# Africa Token Lab

## Blockchain for traceability

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African Token Lab

An innovation-as-a-service company with a human-centered design approach to problem solving for our Business partners, with a strong focus on emerging technology, starting but not limited to Distributed Ledger Technology.

Blockchain for traceability

## Introduction

Nowadays, corporations, medium to large enterprises are under increasing pressure from the responsible consumer to embrace new technologies to meet more demanding requests for safer goods, food and beverage, or pharmaceuticals, that check for transparency, verifiability, traceability and, ideally, fair trade.

One solution that has proven to be adequate for this purpose is distributed ledger technology (DLT), blockchain technology.

Intrinsically, blockchain is an evolution of data system that records and maintains data in a way that allows multiple stakeholders to “trustlessly” share access (ie. without the need of a middleman authority) to the same data and information.

Going beyond the hype, we are exploring the feasibility of blockchain to enable an end-to-end supply chain traceability in various sectors of activity; some of which the food industry,the coffee industry, and the agriculture as a whole.

The study looks at the opportunities and challenges of implementing this emerging technology, including business and environmental benefits and wider ecosystem and

governance considerations

industry actors are coming together to invoke from technologists and blockchain strategists[1]:

• A clear definitions of business problems that call on innovative, human-centered approaches;

• Data requirements for effective traceability and other business processes;

• Interoperability of data-sharing systems and, if applicable, payment options for operators along the production line.

Let us remind that interoperability illustrates the ability of different computerised systems (even when belonging to different ecosystems) to readily connect and communicate with one another.

### In a nutshell

According to recent trends, the potential for ethics as a business metric has been identified among topics of some industry debate."

If industry actors identify that an added layer of trust and validation—a certain level of transparency provided through distributed ledger technology—offers a competitive advantage that traditional mechanisms-based offering do not, next is a call to action that leaders within the organization must undergo to ensure the interoperability of blockchain-based traceability solutions of choice. Work would be performed at different levels taking into account business and Technical considerations.

## The challenge

More and more companies nowadays are realizing the business value of traceability that, through the enabling of safe, sustainable and ethical practices, can result in efficiency, cost savings, or higher product's quality in the market.

[1] *GS1 Traceability and Blockchain whitepaper*

In light of this we believe that real-time traceability of products, in particular within global supply chains — eg. proof of provenance implementing track-and-trace of products through the supply chain — more can assist companies in meeting these objectives.

Though it does not alone solve traceability, nor it does solve the human challenges at hand or the need for digital transformation within companies, blockchain can be a game-changer by prompting for new ways of working, enabling greater accountability and trust when implemented effectively. Additionally, reliable data can help optimize business decisions and reach higher standards to meet customers demands.

With a dynamic international business environment, supply chains are evolving into “supply chain networks”. Companies recognize that to succeed in the digital economy, they must manage the integration of business, people, technology and processes across extended enterprises — therefore enabling inter-enterprise cooperation and collaboration with suppliers, customers, business partners.

Significant challenges in digitizing companies' supply chains remain, though:

1. Coordinating across multiple, disconnected supply chain actors of the network;

2. Lack of connectivity;

3. Costly data reconciliation processes;

4. Ineffective solutions for handling large amounts of data.

## High-level view on the process

### Data collection and information capture

To facilitate traceability and visibility on their products or services, hence providing a proof—or audit—of a transaction that has happened while demonstrating non alteration of the data, companies must first capture the relevant information embedded into collected

(or logged) data.

This is done by implementing a global identification for all of the products and locations relevant to their operations—at the batch/lot level for products.

Once this is completed, companies must standardize (or leverage on existing) data model(s) for physical supply chain events and capture the information in the business applications.

## Sharing the data

To share the data required to facilitate traceability and visibility, thus ensuring business application interoperability and choice for various solutions,

Standardised data formats, exchange system interfaces and protocols are needed at two different levels:

Standardised interfaces for capture and query of the database on a standard data model; Standardised communication protocol (eg. Web Services, REST etc.)

## Identifying known and unknown partners

As the multiple parties with whom companies need to communicate and share data are often spread across complex supply chains, a method for discovery (eg. routing, registry service) is highly needed.

## Ensuring governance for use cases

Lastly, comes the need to establish governance and agreement principles, in the form of a set of rules focusing on the minimal requirements needed to share data between parties and between members of a network, for each business case.

## Basic understanding the blockchain layer

The specific requirements of the blockchain layer need to be understood for a specific use case, industry or ecosystem.

The type of data written to a blockchain ledger, that vary depending on the system and/or solution implemented, can be;

### A fully formed, cryptographically signed plain text event data.

Note. There could be a concern about scalability and performance in the occurrence of full events written to a ledger.

### A cryptographic hash of the data with a pointer to required off-chain data exchange

via a separate traceability application and a hash comparison (with the hash that was written to the ledger).

A combination of the above, possibly with other methods, can enable the ledger to act as part of a discovery mechanism for parties who need to communicate and share data.

Based on the DLT in application, the following parties are allowed to see the data that is stored on a ledger;

### Public

Transactions to everyone.

### Private

Transactions are only viewable to parties approved.

## Ways ahead

If/when an industry determines that an added layer of DLT is needed and relevant for a specific business problem, below are listed the different considerations to account for;

### Business

1. Concertation over

1.1. The application of existing standards for unique identification and visibility on data models, and
1.2. The method of data exchange.

2. Develop guidance about how to apply standards consistently across the industry of interest.

3. Governance policy making for a broader blockchain-based solution ecosystem.

### Technical

1. Discovery method on data-sharing partners.

2. Identify what is to be written to the DLT, and how.

3. Identify areas in need of consistency and standardisation on data written to ledgers.

4. Concertation over

3.1. Requirements for access and visibility (private or public) to ledger transactions), and
3.2. Associated rules of governance for Industry partners collaboration and interoperability.

When assessing the feasibility of blockchain use in supply chain, here are a few things[2] to look into

• Value and incentives for the various actors of the networks — eg. transparency, auditability, streamlined operations, from new product development (NPD) to new, sustainable, business models and product differentiation;

• Availability of supporting tools, and enabling technology;

• Level of digital maturity, connectivity, data quality and standardization, among the different actors;

• Level of collaboration (or mistrust) between partners of the networks;

• Investment required (that encompasses costs to set up, technology and team operations).

Further words about value brought up by the blockchain in a traceability context:

• Provenance of the data — from origin to complete history;

• Tamper evidence that ensures data immutability;

• Access control is provided data element level;

• Security through encryption and segregation at a data element level.

## Implementation process

Below are identified the project's key components for implementing a blockchain traceability solution, independently of the industry of focus;

[2] *Accenture Tracing Supply Chain Blockchain Study*

• Initiation: Preliminary Assessment;
• Planning: Policy and Organizational Framework; Technical Feasibility and Financial Viability;
• Execution: Human Centered Design and Roll out;
• Closure: Control and Monitoring; Output.

The scope of the study is as follows;

1. Preliminary Assessment

1.1. Project scope
1.1.1. The framework within which the study is carried out;
1.1.2. Infrastructure assessment, necessary for safely, securely, sustainably and efficiently managing the project;
1.1.3. Project rationales
1.2. Identification of potential stakeholders and partners; Quantify needs;
1.3. Evaluation of customers and stakeholders' perception. Challenges and opportunities;
1.4. Feasible use case(s) assessment

2. Policy and Organizational Framework

2.1. Governance
2.2. Rules

3. Technical Feasibility and Financial Viability

3.1. Solution mapping
3.2. Solution specification
3.3. People (personnel, users or customers) requirement
3.4. Cost-Benefit Analysis (CBA) and Budgetary Estimation
3.5. Risk management and mitigation measures

4. Outputs

Project's timeline, Reporting and deliverable to be submitted as per use case specific requirements.

| Initiation | | Planning | | Execution | | Closure | |
|---|---|---|---|---|---|---|---|
| Leadership | Preliminary Assessment | Policy and Organizational Framework | Technical Feasibility and Financial Viability | Human Centered Design | Roll out | Control and Monitoring | Output |
| Stakeholders | Scope and Needs<br><br>Perception, Challenges and Opportunities<br><br>Use Cases | Governance<br><br>Rules | Solution Mapping and Specs<br><br>People<br><br>CBA<br><br>Risk Management | Inspiration.<br>Ideation.<br>Implementation. | PoC, prototype or MVP deployment | Change request, project status, issues, steering committee | Deliverable and Reporting |