# BLOCKCHAIN & SMART CONTRACTS

## Dutch Life Science Congres

**Yurry Hendriks**

**ABN AMRO Blockchain & Smart Contracts Lab**

**22-11-2017**

# **VALUE** OF BLOCKCHAIN

**“What Blockchain will do for transactions, is what the internet did for information”**

**IBM CEO**
**Gini Rometty**

# FAST FORWARD
# EVOLUTION

**INTERNET**
**Transfer information**


**TEXT**


**IMAGES**


**PROGRAMS**


**VIDEOS**

**BLOCKCHAIN**
**Transfer ownership**


**MONEY**


**CONTRACTS**


**PATENTS**


**ASSETS**


*“We tend to overestimate*
*the change that will occur in the next two years*
*and underestimate the change that will occur in the next ten.”*

# VALUE

| | |
|---|---|
| 1 | **Operational simplification**<br>DLT reduces / eliminates manual efforts required to perform reconciliation and resolve disputes |
| 2 | **Regulatory efficiency improvement**<br>DLT enables real-time monitoring of financial activity between regulators and regulated entities |
| 3 | **Counterparty risk reduction**<br>DLT challenges the need to trust counterparties to fulfil obligations as agreements are codified and executed in a shared, immutable environment |
| 4 | **Clearing and settlement time reduction**<br>DLT disintermediates third parties that support transaction verification / validation and accelerates settlement |
| 5 | **Liquidity and capital improvement**<br>DLT reduces locked-in capital and provides transparency into sourcing liquidity for assets |
| 6 | **Fraud minimization**<br>DLT enables asset provenance and full transaction history to be established within a single source of truth |

WORLD ECONOMIC FORUM | 2016

# **BLOCKCHAIN** BUILDING BLOCKS

**Distributed Trust Technology, build upon existing technologies**

**Security**

**Distributed Shared Ledger**

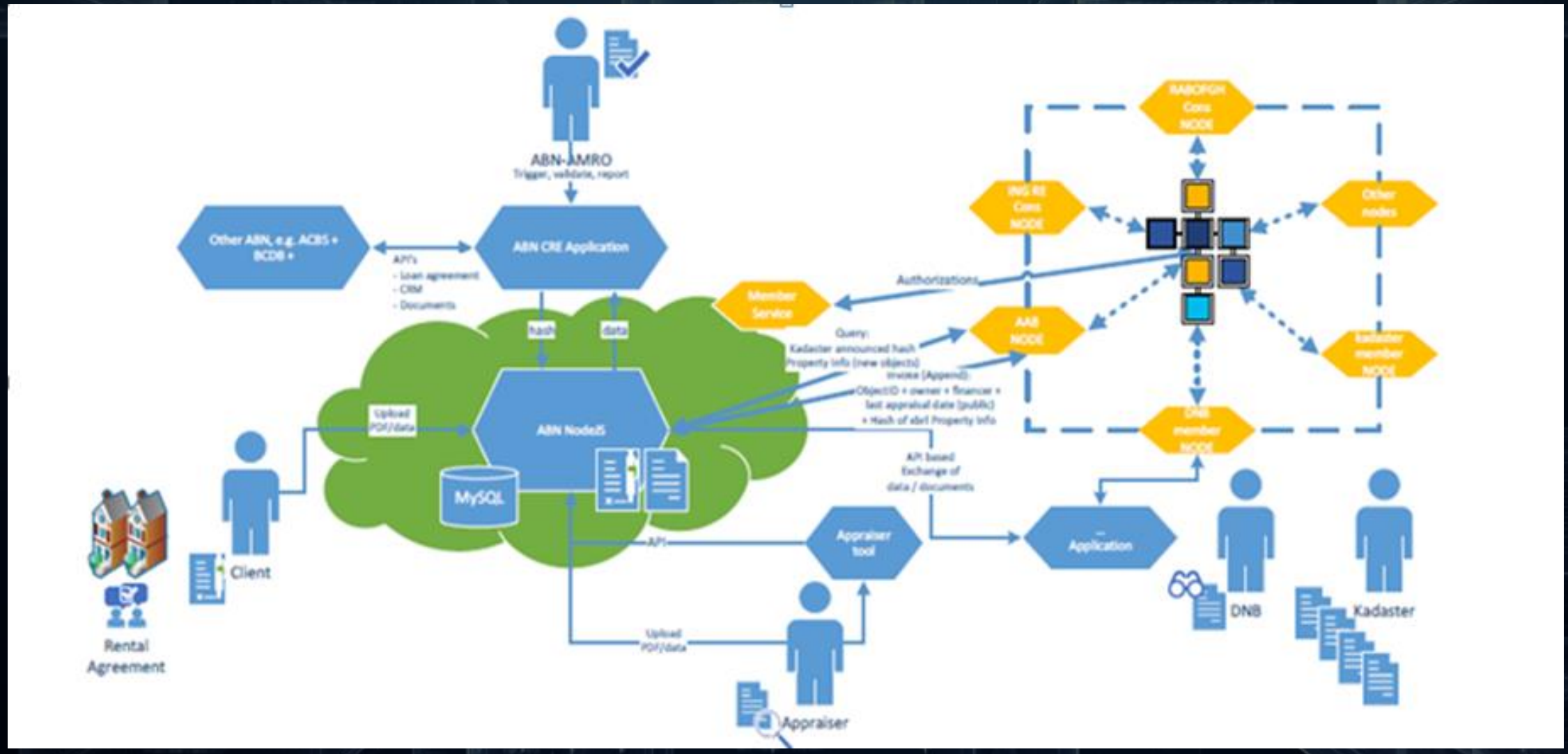
**Consens us**

**SMART Contracts**

# TORCH

**Explaining blockchain by means of our initial setup of the TORCH Real Estate platform.**

# PUTTING IT INTO **PRACTICE**



# Blockchain will disrupt multiple industries

## Financial

Redesign costly legacy workflows, improve liquidity and free up capital. Help reduce infrastructure costs, increase transparency, reduce fraud and improve execution and settlement times.

## Retail & Manufacturing

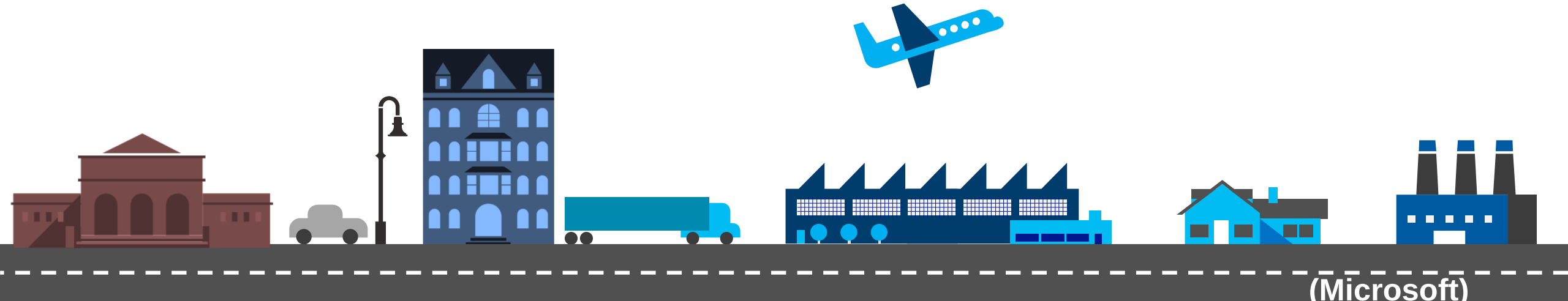
Better supply chain management, smart contract platforms, digital currencies, and tighter cybersecurity.

## Healthcare

Removes third-party verifiers such as health information exchanges by directly linking patient records to clinical and financial stakeholders. Provides fast, secure, authenticated access to personal medical records across healthcare organizations and geographies.

## Government

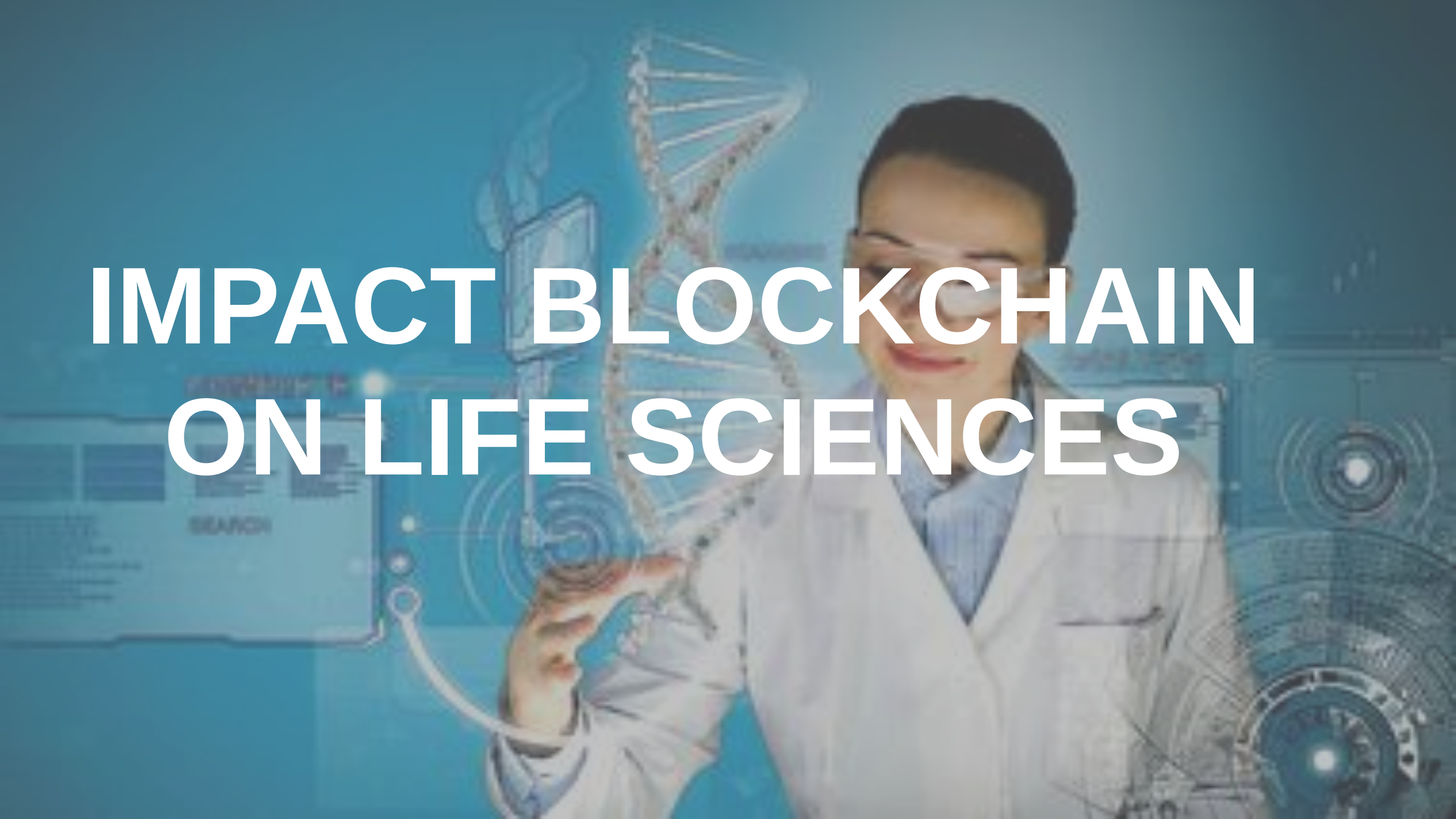
Increase transparency and traceability of how money is spent. Track asset registration, such as vehicles. Reduce fraud and operational costs.



(Microsoft)

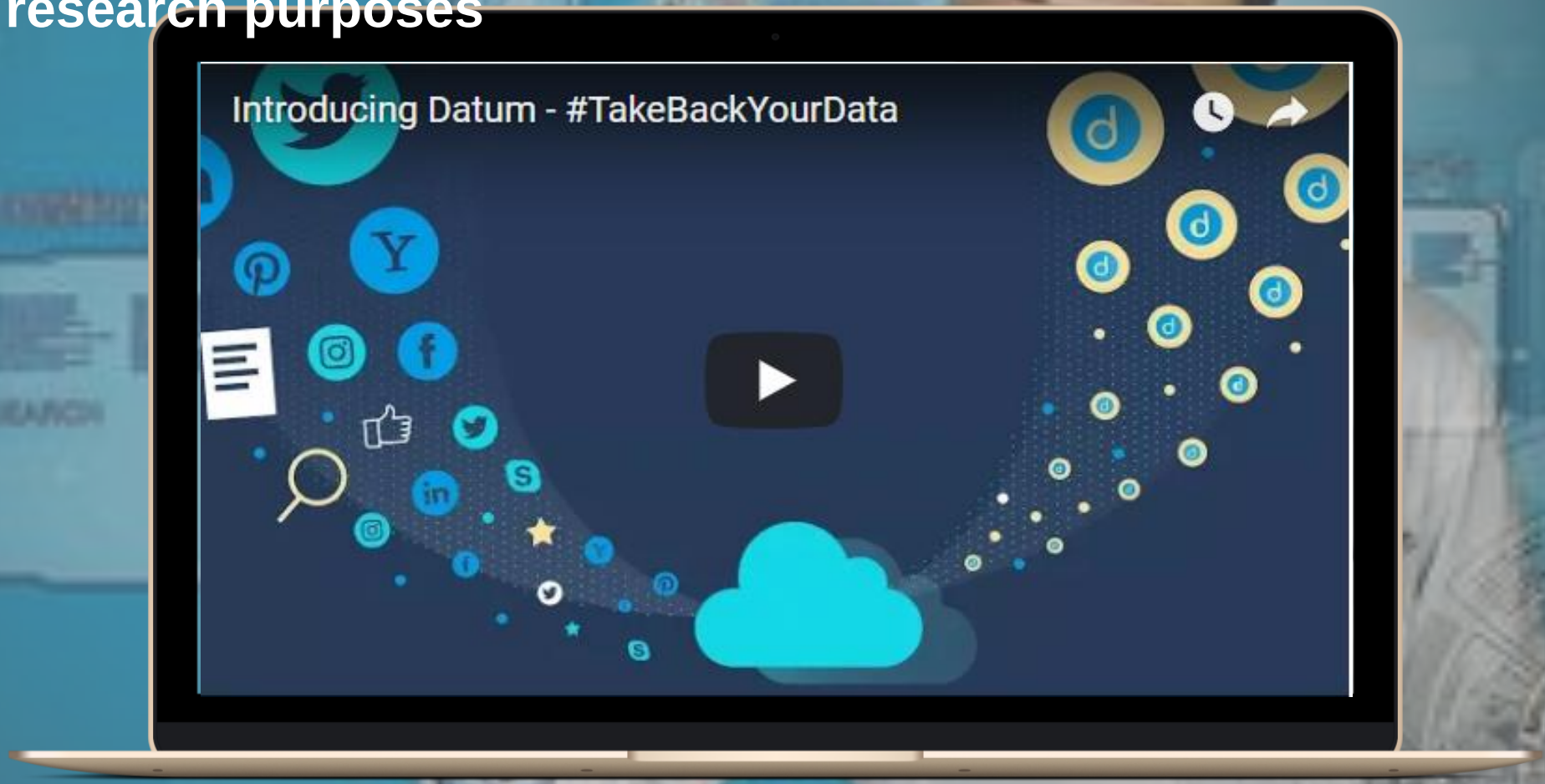
# STILL MANY **CHALLENGES**

- Scalability
- Consensus
- Privacy
- Legal and regulatory
- Training and education
- Impact on climate
- Job displacement
- Governmental misappropriation


IMPACT BLOCKCHAIN
ON LIFE SCIENCES

# PATIENT GENERATED DATA

**The Datum App helps users extract and anonymize their health data. Insurers, pharmaceuticals and academic researchers can buy this health data for research purposes**



# CLINICAL DATA AND HEALTH RECORDS

## MIT MEDIA LAB introduces “MedRec”

**a novel, decentralized record management system for EMRs that uses blockchain technology to manage authentication, confidentiality, accountability, and data sharing.**

**challenges for contemporary clinical research:**

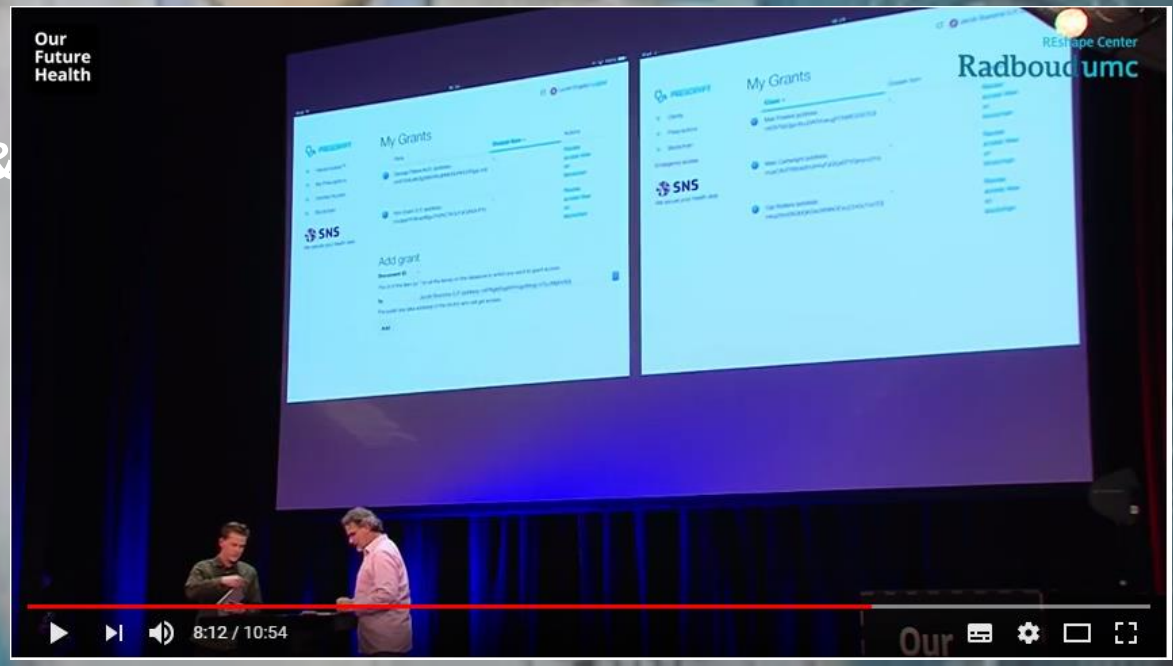
- **Reproducibility,**
- **data sharing,**
- **Provenance**
- **personal data privacy concerns**
- **and patient enrolment in clinical trials**

# PRESCRYPT

**Proof of concept of a blockchain application that makes it easier for chronic health consumers to acquire their repeat medication**

**Radboud UMC REshape Center in cooperation with Deloitte and SNS Bank**

**https://www.youtube.com/watch?v=2V0XqKb9nhg&**



# FOOD FOR THOUGHT - **BC CAPABILITIES**

**Transparency**

All blockchain participants are able to view data added to the chain, while the chain improves data integrity by being the single source of truth

**Disintermediation**

By enabling transparency and trust, the blockchain can fulfill the roles that intermediaries traditionally provide

**Trust**

Blockchain's connected data blocks and distributed validation structure establishes trust between participants without them having to know one another

**Auditability**

Blockchain data is immutable and everlasting, creating an exhaustive means of record keeping

**Source: Deloitte and AWS – "Blockchain, an enabler for life sciences health care"**
https://www2.deloitte.com/content/dam/Deloitte/us/Documents/about-deloitte/us-allian-blockchain.pdf

# FOOD FOR THOUGHT - **LSHC ISSUES**

| Common LSHC Issues how blockchain can help | |
|---|---|
| **Patient control and trust** | A patient's medical record can be secured through blockchain' s private-public key mechanism, in which the link between the patient's identity and the information housed on the blockchain can only be interpreted with the private key. In this way, high-level patient demographic and medical history information can be stored directly on the blockchain (e.g., gender, age, vital signs, chronic illnesses), but remain nonidentifiable to a specific patient. |
| **Ecosystem collaboration** | As a patient visits providers, selected data events from each interaction can be directed to a shared blockchain within a defined network of providers. Providers can be incentivized to share their information with one another because the culmination of data, across the provider types, is key to accurately understanding which treatments are providing the most value, at the best price, to patients. Trusted and available patient information will assist providers and payers to optimize medical resources and support risk based payment models. |
| **Transaction Processing and automation** | A simplified smart claim contract with pricing terms atomically tied to the product definition can be created in coordination with the payer and provider and published to a blockchain in a transparent manner. Providers that adopt this simplified contract can continue to submit claims using standardized electronic claim forms. Once the information is submitted, adjudication would take place in real time, on a claim per claim basis and can also trigger payments automatically when certain conditions are met. |
| **Authentic care delivery** | As a pharmaceutical drug moves beyond the R&D phase of its life cycle, the blockchain can provide visibility and end-to-end traceability to the global supply chain. As drug units are fitted with electronic serial numbers (as part of the Drug Quality and Security Act),[6] the identifiers can be encoded on the blockchain to establish the drug's footprint. As the drug moves through the supply chain, intermediaries can validate receipt of the drug and provide updates (e.g., date shipped, end customer). As the drug's transaction history grows, its transcript can be provided to the government regulator ad hoc to comply with reporting regulations and pinpoint the drug's current status and location. |

**Source: Deloitte and AWS – "Blockchain, an enabler for life sciences health care"**
https://www2.deloitte.com/content/dam/Deloitte/us/Documents/about-deloitte/us-allian-blockchain.pdf