Potential of Blockchain in the Manufacturing Industry

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Science and Innovation
REPUBLIC OF SOUTH AFRICA

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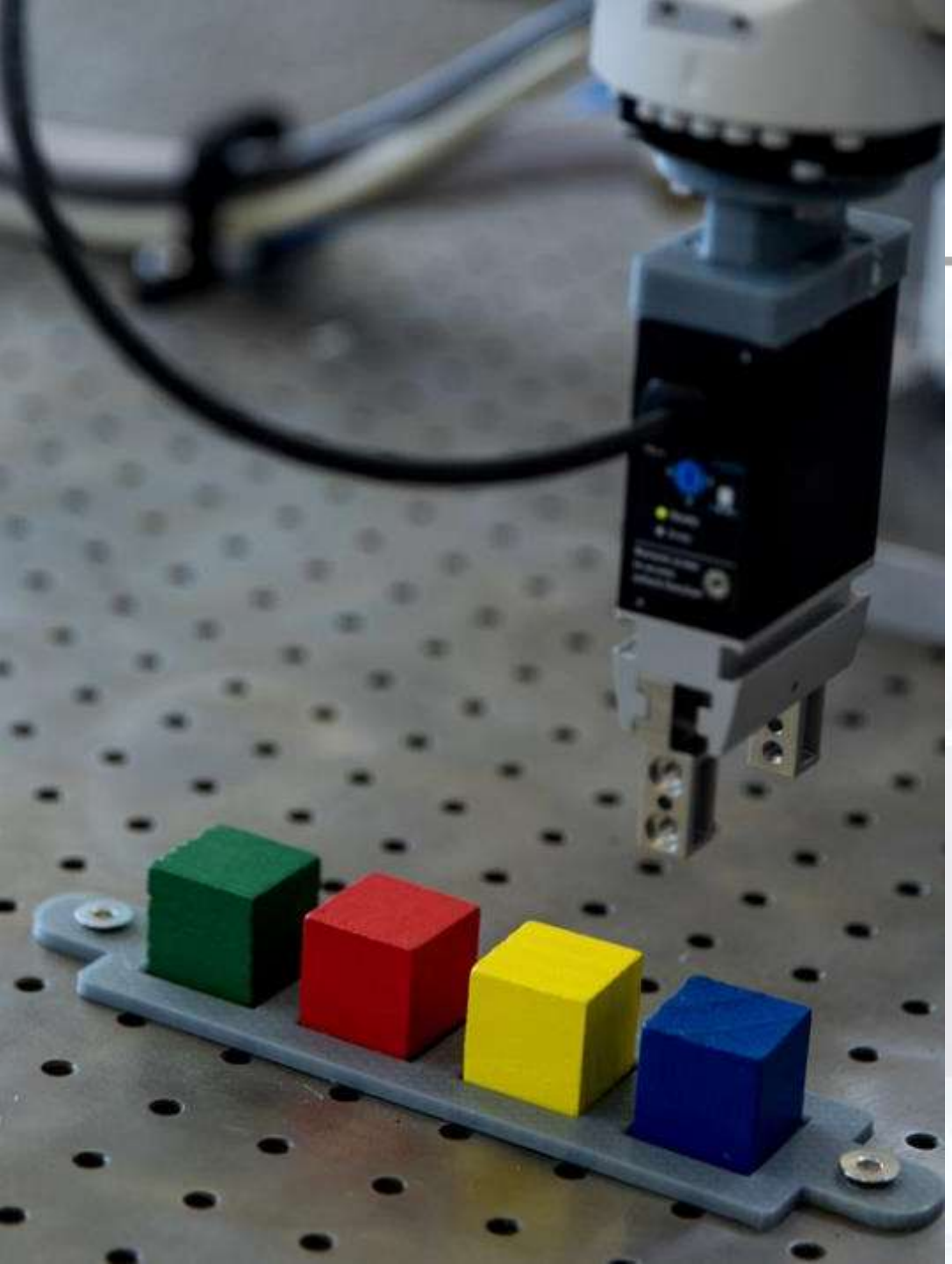

Contents

- 4IR - a new socio-technical paradigm
- Blockchain’s role in the 4IR technology stack
- Blockchain benefits and value proposition
- Current issues in the global manufacturing industry
- Blockchain Use Cases in Manufacturing
  - Supply Chain Management
  - Additive manufacturing / Protection of IP / Digital Twins / Machine-controlled maintenance / Counterfeit protection
- Challenges
- Opportunities in South Africa

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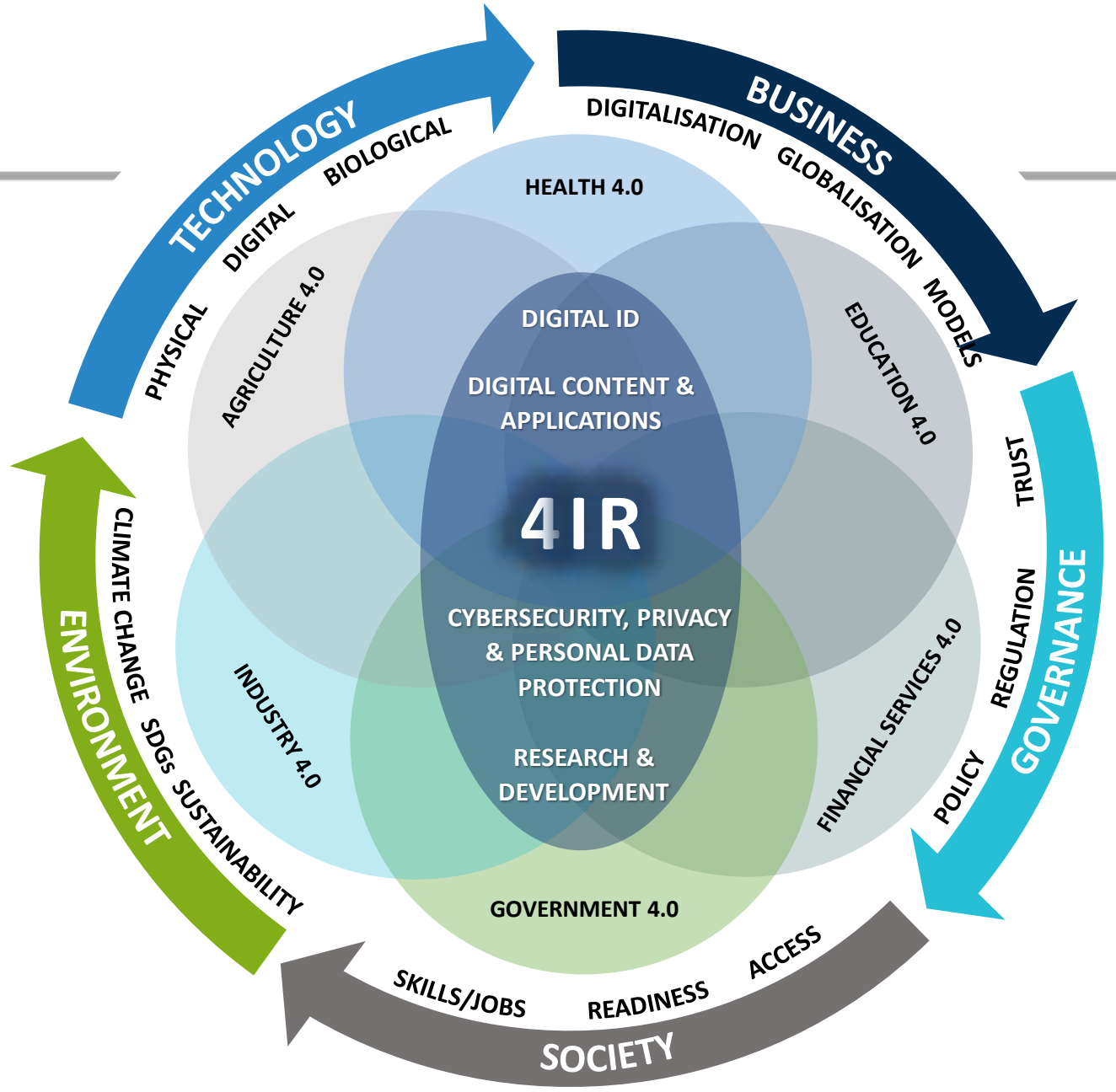
4IR – a new socio-technical paradigm



Source: M.Ford,
CSIR (2019/20/21)

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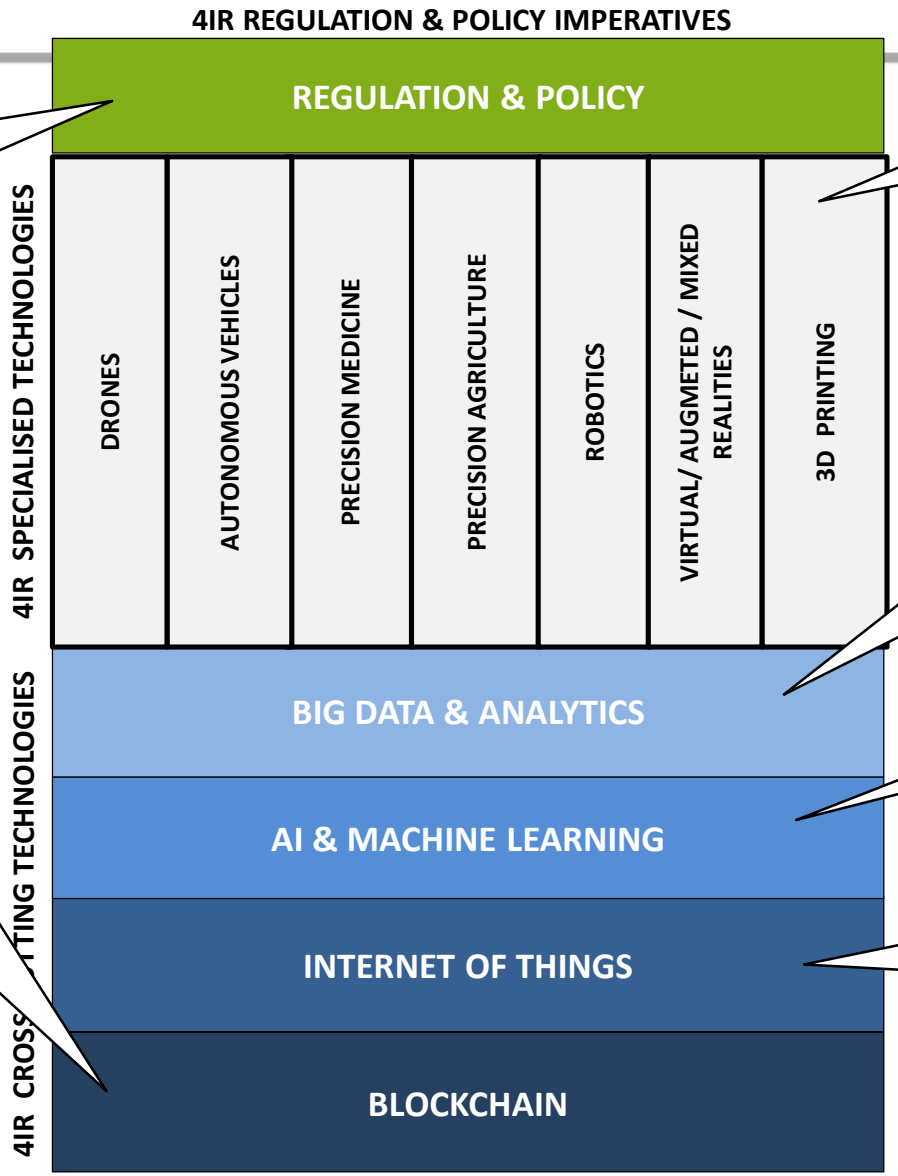
Blockchain's role in the 4IR technology stack



Regulatory challenges within the **4IR "WAYS OF DOING"** need to be identified and mitigated.

Various specialised 4IR technologies can be used to provide specific interventions in different sectors.

Big data & analytics can be used to enable operational efficiency and cost reduction via the **AUGMENTATION OF DATA-DRIVEN DECISIONS.**

AI & Machine Learning can be used to **AUTOMATE REAL-TIME DECISION- MAKING (e.g.** via Smart Contracts.)

IOT devices can be used to **TRACK, MEASURE, MONITOR AND AUTHENTICATE** environments, products and services to **CREATE SMART ENVIRONMENTS**.

Blockchain provides the **TRUST FOUNDATION** for various ecosystems, e.g. when used in a supply chain, it ensures the data collected can be verified. It also enables traceability, tracking, transparency, equity and efficiency.

Customised from WEF 4IR Technology stack

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Blockchain benefits and value proposition

TRANSPARENCY	REDUCED COSTS	OPERATIONAL SIMPLIFICATION	IMMUTABILITY	FAIR ALLOCATION OF RESOURCES	DISINTERMEDI-ATION
With a public blockchain, transaction data is viewable by all.	Due to blockchain decentralisation, costs can be reduced, as unnecessary middlemen are eliminated.	Reduces/eliminates manual efforts required to perform reconciliation and resolve disputes.	Data is stored forever on the blockchain and cannot be altered	The producer is able to receive a fairer price for goods because of disintermediation.	Unnecessary intermediaries that add cost to the supply chain are no longer needed

PROOF OF OWNERSHIP	REALTIME TRACKING	FRAUD MINIMIZATION	TRUSTLESS ENVIRONMENT	COUNTERPARTY RISK REDUCTION	CLEARING AND SETTLEMENT TIME REDUCTION
Members of the network are cryptographically identified, and goods linked to them.	The status of a transaction can be tracked as it moves through the system	Blockchain enables asset provenance and full transaction history to be established as a single source of truth.	Due to the decentralised nature & consensus methods, transactions can occur between unknown parties	Smart contracts are used to codify agreements between parties .	Because of automation & disintermediation, there is a marked time reduction.

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Current issues in the global manufacturing industry

Supply chain disruption

The inefficiencies and vulnerabilities in supply chain systems have been highlighted by Covid and post-Covid struggles.

Lack of traceability

With increased global trade, the complexity has made it difficult for companies to keep track of individual events. This often leads to shipments getting lost, delayed or stolen

Entrance of counterfeits

Due to loss of documentation, it’s often difficult to avoid the entry of counterfeits in the supply chain, especially in automotive, aerospace and healthcare industries where fake products have higher repercussions

Lack of accessibility & visibility

The lack of visibility into the procurement process makes finding the right manufacturing supplier a problematic issue for buyers

Lack of intellectual property protection

In the last year, 39% of businesses worldwide have experienced a breach in their intellectual property, making it a top concern for a lot of businesses in the manufacturing industry

Struggles in reducing costs

There is a need to reduce costs substantially, decrease lead times so that manufacturers can focus on other core areas to enhance profitability.

Blockchain Use Cases in Manufacturing:
Supply Chain Management

- As materials, products, parts and money are exchanged via supply chains, blockchain technology can be used to provide better visibility, scalability, security and raise trust and broaden participation in supply chains that were previously opaque and fragmented.

- In 2019, a survey performed by PwC revealed that 24% of industrial manufacturing CEOs were planning, piloting, or implementing blockchain technology.

- The World Economic Forum (WEF) has developed the "***Redesigning Trust: Blockchain Deployment Toolkit"*** as a guide for companies wishing to use blockchain for supply chain management.

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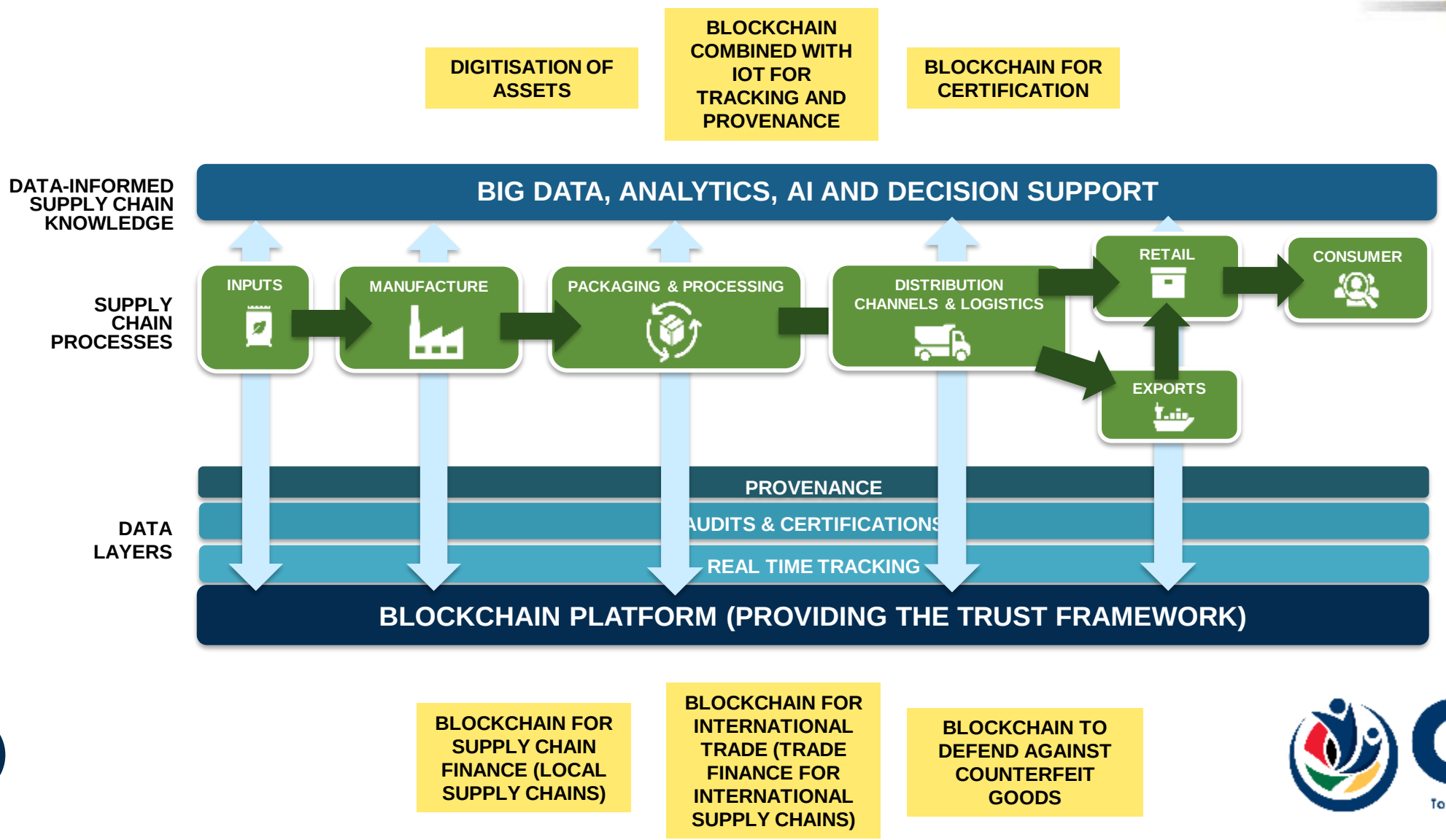
Blockchain Use Cases in Manufacturing:
Supply Chain Management



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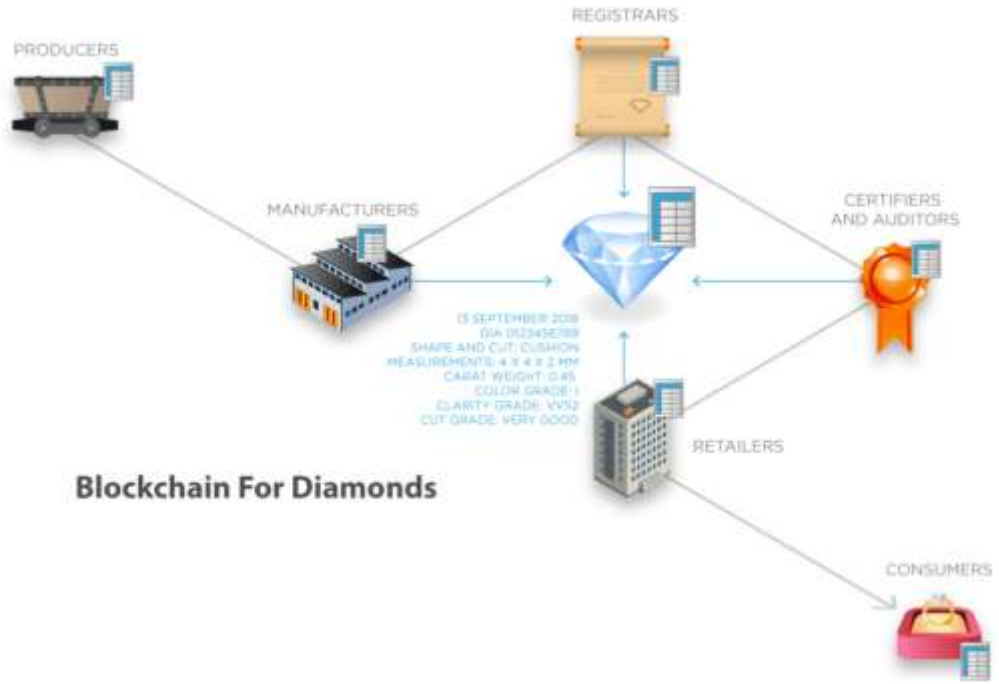
Blockchain Use Cases in Manufacturing:
Supply Chain Management

De Beers – digital tracking of diamonds from mine to retail



Each stakeholder forms part of a diamond-specific blockchain network, they can view important details about a particular diamond. For example, they can determine the diamond's source and attributes (cut, carat, color, and clarity), as well as the ownership of the diamond as it passes through different parties until finally reaching the jeweler. The stakeholders themselves add this information as data blocks to the blockchain as the diamond moves through their custody.

A "**digital twin**" of the diamond is created. It enables a consumer to more easily avoid purchasing an unethically sourced diamond.

This demonstrates unique promise of blockchain: its associated technological functionalities and features enable **real-time updates, greater transparency, and auditability.**

https://www.tracr.com/

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Blockchain Use Cases in Manufacturing:

Additive manufacturing / Protection of IP / Digital Twins / Machine-controlled maintenance / Counterfeit protection

The best way to demonstrate an example of how blockchain is able to provide unique solutions to many existing problems is via a use case.

USE CASE: ON DEMAND SPARE-PARTS IN ASSET HEAVY ORGANISATIONS – e.g. the mining industry

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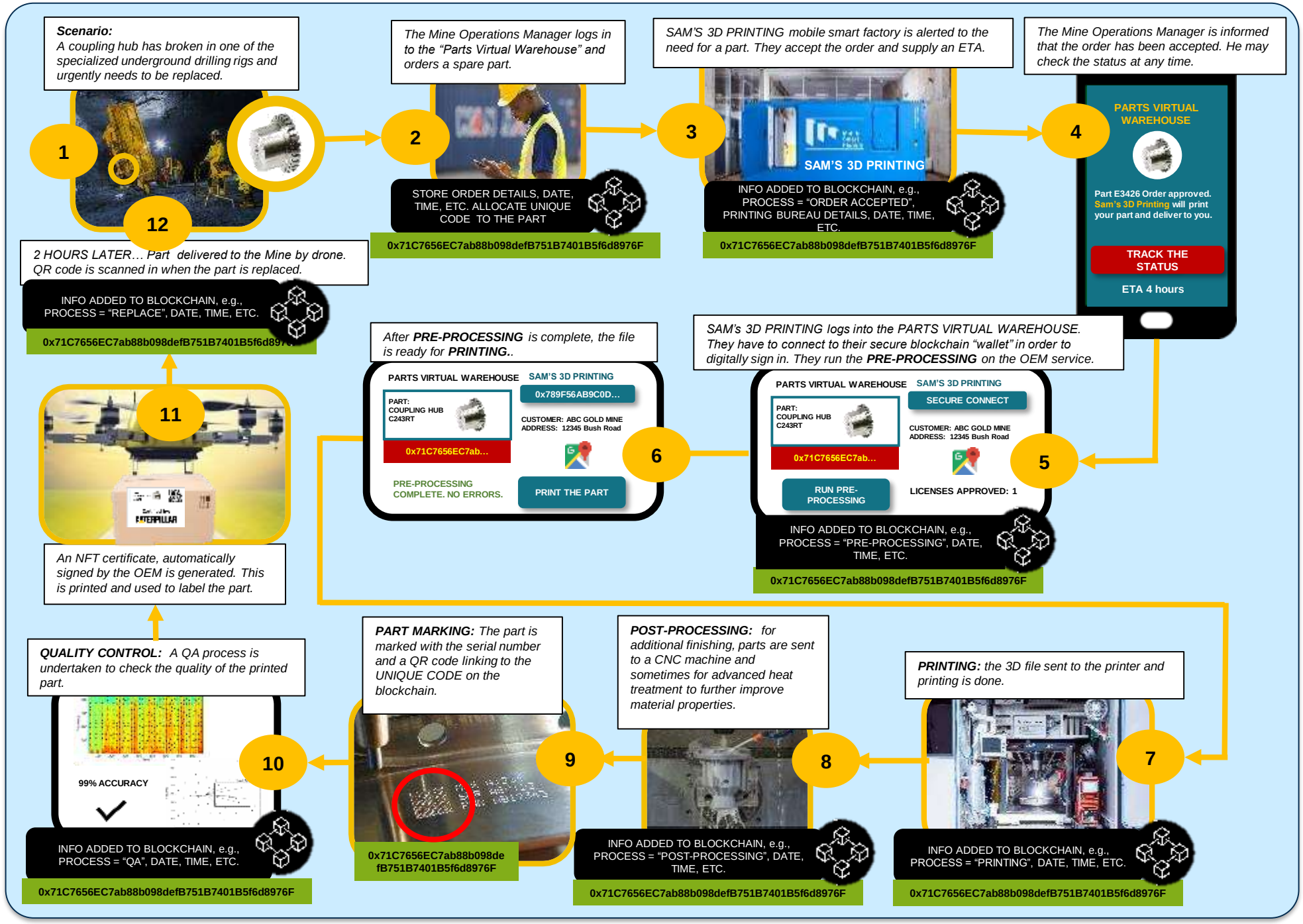

ADDITIVE MANUFACTURING

The part can be traced from when it was produced (printed) until delivery to the mine. This gives the mine peace of mind re the validity of the part and provides protection against low quality **FRAUDULENT PARTS**. By recording the QA process, the part is also **CERTIFIED** as authentic and that it conforms to quality **STANDARDS & REGULATIONS.** An NFT is produced as the digital certificate.

IP PROTECTION

The IP is codified into a smart contract and license payment happens immediately. Only valid 3rd party printing facilities are able to print the part.

DIGITAL TWIN

Once the physical part is delivered to the mine, the digital equivalent continues to exist (identified by it's unique code that was generated by the blockchain and the NFT certificate).

MACHINE-CONTROLLED MAINTENANCE

Becomes possible, based on data on wear and tear of this particular part. The mine would receive an automated alert when maintenance is necessary.

Challenges

- Blockchain is a team sport
- Blockchain is an emerging technology and therefore subject to risk
- Reputation due to Bitcoin / cryptocurrency confusion
- There may be challenges in integration between existing systems and a blockchain system as well as interoperability between different blockchains
- Blockchain development skills are in demand and therefore in short supply
- The cost-benefit conundrum

Top Blockchain Trends in 2022

- Expansion of Blockchain as a Service
- Blockchain and Web 3.0
- The Rise of Non-Fungible Tokens
- Blockchain and Metaverse
- Scope of Blockchain in DeFi To Expand
- Sustainable Blockchains
- Global Expansion of Cryptocurrencies
- Blockchain and IoT

https://www.blockchain-council.org/blockchain/5-biggest-blockchain-trends/

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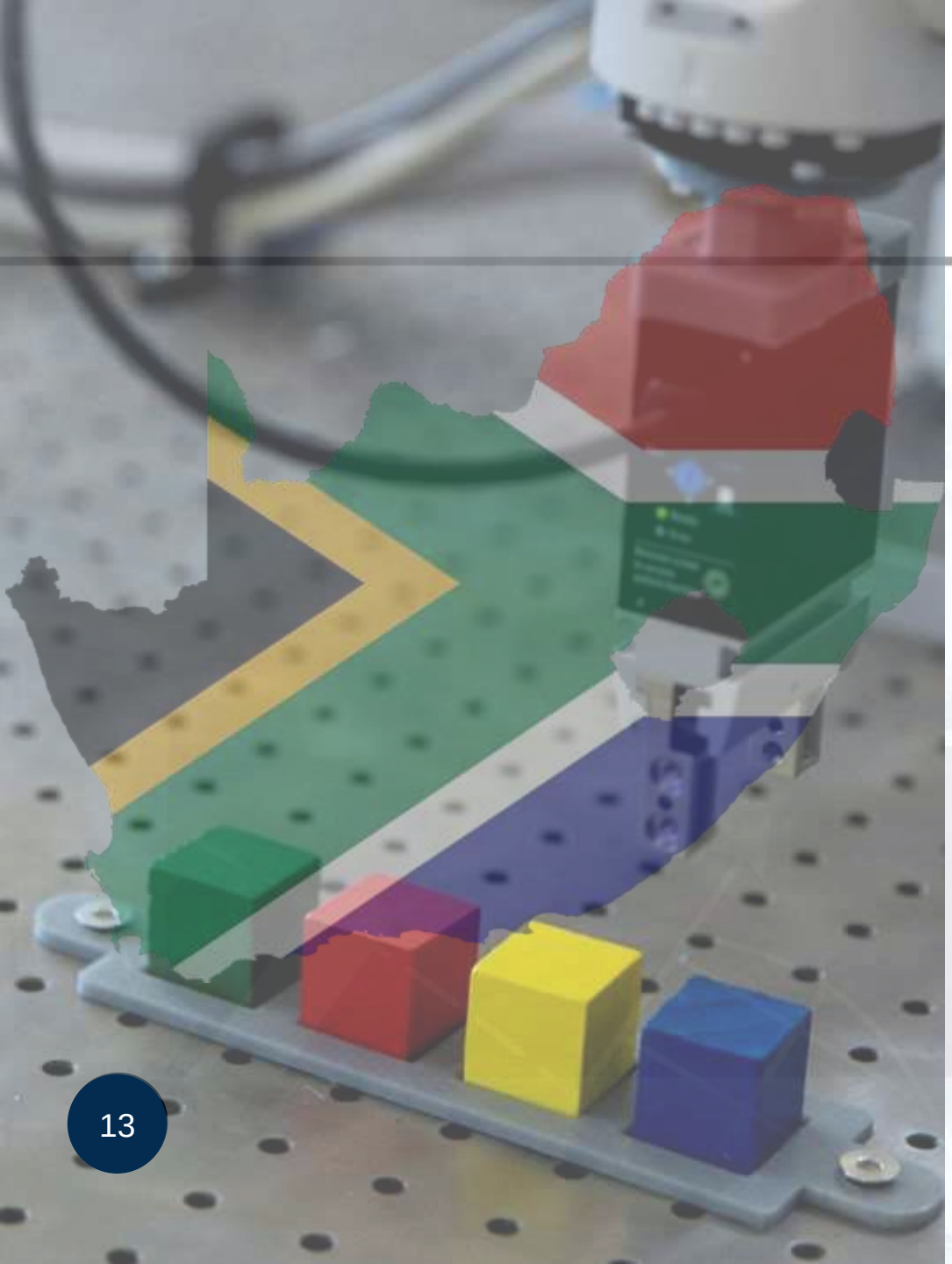

Opportunities in South Africa

Particular “quick win” blockchain opportunities in the manufacturing sector in South Africa include the following:

- Supply chain management / Provenance
- Ensuring regulatory compliance / Certification
- Combating counterfeit goods & fraud

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THANK YOU

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