Technology deep dive: DLT and blockchain

Description of technology

DLTs[1] are public or private networks recording transactions across distributed infrastructure.

Stored transactions are encrypted through unique, unchangeable hashes (for example, SHA 256 algorithm).

Multiple nodes verify items based on permissions or economic incentives to reach majority consensus to add transactions to the ledger, called consensus mechanisms.[2]

Blockchain is a type of DLT, a public network with a shared ledger without central authority controlled by economic incentives for nodes to update the ledger.

In a public network, economic incentives for transaction verification promise rewards to nodes as they credibly prove that transactions are legitimate; this is called mining.

Technology maturity

Technical maturity: Fundamental research — Mass adoption

By 2027, **up to 10% of global GDP** could be associated with blockchain-enabled transactions

Industry applicability

Industry applicability: Niche — Industry cross-cutting

What it enables companies to do

Immutability of records
Encryption of transactions ensures that any alteration to the ledger would recognized by the network and be rejected

Auditability
Sequential and indefinite recording of transactions create an indelible audit trail[3]

Traceability of positions
Transactions can be tracked down to their current position as it is always known where it was sent from and arrived at

Embedded security
Consensus from the network and encryption mechanisms ensure security is natively incorporated into operations

In private networks, permission designs determine degree of DLT/blockchain properties, and hence benefits apply

Main opportunities

Example use cases

I ***Reduced risk and lower compliance costs***
As trust in the system replaces trust in the counterparty, fewer risk checks are needed (eg, KYC[4] guidelines) as actors and transactions are approved through consensus

II ***Cost-efficient transactions***
No middleman required to authenticate transactions as system is based on high security, consensus, and verification via economic incentives

III ***Automated and secure contract fulfillment***
Deployment of smart contracts that trigger transactions automatically upon fulfillment of contract criteria, ie, less reconciliation

Network transparency
Network members can view status of transactions or item positions any time (eg, proof of provenance within supply chain)

1. Distributed-ledger technologies. 2. Two consensus mechanisms exist: the first is private blockchain, using big trusted corporations (smaller share of market) and the second is public mass-market blockchain. 3. Technically, blockchains could be reverted/deleted; however, there is minimal risk if designed properly. 4. Know your customer.

Source: Expert interviews; OECD; *Building block(chain)s for a better planet*, World Economic Forum, September 2018, weforum.org; McKinsey analysis

Use case deep dive: DLT and blockchain

Proof points

Use case	Situation and approach	Impact
I **Reduced risk and lower compliance costs** 	Existing KYC[1] processes are outdated and generate costs of up to $500 million/year/bank New DLT[2] system is proposed to reduce verification costs and improve customer experience	KYC verification in DLT system is only conducted once for each customer and then shared between the different financial institutions Creates efficiency gains, cost reduction, improved customer experience, and transparency throughout onboarding process
II **Cost-efficient transactions** 	For a letter-of-credit deal between Ornua and Seychelles Trading Company, companies decided to opt for a paperless solution to reduce costs and produce error-free documentation Usually, process takes 10 days	Decided to opt for blockchain to trade almost $100,000 worth of cheese and butter Process could be reduced to less than 4 hours from issuing to approval of the letter of credit
III **Automated and secure contract fulfillment** 	One retailer sought to streamline its supply-chain management by recording all processes and actions from vendor to customer and coding them into smart contracts on blockchain	Retailer yielded several benefits: 1) Improved transparency (easier to trace food provenance leading to safer consumption) 2) Fewer human actions in the chain 3) Improved tracking of lost products

1. Know your customer.
2. Distributed-ledger technology.

Source: Expert interviews; OECD; *Building block(chain)s for a better planet*, World Economic Forum, September 2018, weforum.org; McKinsey analysis

Expected technology-development horizons: DLT and blockchain

Expected technology-development horizons in next 5 years

Growth of federated DLT networks

Type of private blockchain in which multiple authorities can control the preselected nodes to validate transactions, instead of only one authority

Along with increasing possibilities to digitize values of physical assets (tokenization), federated blockchains will grow industry adoption

Growth of blockchain as a service (BaaS)

Cloud-based service to build digital products for DLT[1] and blockchain environments without any setup requirements for infrastructure

Big Tech companies are leading the efforts (eg, Amazon and Microsoft), likely accelerating diffusion of DLT/blockchain technology

Interoperability across DLT/ blockchain networks and outside system

Enabling disparate DLT/blockchain and external systems to view, access, and share data while maintaining integrity

Interoperability needs to take place on three layers: business model, platform, and infrastructure

Hardware standard-ization and scalable consensus algorithms will enable cross-network use cases (eg, the Internet of Things on DLT/Blockchain infrastructure)

1. Distributed-ledger technology.

Source: Expert interviews; McKinsey analysis

Enablers

Economic uncertainty as predictor of uptake of DLT/blockchain initiatives given independence of centrally regulated systems (eg, fiscal monetary system, public-cloud solutions)

Increased pressure from regulators and customers to institutionalize supply-chain transparency from provenance to end consumer (eg, German supply-chain law initiative)

Growing number of successful pilots and validation of use cases attracting network members (eg, Walmart)

Barriers

Limits to scalability for well-known applications, including transaction throughput and energy or infrastructure requirements

Uncertainty about regulatory and governance developments, including jurisdiction and enforceability of smart contracts, financial regulations, and offshore data storage

Lack of standards for deployment of DLT/blockchain solution (eg, terminology, programming practices, or platforms) and incompatibility with legacy systems

Unresolved threats of cyberattacks (eg, quantum brute-force attacks)

Efficient consensus for effective consensus mechanisms that require less or no energy