



EUROPEAN CENTRAL BANK

EUROSYSTEM

# **Distributed ledger and block chain technology: implications for post-trade \***

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Frankfurt, 12 October 2016

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\* The views expressed do not necessarily represent the views 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**

**Machine  
learning**

**Robotics /  
robo advice**

**Biometrics**

**Quantum  
computing**

**Cloud  
computing**



## Big banks plan to coin new digital currency

August 23, 2016

FINANCIAL  
TIMES



## Blockchain Reaches a Tipping Point

August 5, 2016



CoinDesk  
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Aug 25, 2016



## Blockchain Pitched as Way to Simplify FX Trading Databases

Aug 24, 2016



## UBS leads team of banks working on blockchain settlement system

REUTERS

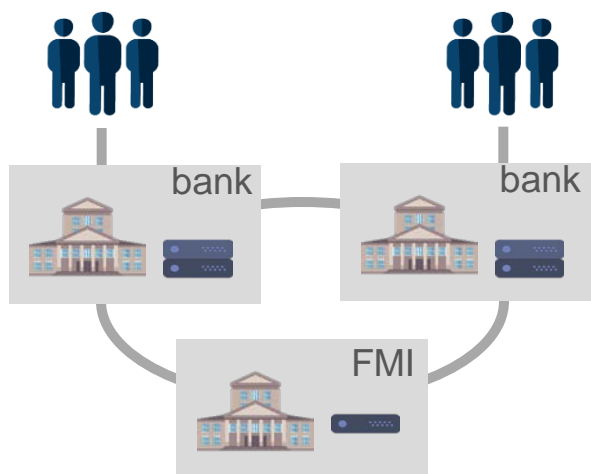
Aug 24, 2016

# Disruptive nature of digital innovation



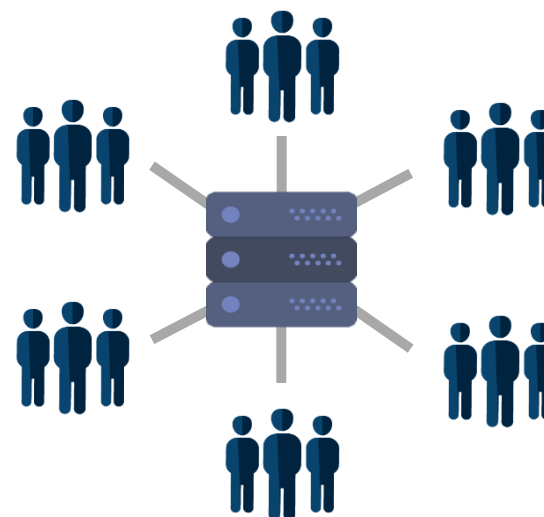
Disruptive potential of blockchain lies in the fact that it enables shared databases and trust is embedded through cryptographic proof

## Today



trusted parties operating  
centralised ledgers

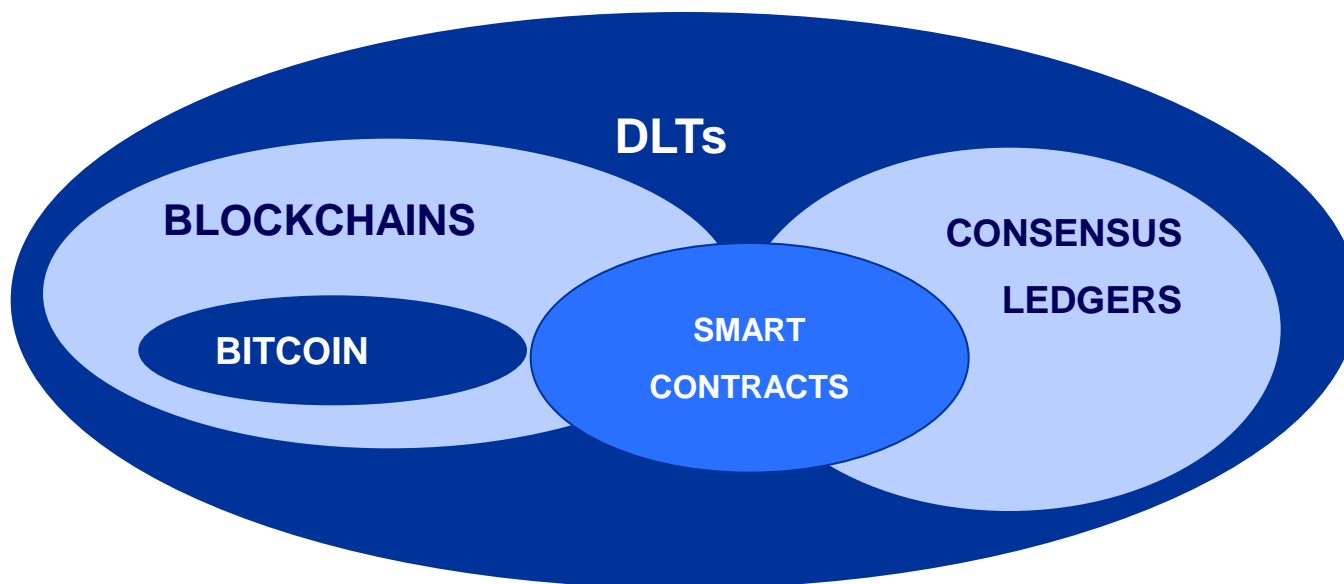
## Tomorrow?



decentralised ledger with  
trust as a built-in feature

# Blockchains and distributed ledger technologies (DLTs)

- A distributed ledger is a *shared* database to record either *transactions* or *account balances* for a given set of assets and users
- DLT users can modify accounts in the distributed ledger and consider it as *authoritative even without central operator*
- The DLT landscape:



## Restricted vs. unrestricted DLTs

### Restricted DLT

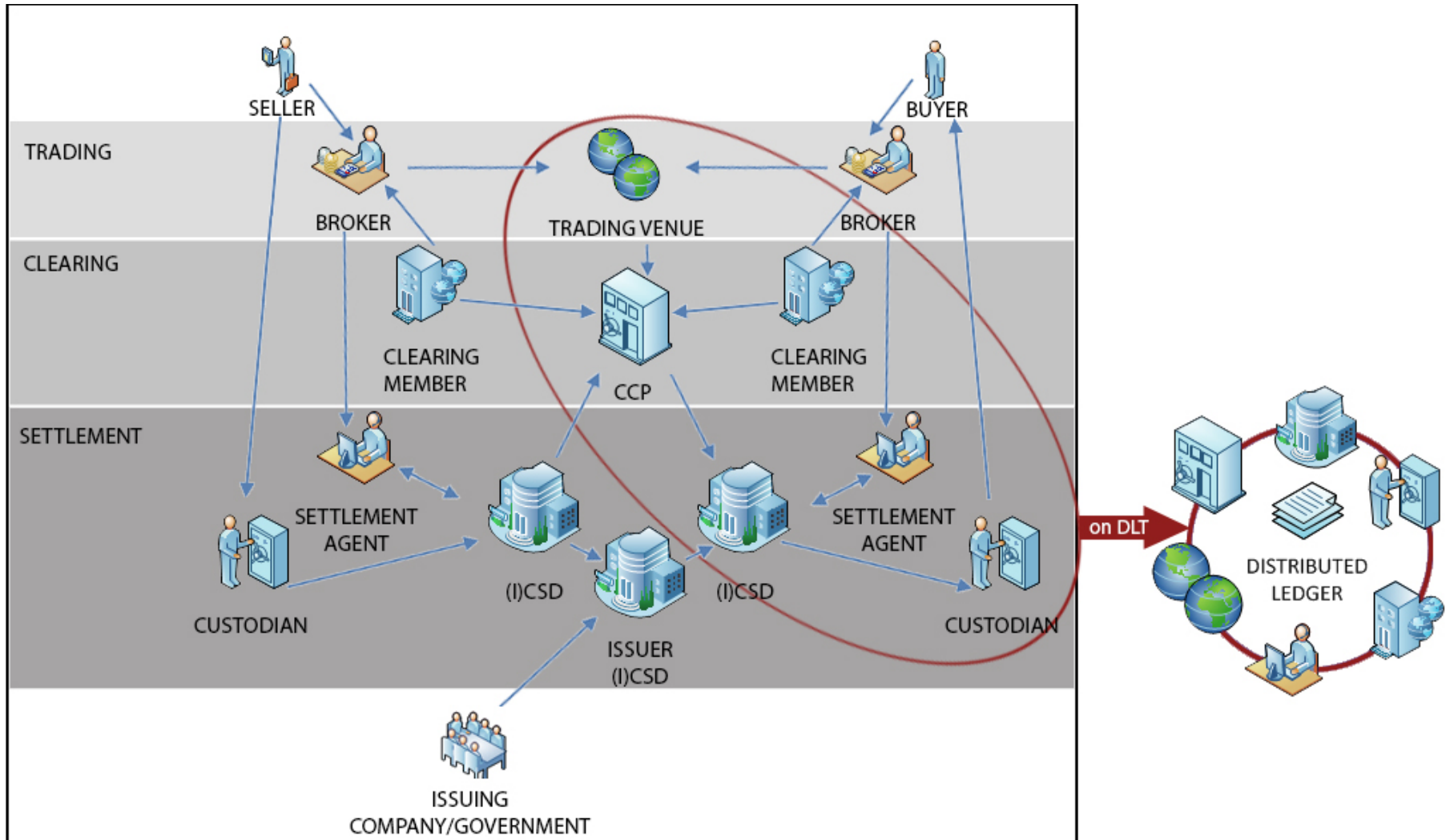
closed system among  
*identified and accountable*  
entities

### Unrestricted DLT

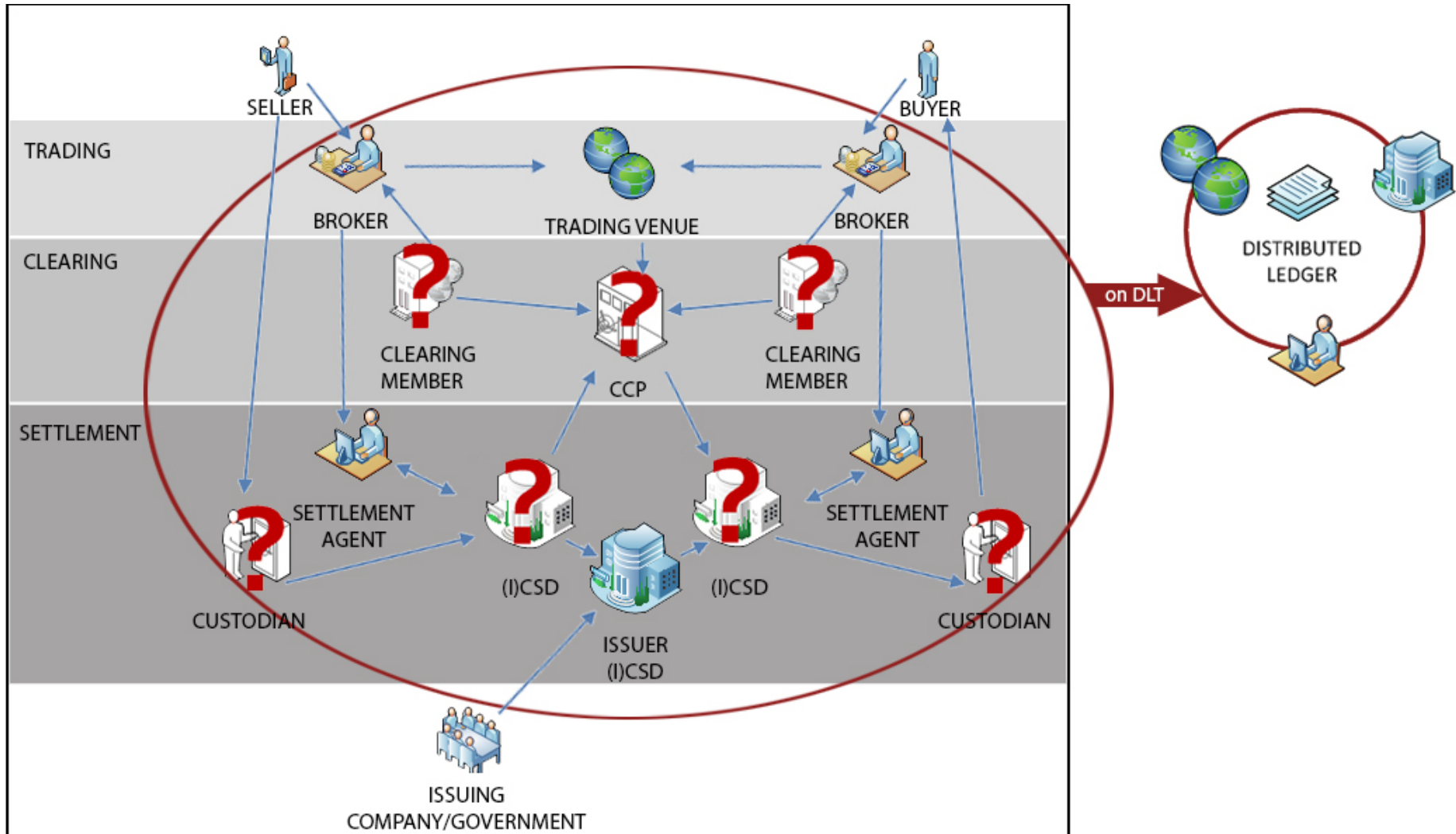
*unknown* entities can  
propose/validate  
transactions

- Unrestricted DLTs do *not* allow to:
  - punish *illicit* behaviour
  - ensure *compliance* with KYC, AML, and ATF provisions
  - use *efficient* validation methods
- Financial institutions are focusing on restricted DLTs
  - *Governance, authentication and accessibility* will be key issues

# Scenario 1: DLT to improve cluster efficiency

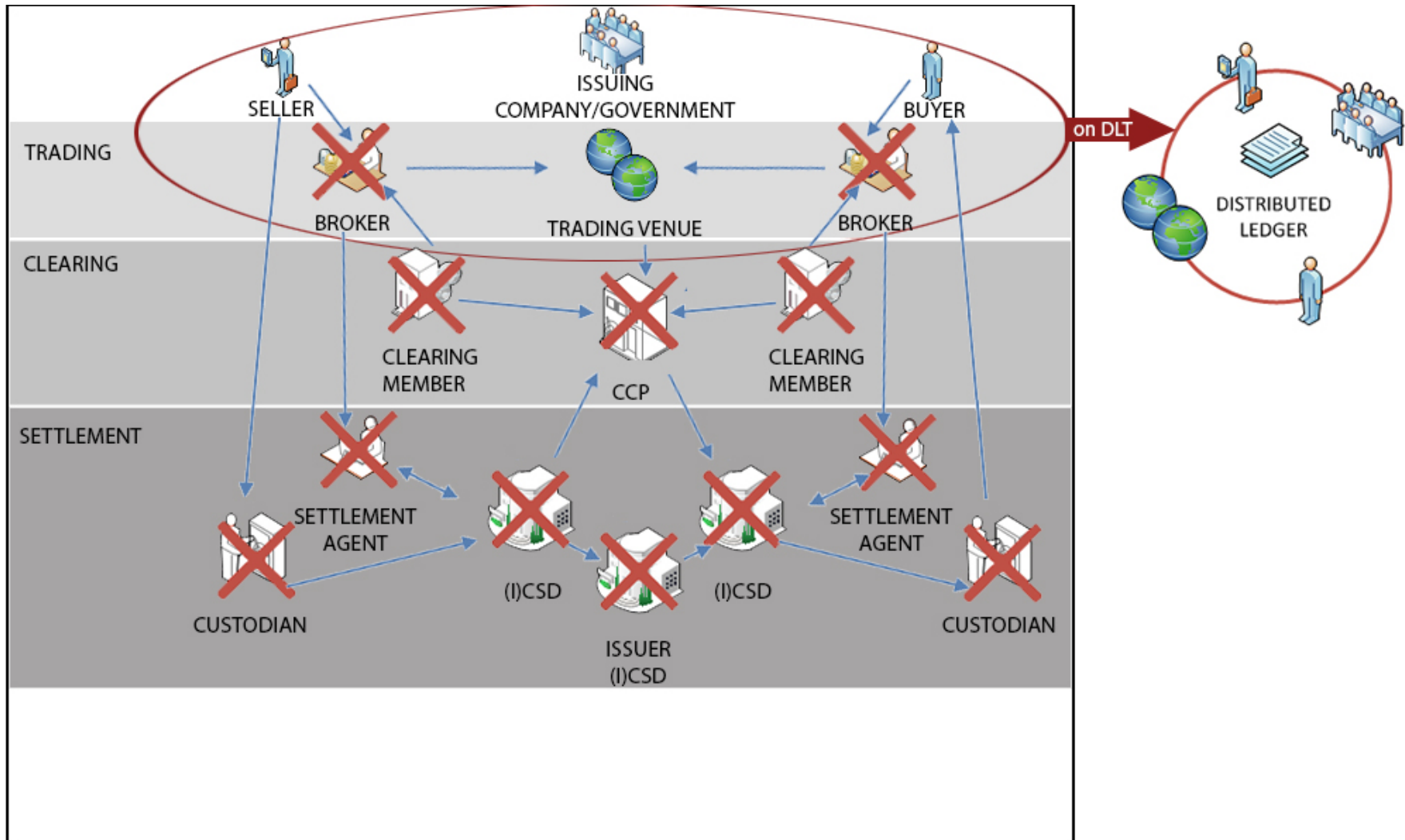


# Scenario 2: market-wide adoption





# Scenario 3: peer-to-peer



## Impact of digital innovations

- **Segregation of the two key features** of digital innovations:
  - *the **assets side** (e.g. Bitcoins) - typically not a liability of any entity nor backed by a public authority)*
  - *the **technology** used - in particular the use of *cryptography* and *distributed ledgers*, allowing transactions in the absence of trust between the parties and without the need for intermediaries*
- **Potential of technology to induce changes** in
  - *trading* (exchange function)
  - *transfers* (*payment, clearing* (margin settlements, instant recordings) and *settlement services* (collateral and liquidity management, matching))
  - *reporting* (incl. regulatory reporting, identity management)
  - *holding* of assets (records of ownership, asset servicing)

# Impact of digital innovations on the financial ecosystem

## Possible scenarios

- In the customer-to-bank domain
  - Incumbent banks cooperate with FinTech companies
  - Banks are disintermediated by FinTech companies
  - “BigTechs” enter the market
- In the infrastructure domain
  - FMIs embrace new technologies and cooperate with FinTech companies
  - Traffic is moving away to new initiatives
  - Crowding out / disappearance of some FMIs

# Issues to consider

## Perceived potential

- Higher speed and immutability of records
- Lower costs through streamlining of processes
- Automation of certain processes
- Enhanced resilience
- Cross-border reach

## Challenges

- Business model sustainability and consumer protection
- Consumer experience and usability/market adoption
- Security
- Scalability and efficiency (latency, costs)
- Data privacy/pseudonymity

## Monitoring and assessment of impact

- ***Digital innovations based on blockchain/DLT*** may have disruptive implications for financial markets and its participants and thus are ***monitored by central banks and prudential authorities***
- As part of the shift in focus towards new and disruptive innovations, the emergence of ***digital currencies have been frontrunning developments in other field***
- ***Regulatory bodies and central banks*** assess these developments, eg. recent reports
  - by the ***CPMI*** on *innovations* (2012) the role of *non-banks* (2014), and on *digital currencies* (2015) and
  - by the ***ECB*** on *virtual currency schemes* (2012, 2015) and *distributed ledger technology in post-trading* (2016)

# Implications of distributed ledger technology and blockchain

- Current debate is still very much **focussed on the technological aspects**
  - ⇒ *irrespective of technology deployed*, certain functions will always have to be performed by regulated entities (*be it the incumbent or new ones*): this limits potential disruption
- Financial industry is a **network industry**
  - ⇒ *technical standardisation, harmonisation* of business rules and *sound governance* arrangements are needed for digital innovation to succeed
- How to **link cash leg with securities leg?**
  - ⇒ *delivery versus payment* model in a DLT environment has its limitations without nexus to central bank money
- **Fundamental unresolved issues**
  - ⇒ *Legal underpinning, regulatory treatment,...*

# Selected governance and regulatory aspects

- **Governance**

- who is in charge of setting or changing the *rules/protocols*
- who controls *access*
- who is responsible for the *operational design and risk management*

- **Regulatory compliance**

- who is responsible for performing *KYC* duties (e.g. exchanges or wallet providers)
- who is accountable for *money laundering and terrorist financing*
- who is responsible for *investor protection, data secrecy and privacy rules*
- how can *consumer protection* be safeguarded
  - digital services are not well understood by consumers (but not only by them)
  - digital assets are typically stored in digital vaults or wallets which can be hacked and the units of value can be stolen

## Selected legal issues

- the *nature of assets* represented in digital form on a distributed ledger
- the *legal status of the ledger* and of the “*rules of system*”
- the *legality and enforceability of the records* kept on a distributed ledger (“public trust”)
- the *identification and authentication* of users/parties to a transaction (e.g. to prevent access by unauthorized participants or minors)
- the *rights and obligations* of the parties to a transaction executed through entries on a distributed ledger or via blockchain
- the *liability* for operational vulnerabilities (cyber resilience, protocol control, etc.), losses, fraud or theft



## Impact on regulatory authorities

### ⇒ Existing **legislation and regulation may be affected**

- *carve outs and fragmentation of existing rules*
- requirements in existing legislation/regulation to *use specific types of central infrastructure (eg FMIs) and access points (eg banks)*
- operational and prudential requirements for *regulated entities* (intermediaries, counterparties, service providers)

### ⇒ How should regulation take into account **rapid technological developments**

- dedicated *new rules* or *adapting* existing regulation?
- *technology neutral, supportive, restrictive,...*
- *collaborative* or *top-down*

### ⇒ **Regulators to adapt own frameworks** for data access and reporting

- «*RegTech*»

# Regulatory approaches

## Innovation originally led by non-banks, increasing take-up by financial institutions

- *commercial or competition* reasons (fees, seigniorage, promotion of other business services, simplification or integration of services)
- *non-profit motives* (experimentation, ideological motivations, or facilitating financial inclusion)

**Regulatory response** are driven by a **variety of motivations**, eg consumer protection, prudential and market organisation rules – consequently the tools used vary:

- *Information/moral suasion* (eg warnings)
- *Regulation of specific entities* (eg wallet providers, exchange platforms)
- *Interpretation of existing regulations* (eg taxation)
- *Accommodation* (eg sandboxes)
- *Prohibition* (for certain types of entities or instruments)

# Implications for central banks

## ***Operational role***

- assessing potential of digital innovations for efficient and safe central bank infrastructure services for settlement of payments and securities
- 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)
- An ***ad-hoc coordination group*** has been established as facilitator of information sharing and coordination between global standard-setting bodies (BCBS, CGFS/MC, CPMI, FSB, IAIS and IOSCO)