



Blockchain and Accounting

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Overview

- + What is Blockchain?
- + How does it work?
- + Types of Blockchain systems.
- + Impacts of the Blockchain on business and accounting.
- + Integration with Smart Contracts.
- + Direct application to accounting.
- + Concluding thoughts

What Is Blockchain?

- + Blockchain is a decentralized ledger system developed originally for Bitcoin trading.
- + It is designed to be:
 - + Tamper resistant.
 - + Robust
 - + Pseudo-anonymous
 - + Decentralized

Blockchain Background

- + Blockchain was originally developed by Satoshi Nakamoto and published in October 2008.
- + Blockchain was originally designed to:
 - + Solve the problem of double spending cyber currency.
 - + Enable trading in a low or zero trust environment.
 - + Create a distributed ledger that is robust to failure of various nodes.
 - + Operate without a centralized authority.

Blockchain Overview

- + A blockchain is what it sounds like, that is:
 - + A chronological chain of blocks where:
 - + Each block is linked to all previous blocks.
 - + Each block contains identifying information about the information contained therein.
 - + Each transaction is verified before being loaded onto the blockchain
 - + Distributed amongst all “nodes” or users within the system such that:
 - + Each node has a complete record of the entire block chain.
 - + The majority of nodes can determine transaction validity if there is conflicting information.
 - + Usually no one node as any more or less power than another.

How does Blockchain actually work?

1. Transactions are collected to be loaded onto a block.
 - + 1 block represents either:
 - + A pre-specified number of transactions.
 - + All transactions over a pre-specified time interval
 - + In the case of Bitcoin this is all transactions over 10 minutes.
2. Once a block is completed, it is “mined” and added to the blockchain.
 1. All transactions within the block are verified by the mining nodes.
 2. The blockchain algorithm generates a problem string.
 3. Once a miner generates a correct response hash the block is loaded to the string.

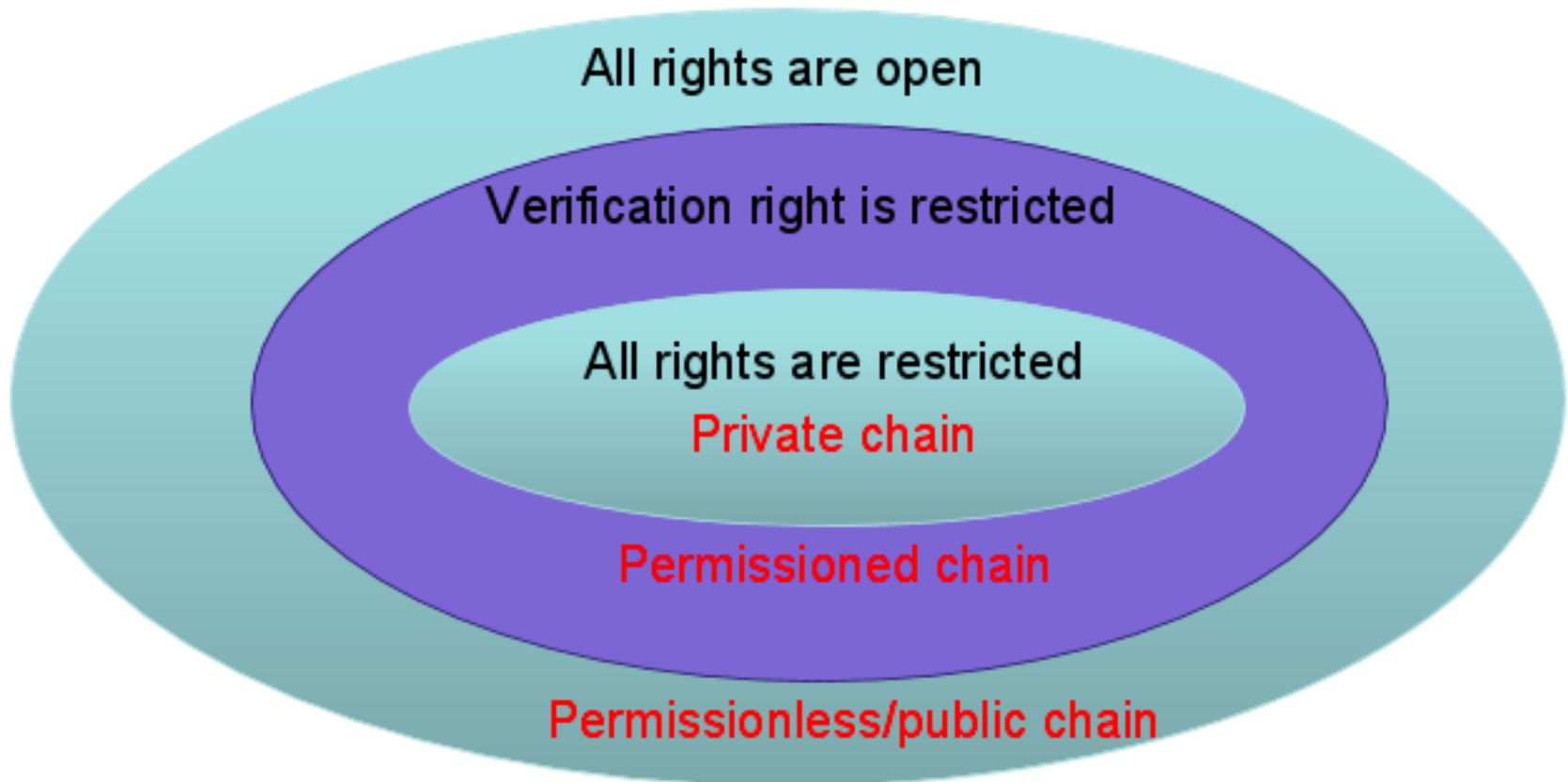
How does hashing work?

- + Hashing is the method used for identifying blocks on a blockchain.
- + The hash of each block on the blockchain is made up of information drawn from:
 - + The hashes of all previous blocks in the blockchain.
 - + All information contained within that block.
- + Generating these hashes is computationally expensive so miners are often rewarded.
- + This hashing system enables the tamperproof nature of most blockchains.

Hashing Methods

- + The most common hashing method is proof of work.
 - + The blockchain algorithm generates a problem string. When a miner solves for the correct response they are rewarded and the block is loaded.
 - + This is computationally expensive and prevents people from altering the chain and uploading false blocks.
- + Another method is proof of stake
 - + In this method one node is randomly chosen to mine a block based on some stake in the network.
 - + This relies on the fact that those with a large stake are unlikely to subvert the system.

Types of Blockchain Systems



Impacts of Blockchain

- + At the very least accountants will have to learn how blockchains can provide assurance and security to information and business processes.
- + In a more broad scope blockchain is already being used to:
 - + Track inventory.
 - + Track the ownership of rare goods.
 - + Track and verify product authenticity.
 - + As a transaction platform for some businesses.

Blockchain and Accounting

- + More specifically within the field of accounting blockchain has many applications.
- + Triple entry accounting (Dai and Vasarhelyi 2017):
 - + This is the notion that there would be one blockchain to act as a self confirming secure ledger between two businesses.
 - + Tokens would be transferred for different business processes that coincide with payments and receivable/payable entries.
 - + As each block of transactions is loaded confirmation and agreement between the organizations occur at that moment.

Blockchain and Accounting

- + Process Mining and Internal Control Logging
 - + Since blocks are time stamped they can be used as a log of processes by incorporating unique transaction identifiers.
 - + Internal control processes can also be logged in a tamperproof format.
- + Sharing data with regulators, auditors and investors in continuous “real” time.
 - + By adding nodes for each of these parties to the relevant blockchain information can be shared on a continuous real time basis.
 - + Blockchain information can also be encrypted to limit exposure.

Blockchain and Accounting

- + Blockchain may directly provide audit benefits:
 - + Confirmation
 - + Existence?
 - + Providing a reliable audit trail of evidence.
- + Additionally there are further concerns generated by blockchain networks:
 - + Is the network built correctly?
 - + Are there potential flaws within the system?
 - + Are the benefits being realized by the company?

Smart Contracts

- + Smart contracts are programs that are designed to be self executing and automatically monitoring of contractual conditions.
- + Smart contracts existed prior to blockchain but became feasible when incorporated into a blockchain environment.
- + Once a smart contract is programmed it is able to draw from both data within the blockchain, or through oracles to examine data external to the blockchain.
- + Contract provisions will instantly be activated based on these relevant conditions.

Smart Contracts: An Example

- + One example of a smart contract application could be in bank loans.
- + In this example the interest rate may be adjustable based on a companies credit rating.
- + A smart contract will be continuously monitoring rating agencies.
- + Once the rating changes the contract will automatically adjust the interest rate or call the loan.

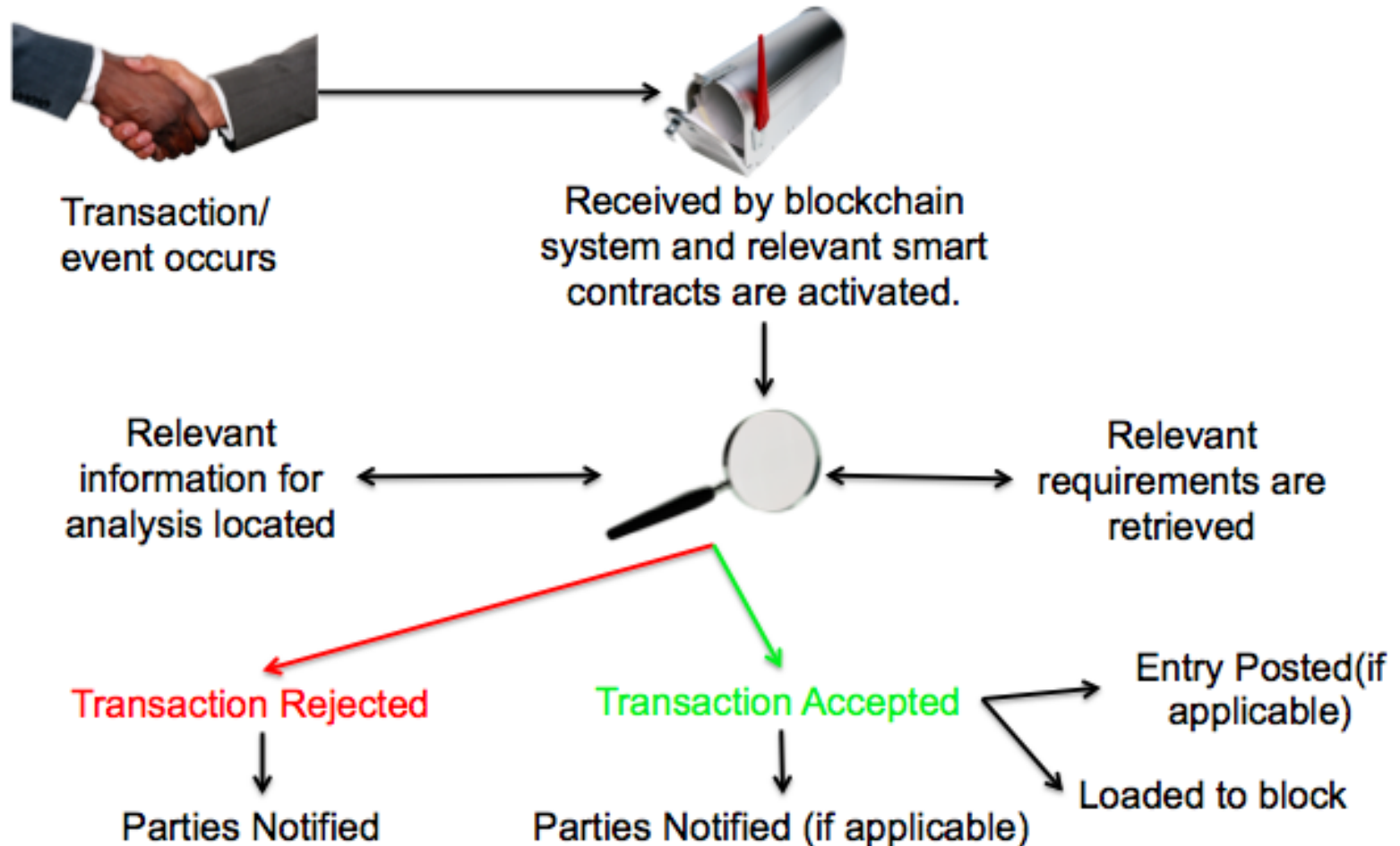
Blockchain-Smart Contract Environment

- + Smart contracts can be set up to monitor blockchain transactions.
- + As a transaction enters the blockchain the relevant smart contracts are activated.
- + Once activated the smart contract automatically verifies the validity of the transaction.
- + If the smart contract approves the transaction it will be loaded onto the next block.
- + If not the transaction can be rejected.

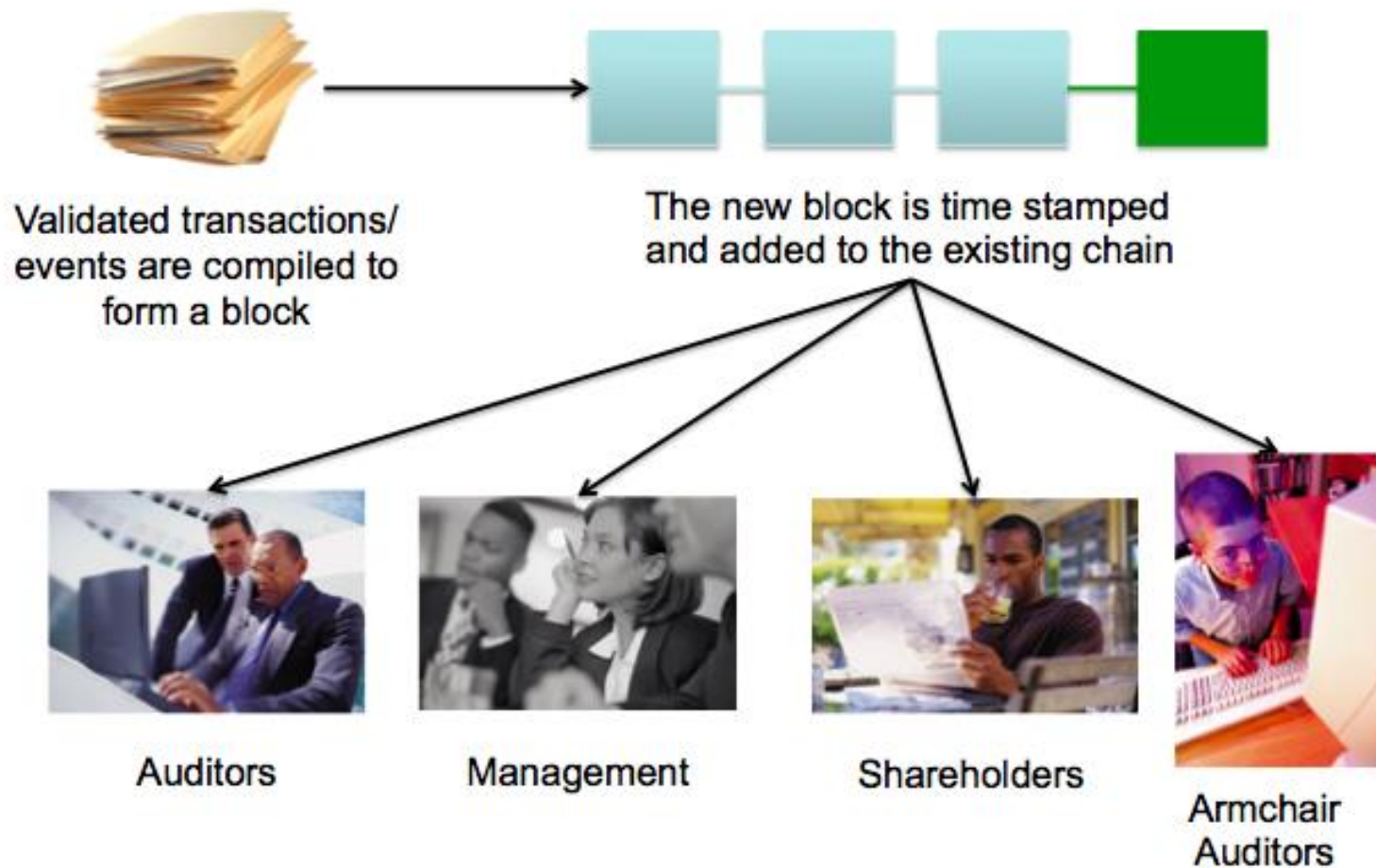
Smart Contract Applications

- + Blockchain enabled smart contracts can be programmed do do a variety of things:
 - + Act as automated internal control checks.
 - + Once programmed with relevant rules these smart contracts can operate to examine incoming data.
 - + Automate business process monitoring.
 - + Operate as continuous audit analytics.
 - + These analytics can be encrypted by auditors.
 - + They can operate on a continuous basis sending alerts to external parties with nodes on the chain.

Proposed Environment



Proposed Environment



Drawbacks

- + Blockchains can be secure but may also be computationally demanding.
- + Compromising on security means that a majority of blockchain benefits may be lost.
- + Smart contracts are only as good as they are programmed to be. If there is a flaw this can be taken advantage of.
- + Blockchains are built on consensus. Therefore a balance of nodes must be achieved.
- + If shared in a public forum, sensitive data may become an issue for a company.

Concluding Thoughts

- + Blockchain may provide some real benefits within a reporting and accounting paradigm.
- + The field of blockchain implementation is new and ever evolving. This means further study and guidance is necessary.
- + There are probably more realistic applications that have yet to be discovered but this technology is still early in the Hype Cycle.
- + Even if blockchain does not catch on in every business aspect it is still here to stay. Auditors and accountants will have to learn to deal with blockchain and cyber systems becoming integrated systems of business operation for some firms that rely upon this technology as a profit center.



Questions?

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