



Blockchain Beyond Finance

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Potentially Disruptive...

**“Blockchain is the most disruptive invention since the Internet itself”
(Digital Doughnut)**



Potentially model changing

- **A secure shared distributed ledger**
 - **Secure** – cryptographically supported
 - **Shared** – a number of entities participate in blockchain
 - **Ledger** –the database is an immutable record of transactions that occur
 - **Distributed** –there are many replicas of the blockchain database
- **It decentralizes data in a trustless environment**
 - Traditional ledgers are centralized, with trusted 3rd parties and middlemen to approve and record transactions
 - Blockchain distributes ledgers across the network without intermediaries
 - Multiple replicas are maintained

Potentially broadly applicable

- Distributed, continuously growing, and replicated databases
 - Concept that is applied outside of finance
- Maintained by peer to peer network of participants
 - Interest in more centralized options among financial firms
- New medium for digital transfer
 - Applied to a number of models

Blockchain environments

Typical for early stage potentially disruptive technology and broadly applicable models

- R&D environments
 - Universities, companies, government research
- Open source – Hyperledger (and other efforts)
 - And regional efforts like China Ledger
- Prototyping within a framework
 - R3
- Standardization (ISO Blockchain effort approved in September 2016 as ISO TC307)
- Regulatory
 - Only crypto currencies are regulated in rare cases
 - Several countries – e.g., Bangladesh, Bolivia –ban Bitcoin
 - Many countries (e.g., Germany) accept Bitcoin as legal tender
 - Most countries don't regulate this area, although cryptocurrency regulatory explorations are starting...

Broadly applicable characteristics

- Enable direct transfer of value between parties
 - A number of models emerged
- Remove the need for intermediaries
 - A fundamental feature because it run contrary to typical Internet-driven models
- Eliminate central points of failure and control
 - Leading to the emergence of new security models
- Ensure integrity and immutability of records
 - Consistent with a large number of key requirements in technology and regulatory space
- Influence supply chains by improving
 - Traceability & provenance; chain of custody; monitoring & auditing, etc.

Uses beyond finance (examples)

- Government
 - Notarization, land registry, vehicle registration, healthcare, etc.
 - Increase transparency and traceability; asset tracking, and reduce fraud
- Retail, Manufacturing
 - Supply chain, smart contracts, traceability, provenance
- Healthcare
 - Distributed health information exchanges removing third parties; access to medical records

Supply chain example: integrity

- Blockchain could be used to track the components for a complex device, e.g., a medical device
- A unique ID could be created based on all the parts of the device supplied by different manufacturers or intermediaries
- The information could be used:
 - As proof of authenticity
 - For compliance
 - To support warranties

More use cases

Financial

Trading
Settlements
Origination
P2P lending
Crowd funding

Insurance

Claim processing
Fraud reduction
Tracking
Data integrity

Media

DRM
Ticket purchasing
Fan tracking
Art authentication

Health

Records
Prescriptions
Compliance
DNA sequencing
Personalized medicine

IoT

Operations
Grid monitoring
Device to device payments
Data integrity

Consumer

P2P Commerce
Shared economy (e.g., Uber)
Digital rewards

Supply chain

Tracking
Authentication
Provenance
Authenticity

Identity

Authentication
Objects
Individuals
Enterprise

Work processes

Micronization of work
API platforms
Developer to enterprise
Delivery of work

Government

Registration
Notarization
Document access
Provenance
Titles

Payments

B2B payments
Micropayments
Tax
Wallets

Assets

Tracking
Authentication



Barriers to Broad Adoption

BUSINESS	TECHNICAL	BEHAVIORAL	REGULATORY
<ul style="list-style-type: none">• Moving assets to the Blockchain• Critical mass of users• Quality of Startups• User Experience• Few poster application companies	<ul style="list-style-type: none">• Scalability• Privacy & Security• Lack of Standards• Underdeveloped ecosystem infrastructure• Immature Development tools & frameworks• Lack of mature applications• Legacy Systems integration	<ul style="list-style-type: none">• Change Management• Trusting a Network• Few best practices• Low usability factor	<ul style="list-style-type: none">• Unclear regulations• Compliance Requirements• Taxation and Reporting

Unsolved problems

- Privacy
- Performance
- Standardization
- Infrastructure
- Other

Future Direction

- Current: Ledgers
- Future: Ledgers, Smart Contracts, Cloud Services, Identity

Questions?

Distributed Ledger Technology In One Slide

Summary

Distributed Ledger Technology, or DLT, is a set of communication protocols that enable administratively decentralized, replicated databases. It is currently being used as the basis for crypto-currencies. Initial alternative usages are being explored in financial services, around clearing and settlement. DLT is useful today, but potentially, DLT as a common protocol COULD have widely transformational impact. It would enable any trusted, decentralized transactions and transform all online transactions, although significant barriers to these usages remain.

DLT Today Is Still Being Worked Out:

- There are many unanswered questions about validation mechanisms, scalability of transactions, complexity of transactions, number of participants, viability of privacy, and more.

DLT Is Immature for Enterprise:

- No service level agreements, transaction rates are too slow, anonymity is uncontrolled, endpoints are insecure, validation is (computationally or network-load) inefficient. And useful applications are still emerging.

The Upside Potential Is Substantial, But Untested

- In financial services alone, cost reduction for pre- and post-trade settlement; syndicate lending could be very substantial. Instant auditability could improve many processes. In e-government, the same practices could be broadly applied.

Industry is looking at a wide range of applications

Considering security, privacy, scalability, and standards, but the work is in its early stages..

