

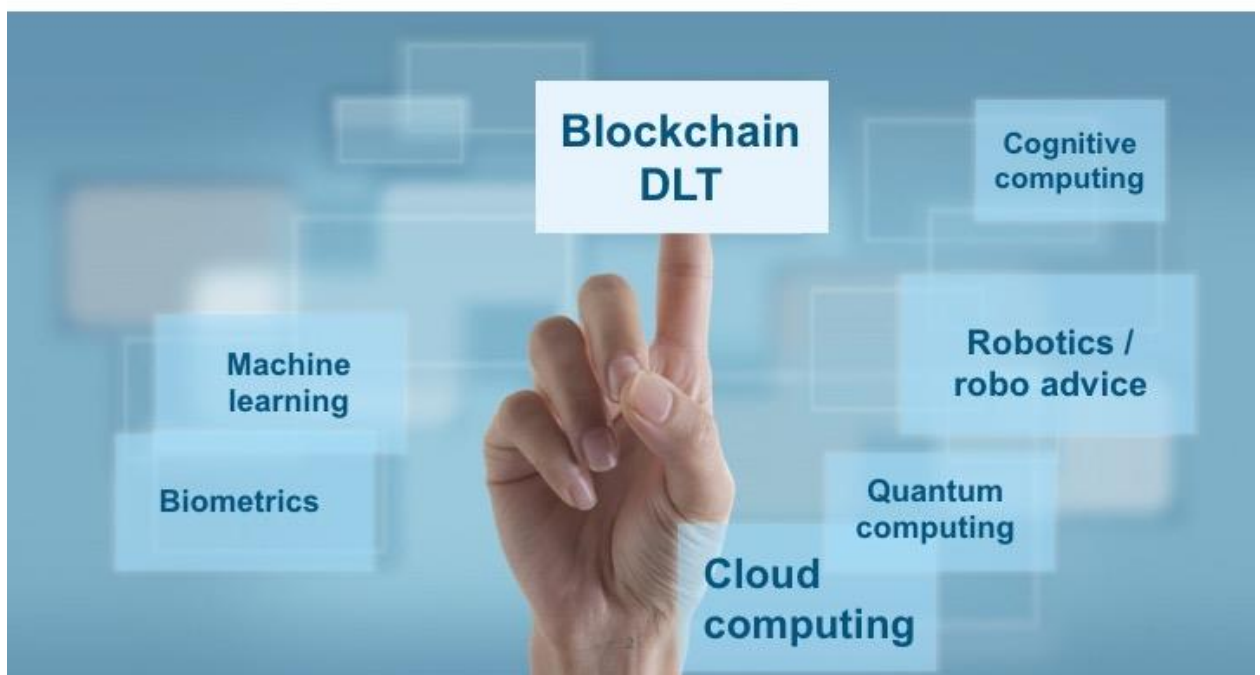
Implications of blockchain in payment, clearing and settlement for central banks and regulators *

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* The views expressed are those of the author and do not necessarily reflect those of the ECB

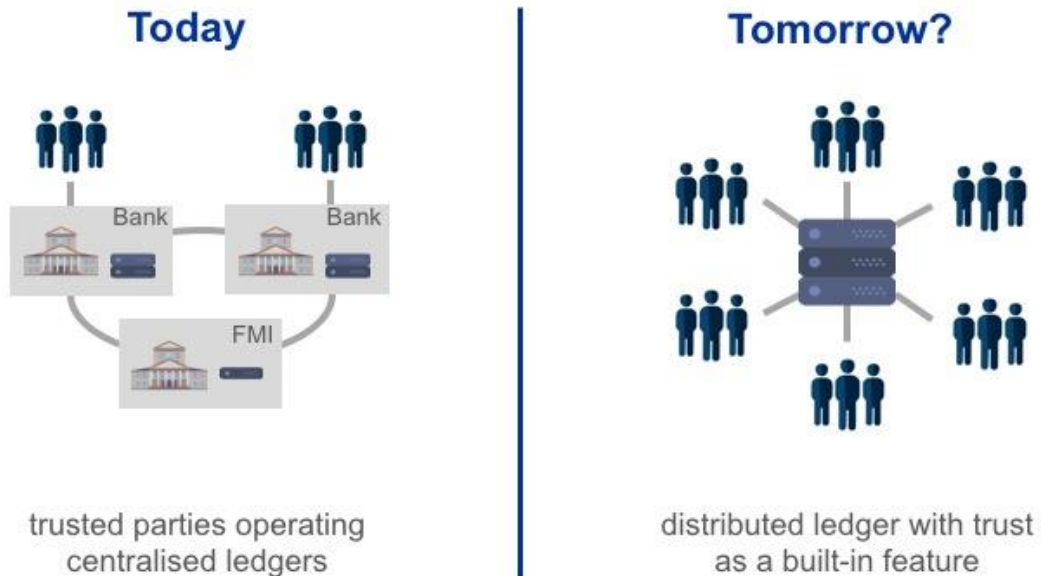
Technological innovation as constant game changer

➔ **Fintech:** innovation that could result in new business models or products with disruptive potential in the financial sector



Distributed Ledger Technology

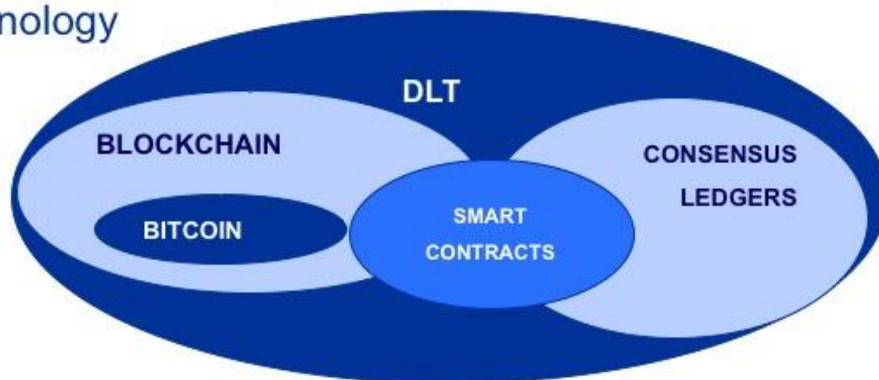
➔ Distributed ledger technology (DLT) combines existing technologies (cryptography, distribution, consensus mechanisms) to enable **shared use** of a network and related processes with no technical need for a central entity



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Terminology



Restricted tiered networks	Restricted networks of equals	Unrestricted structures
Only identified and accountable entities use the DLT and can be assigned different roles (permissions)	Only identified and accountable entities use the DLT and can perform any role	Any (possibly unknown) entity uses the DLT and can perform any role

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Impact on the financial sector

- **Virtual («crypto») currencies** were at the forefront of recent developments
 - ⇒ Separation of **assets** (e.g. Bitcoin) and **technology** (e.g. Blockchain)
 - **Potential to induce change across the value chain**
 - Trading
 - Payments, clearing and settlement
 - Data and identity management as well as regulatory reporting
 - Holding of assets, record of ownership and asset services
- ⇒ **Monitoring by central banks and supervisory authorities**
- Cf. recent reports of **CPMI** on *innovations* (2012), the role of *non-banks* (2014), and *digital currencies* (2015), as well as **ECB** on *virtual currency schemes* (2012, 2015) and *distributed ledger technology in post-trading* (2016)

Potential market adoption scenarios

- **Pressure on business models, risk management and supervision**
 - Challenges to the intermediary function of banks and financial market infrastructures
 - Market entry of new (unregulated) entities
- **Possible scenarios:**
 - (i) *individual market players* try to use DLT mainly to improve internal efficiency => happens already, limited impact
 - (ii) blockchain based market solutions are offered by
 - a) fintech startups *disintermediating* incumbents
 - b) bigtech companies *crowding out* incumbents
 - c) incumbent banks and infrastructures *cooperating* with fintech companieswith whole market segments shifting to DLT
 - (iii) a *peer-to-peer* world without intermediaries emerges => major impact, but unlikely to happen

Current key trends and observations

- Application of the technology mainly to **limited activities**, with recordkeeping and information sharing services more advanced than those involving asset transfers
- Experimenting with **tokenization** of assets is ongoing
- No use case in full production as **time is needed** to let the technology and its application to clearing and settlement processes mature
- Use cases based on **restricted, permissioned ledgers** with some use cases maintaining centralised control of the ledger
- Focused on **incremental improvements in post-trade processes** rather than substantial replacements of current market structures and practices
- Typically **rely on existing infrastructures** for settlement

Further evolution of DLT and blockchain

- **Re-intermediatisation**
 - Regulatory *compliance*
 - Control of *access*
- **Network effects**
 - *Fragmentation vs. economies of scale*
 - *Technical standardisation, functional harmonisation* of business rules and data sets
- **Process integration**
 - «*Delivery vs. Payment*»
 - Nexus to *central bank money*
- **Fundamental unresolved issues**
 - *Legal basis*
 - *Regulatory compliance, governance*

Selected governance, regulatory and legal aspects

- **Governance**
 - Setting or changing the *rules/protocols*
 - Control of *access*
 - Responsibility for the *operational design and risk management*
- **Regulatory compliance**
 - *KYC duties, money laundering and terrorist financing*
 - *Consumer protection, data secrecy and privacy rules*
- **Legal issues**
 - *Nature of digitised assets, the legal status of the ledger and of its “rules”*
 - *Identification and authentication of users/parties to a transaction*
 - *Finality of the records/balances on a DLT/blockchain*
 - *Liability for operational vulnerabilities (cyber resilience, protocol control, etc.), losses, fraud or theft*
 - *Applicable law, jurisdiction and enforceability*

Impact on regulatory authorities

- ⇒ Existing **legislation and regulation may be affected**
 - requirements to *use specific types of FMIs and access points (eg banks)*
 - operational and prudential requirements for *regulated entities*
- ⇒ **Regulatory responses** are driven by a **variety of motivations** (eg consumer protection, prudential or market organisation rules), consequently the tools used vary:
 - *information/moral suasion* (eg warnings)
 - *prohibition* (for certain types of entities or instruments)
 - *regulation of specific entities* (eg wallet providers, exchange platforms)
 - *interpretation of existing regulations* (eg taxation)
 - *accommodation* (eg sandboxes)
- ⇒ **Regulators to adapt own frameworks** for data access and reporting («RegTech»)

Implications for central banks

Operational role

- assessing potential of digital innovations for efficient and safe *central bank infrastructure services* for payments and securities settlement
- assessing impact on *monetary operations* and *central bank money issuance*

Catalyst role

- facilitating private sector efforts to improve *market efficiency*
- promoting work on *standardisation and interoperability*, countering the risk of silos and proprietary solutions

Oversight, supervisory and financial stability role

- assessing possible *impact of technology adoption* on overseen/supervised entities and their business models and the financial markets at large
- adapting central bank frameworks for *data collection and handling*

Involvement of regulatory standard-setting bodies

- **Global sectoral and cross-sectoral analysis and evaluation**
 - monitoring *developments and evolution* of digital schemes
 - impact on services and financial institutions
 - *security and operational (cyber) resilience* of products and services
 - relevance for *AML / TF*
 - *legal aspects*
 - impact on *financial intermediation*
 - relevance for *financial inclusion*
 - wider impact on *financial stability*
- **Assessment of need for global regulatory guidance** (risk-based approach)
- **Information sharing and coordination** between global standard-setting bodies (BCBS, CGFS/MC, CPMI, FSB, IAIS and IOSCO)

CPMI analytical framework (February 2017)

- DLT and its **component parts**



- **Technical design** elements
 - Maintaining information on the ledger (transaction history, account balances, tokens, other elements)
 - Updating the ledger (validation, consensus, roles of nodes)
 - Process flow
- **Institutional design** elements
 - Governance of the ledger
 - Access to the arrangement (unrestricted or *restricted*)
- Potential configurations and **trade-offs**

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CPMI analytical framework (February 2017)

- Guidance on **understanding the arrangement**
 - Functionality and nature of the arrangement
 - Key factors for an effective implementation
- Potential implications for **efficiency, safety and the broader financial markets**

Efficiency	Safety
Speed of end-to-end settlement Costs of processing Reconciliation (speed, transparency) Credit and liquidity management Automated contract tools	Operational and security risk Settlement issues Legal risk Governance Data management and protection
Broader financial market implications	
Connectivity issues and standards development Financial market architecture (actors, markets, regulators) Broader financial market risks (micro- and macro-level)	

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