content of 13%, and composition of the two shipments can be identified (from the data stored about the shipments when they entered the shipping chain) to have an aggregate ore content of 14%.

At the destination of the shipping chain, the data about the shipments and the overall shipping process can be used to provide assurance to buyers that the shipments that they are purchasing are of the anticipated quality (and quantity). These assurances can be used to increase the overall value of the product delivered, by providing greater assurance of quality, expected quantity, delivery time, and mineral content.

Expectation of product delivery with high expectation of anticipated quality and expected delivery can lead to greater sales price (and higher profit). As an example, proof of the origin point (via consistently tracked RFID chip with a shipment) and assurance of maintained quality along the shipment process (with associated secondary measurements of weight and photography for example) can lead to considerable additional profit on mined materials.

Once the shipment reaches a point where it is to be sold, the shipments or their bulk aggregation can be sold for cryptocurrencies. The existence of the blockchain records in their immutable form makes it very easy to place their ownership up for sale on a cryptocurrency exchange. These cryptocurrency exchanges make for easy transaction with very low transactional costs and extremely high reliability. These cryptocurrency transactions represent the leading edge of commerce in the digital world.

Demonstration of consistent and reliable recordkeeping about product shipments and their origins and provably guaranteed delivery can allow for increased efficiency in the process of commercial operation of a mining process. For example, a consistently blockchain-tracked shipping solution with a proven history of delivery could allow buyers to have confidence to purchase their shipments prior to taking custody of them; that is, at the point at which the minerals are extracted from the mine, rather than waiting for the minerals to arrive at the shipping or processing facility. This allows for highly efficient use of capital (and can increase profit margins).