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

Blockchain
DLT

Cognitive computing

Robotics / robo advice

Quantum computing

Cloud computing

Machine learning

Biometrics
**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.

**Today**

- Trusted parties operating centralised ledgers

**Tomorrow?**

- Distributed ledger with trust as a built-in feature

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**Terminology**

- DLT
- Blockchain
- Bitcoin
- Smart Contracts
- Consensus Ledgers

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<thead>
<tr>
<th>Restricted tiered networks</th>
<th>Restricted networks of equals</th>
<th>Unrestricted structures</th>
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<tbody>
<tr>
<td>Only identified and accountable entities use the DLT and can be assigned different roles (permissions)</td>
<td>Only identified and accountable entities use the DLT and can perform any role</td>
<td>Any (possibly unknown) entity uses the DLT and can perform any role</td>
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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 companies
    with 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**

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<th>Safety</th>
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<td>Speed of end-to-end settlement</td>
<td>Operational and security risk</td>
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<tr>
<td>Costs of processing</td>
<td>Settlement issues</td>
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<tr>
<td>Reconciliation (speed, transparency)</td>
<td>Legal risk</td>
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<tr>
<td>Credit and liquidity management</td>
<td>Governance</td>
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<td>Automated contract tools</td>
<td>Data management and protection</td>
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**Broader financial market implications**

- Connectivity issues and standards development
- Financial market architecture (actors, markets, regulators)
- Broader financial market risks (micro- and macro-level)