Blockchain in Healthcare

Presented to the Kentucky HFMA Chapter

Tom Skoog, Principal

July 19, 2018
What are Blockchain and Bitcoin and How Can They Be Used?

- Bitcoin and Blockchain - what’s the difference
  - Bitcoin (and other crypto currencies)
  - Blockchain technology
- Blockchain’s potential transformative effect across industries
- Blockchain application to healthcare
- Next steps
Bitcoin and Blockchain
What’s the difference?
What is Blockchain

Blockchain ≠ Bitcoin

The Internet is to BLOCKCHAIN what eMail is to BITCOIN

Blockchain – “A digital and distributed ledger in which transactions are recorded chronologically, and PUBLICLY.

“The Trust Machine” The Economist
Bitcoin and Crypto
What is Bitcoin?

“Everything you don’t know about money combined with everything you don’t know about computers.”

John Oliver
Fiat Versus Digital Currency

- Physical paper or metal object
- Backed by Government – not silver or gold
- Trust based on faith in U.S. Government
- 3rd party financial institutions manage digital exchange (ACH, Credit Cards)

- Electronic/digital key to an wallet address
- Backed by worldwide network
- Trust based on network mining consensus
- Validation of transactions by consensus - nodes
Transactions on the Bitcoin Network

Joe’s Wallet
- Bitcoin #12221
- .01
- .03
- .06
- Bitcoin #26995
- -.02 to 1234ghk17

Bill’s Wallet
- Bitcoin #12221
- .02
- .
- .
- +.02
- 1234ghk17

Network
- Exchange
- Mining Pool
- Node
- Wallet Software
- Consensus (graphic)
Cryptocurrency Developments

ethereum

Bitcoin

LTC (Litecoin)
How Are Bitcoin/Cryptocurrencies Used Today?

Medium of exchange

Startups / ICOs

https://github.com/cjdowner/cryptocurrency-icons.git
Banking Functions Impacted by Blockchain - - *FUNDRAISING (VC, IC)*

**USD Raised by ICOs in 2017 - Monthly Totals**

- January 17: $2
- February 17: $14
- March 17: $88
- April 17: $200
- May 17: $364
- June 17: $660
- July 17: $673
- August 17: $829
- September 17: $833
- October 17: $1,217
- November 17: $1,331
- December 17: $1,406

**Tech angel and seed equity funding vs. ICO funding**

- Q1’16: $1,116
- Q2’16: $1,316
- Q3’16: $1,232
- Q4’16: $1,197
- Q1’17: $1,434
- Q2’17: $1,279
- Q3’17: $1,327

Sources: CB Insights, TokenData, CoinSchedule.

**Number of Listed U.S. Companies Continues to Drop**

What is Blockchain Technology?
Blockchain IS:

- The underlying technology for Bitcoin
- A permanent ledger of transactions (immutable)
- Transparent for those authorized to see transactions
- Decentralized

Blockchain IS NOT:

- Just about Bitcoin and other cryptocurrencies
- Necessarily anonymous
- A database
- A replacement for every type of computer software
Blockchain = Decentralized Information

A consensus of replicated, shared and synchronized digital data spread across multiple sites. There is no centralized data storage.

Server 1
- Transaction 1
- Transaction 2
- Transaction 3
- Transaction 4

Server 2
- Transaction 1
- Transaction 2
- Transaction 3
- Transaction 4

Server 3
- Transaction 1
- Transaction 2
- Transaction 3
- Transaction 4

Consensus!
Network Nodes

Computers that connect to a blockchain network are called nodes.

Each full node stores the complete blockchain.
Function of the Miners

Miners:

- Add transactions to each block
- Validate each block
- Validate unique past transactions (no “double-spend”)
What is a Hash?

Hash = Algorithm

Block 1
- Transaction 1
- Transaction 2
- Transaction 3
- Transaction 4

Block 2
- Transaction 1
- Transaction 2
- Transaction 3
- Transaction 4

Block 3
- Transaction 1
- Transaction 2
- Transaction 3
- Transaction 4
ASIC Miner – Application Specific Integrated Circuit
Distributed Ledger

- Distributed – shared between untrusted parties, everyone has the same information
- Immutable – the blockchain is an unalterable history of transactions
- Secure – all updates are performed by transactions that are signed by known identities
Public vs Private Blockchains

**Similarities**
- Decentralized peer-to-peer networks
- Each participant maintains ledger of digitally signed transactions.
- Replicas in sync through “consensus”
- Immutability of the ledger

**Public Blockchain**
- Anyone can join
- Completely open – encouragement to join
- Bitcoin largest public Blockchain

**Private Blockchain**
- Invitation only
- Permissioned network
- Opportunity to realize technical benefits (e.g., “digital identity”)
Blockchains potential transformative effect across industries
Future Uses of Blockchain

- Banking
- Supply Chain
- Identity
- Healthcare

Smart Contracts
# Smart Contracts

CPROP’s blockchain-powered workflow management system is a planned integration with property portals around the world to help deliver an unprecedented level of trust to real estate transactions while increasing their revenue opportunities. For property buyers, CPROP aims to remove anxiety associated with long-distance transactions by providing blockchain-authenticated documents, smart contract escrows, process automation and options to choose user-rated service providers.

## Problems We Are Solving

<table>
<thead>
<tr>
<th>Lack of Trust</th>
<th>CPROP Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untrusted escrow agents</td>
<td>Smart contract escrows</td>
</tr>
<tr>
<td>Unfamiliar legal frameworks</td>
<td>Blockchain-verified documentation</td>
</tr>
<tr>
<td>Untrusted government registries</td>
<td>Tokenized deeds</td>
</tr>
<tr>
<td>Untrusted service providers (agents, lawyers, etc.)</td>
<td>User-rated community of service providers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inefficiency</th>
<th>CPROP Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual, complicated closing processes that can kill a deal</td>
<td>Process automated workflow management platform</td>
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</table>

<table>
<thead>
<tr>
<th>Risk</th>
<th>CPROP Solution</th>
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</thead>
<tbody>
<tr>
<td>Loss of, or flawed, documentation</td>
<td>Decentralized, secure file storage (IPFS)</td>
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</table>

<table>
<thead>
<tr>
<th>Stress</th>
<th>CPROP Solution</th>
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</thead>
<tbody>
<tr>
<td>Anxiety associated with unfamiliar processes</td>
<td>Transparent workflows packaged in a seamless integration with property portal</td>
</tr>
<tr>
<td>Fear of unanticipated delays and costs</td>
<td></td>
</tr>
</tbody>
</table>
## Banking Industry Investments in Blockchain

### Incumbent Banks’ Blockchain Initiatives

<table>
<thead>
<tr>
<th>Institution Name</th>
<th>R3 Member</th>
<th>Hyperledger</th>
<th>Proof of Concept</th>
<th>Investment</th>
<th>Accelerator</th>
<th>Patents</th>
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<tbody>
<tr>
<td>Banco Santander</td>
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<td>✓</td>
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<td>✓</td>
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<tr>
<td>Bank of America</td>
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<td>Barclays</td>
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<td>Commerzbank</td>
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<td>Credit Suisse</td>
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<tr>
<td>Deutsche Bank</td>
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<td>Goldman Sachs</td>
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<td>HSBC</td>
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<td>JPMorgan</td>
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<td>Morgan Stanley</td>
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<td>Wells Fargo</td>
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Source: [Outlier Ventures](#)
Banking

MonetaGo

Sending Or Requesting Payments Overseas?
Click. Save. Grow.

Send and request your global business payments in a click like 50,000+ other Small Businesses.

https://www.veem.com

https://monetago.com/
Identify

Wine Blockchain EY

https://verified.me/

http://www.ey.com/it/it/services/advisory/ey-blockchain
Supply Chain

Blockchain Applications to Healthcare
Banking Functions Impacted by Blockchain

- Health Data Exchange and Interoperability
- Improved Medical Records Management
- Transparent Billing Management
- Supply Chain Source and Integrity
## Improved Medical Records Management

<table>
<thead>
<tr>
<th>Blockchain: Key Benefit</th>
<th>Biomedical/Health Care Use Case: Improved Medical Record Management</th>
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</thead>
<tbody>
<tr>
<td>Decentralized Management</td>
<td>Patient-managed health care records</td>
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<tr>
<td>Immutable Audit Trail</td>
<td>Unalterable patient records</td>
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<tr>
<td>Data Provenance</td>
<td>Source-verifiable medical records</td>
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<tr>
<td>Robustness/Availability</td>
<td>Reduced risk of patient recordkeeping</td>
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<tr>
<td>Security/Privacy</td>
<td>Increased safety of medical records</td>
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</tbody>
</table>
Improved Medical Records Management

Platform allows coordination and communication with other providers

Algorithms forecasts costs in near-real time

Blockchain technology creates a secure audit trail for care

Machine learning improves accuracy over time
## Transparent Billing Management/Claims Processing

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<tr>
<th>Blockchain: Key Benefit</th>
<th>Biomedical/Health Care Use Case: Enhanced Insurance Claim Process</th>
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<tbody>
<tr>
<td>Decentralized Management</td>
<td>Real-time claim processing</td>
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<tr>
<td>Immutable Audit Trail</td>
<td>Improved claim auditing and fraud detection</td>
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<tr>
<td>Data Provenance</td>
<td>Verifiable records for claim qualification</td>
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<tr>
<td>Robustness/Availability</td>
<td>Enhanced accessibility of patient data</td>
</tr>
<tr>
<td>Security/Privacy</td>
<td>Increased security of patient medical insurance information</td>
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</table>
Supply Chain Source and Integrity

Compliance with track and trace regulations.

Patient safety and drug supply security.

Easier reconciliation of exceptions.
Questions?
Thank you!
Tom is Principal at Blue & Co., and a 30 year IT risk and controls professional with extensive experience in cyber security, business continuity planning, and IT compliance, serving the needs of multiple industries including financial services, healthcare, retail, manufacturing, and government. Prior to joining Blue & Co., Tom founded and managed Technology Risk Consultants (TRC), an IT risk consulting firm working with closely held businesses. Prior to founding TRC, he was a Principal (non-CPA Partner) at KPMG, spent eight years at Arthur Andersen and six years working within IT security in the retail industry. He has assisted many companies with the implementation and testing of IT internal controls, improving cyber security postures, implementing business continuity plans, and designing controls within ERP systems.