The Burnie Group

THE BLOCKCHAIN DISRUPTION

INSIGHT REPORT on Blockchain
prepared by The Burnie Group

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BUILDING VALUE

Business networks create value. The efficiency of business networks is a function of the nature and characteristics of the infrastructure that they have access to. Infrastructure may be physical (e.g., road, rail, and maritime), energy (e.g., electricity, fossil fuels), regulatory (e.g., courts, securities, banking), and informational (e.g., telecommunications, Internet). The quality of infrastructure varies and there is often friction that inhibits the efficient operation of the business network. This friction manifests itself as one of three pain point types:

- Information (i.e., imperfect, inaccessible, fraudulent);
- Interactions (i.e., transaction costs, market inaccessibility, regulation, degrees of separation); or
- Innovation (i.e., restrictive controls, culture, organizational inertia, invisible threats).

The most significant infrastructure innovation of the last 20 years, the Internet, has been a huge accelerator of information discovery and exchange efficiency, and a powerful enabler of transaction efficiency. Still, there is significant friction because of the "trust problem." We often find ourselves in a situation where we can very quickly find customers or partners, but still face barriers in transacting because of a lack of trust. As a result, the process has evolved to incorporate trusted third parties to mitigate this trust deficit and facilitate transactions.

These third parties are entities such as banks, credit card companies, PayPal, Alibaba, supply chain coordinators, insurance companies, auditors, regulators, and the like. These entities facilitate transactions between multiple parties as the trusted independent intermediary and as arbiters of conflict. These third parties provide valuable services, but also introduce cost, complexity, and latency to the process.

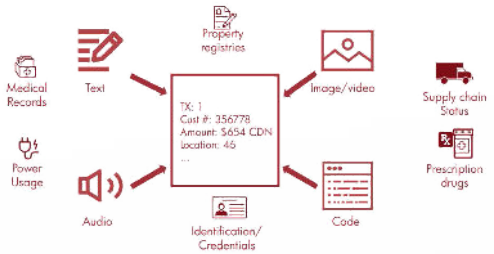
A COMMON VERSION OF THE TRUTH

The questions we need to ask ourselves are: "What would happen if we did not need those third parties? What would happen if a technology existed that provided an immutable and transparent version of the truth for all participants in a business network?" The answer to these questions is that the need for—and the cost, complexity, and latency associated with the services those third parties provided—would no longer be necessary. As the trust barrier falls, transactional velocity accelerates, transaction costs are reduced, and new business network configurations and market opportunities become possible. That is what blockchain is all about.

BLOCKCHAIN

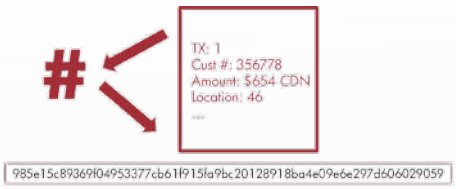
A blockchain is a distributed ledger database technology. Although it happens to be the technology that underpins Bitcoin and other cryptocurrencies, it is not tied to those entities or limited to cryptocurrencies. Cryptocurrencies are enabled by blockchain technology because blockchain offers a highly reliable, highly redundant, encrypted, immutable record of transactions. This solves the "double-spending" problem that is inherent in today's transactions in which a digital unit of value or digital asset can be copied and used multiple times. This is one of the key characteristics of blockchain that make it a compelling and disruptive technology.

The fundamentals of a blockchain are elegant in their simplicity. It all starts with a transaction. This transaction may be text, audio, video or graphic, or it may even be application code. It can be anything that is able to be represented digitally. These transactions can represent any number of different interactions in any number of different industries and use cases.



Transactions can incorporate various data types and represent many different kinds of interactions

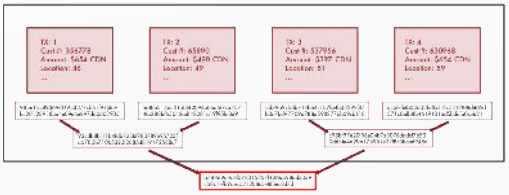
Once a transaction is recorded, it is put through a mathematical algorithm called a hash function. This generates a digital signature of a fixed length, regardless of the length of the transaction content, which will change if even one character of the transaction changes.



A hashing function creates a digital signature of a fixed length

Digital signatures (hashes) should not be confused with encryption. Transactions on a blockchain are encrypted such that transactions can only be accessed when the parties have the proper decryption keys. A Hash by contrast, is simply a proof that a particular transaction happened at a particular time. You can never rebuild the content of a transaction from a hash.

The next step is to gather a number of transactions together and generate hashes from the other hashes. This collection of transactions and digital signatures ("hashes") forms a block from which a hash is generated for the entire block.



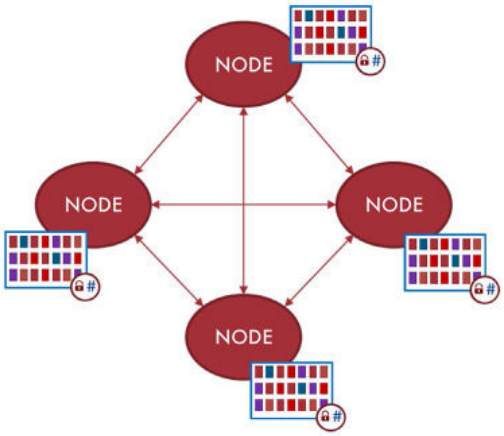
A digital signature is created for the entire block of transactions

Once one block has been created, a second block is built in the same way, but before a hash can be created for this block, the hash from the previous block is added to this new block. In this way, the blocks are "chained" together.

Blocks are "chained" together by including the digital signature of the previous block

FINDING CONSENSUS IN A DISTRIBUTED NETWORK

The next step is to distribute the blockchain among stakeholders and synchronize its content. Some public blockchain networks such as Bitcoin and Ethereum are said to be "permissionless," meaning that you do not need anyone's permission to join the network. The networks can have tens of thousands of distributed copies of the blockchain on servers known as "nodes." Other blockchain networks, based on code bases such as Hyperledger Fabric, may be private, also known as "permissioned." In this case, participants need to have explicit authorization to participate in the network. These networks may have a very small number of nodes.



Copies of the blockchain are synchronized between many servers

Once a blockchain has been distributed, the nodes then implement a "consensus algorithm" to determine if the transactions and block have been properly formatted and hashed. When a majority of the stakeholders achieve consensus that a new block is valid and properly chained, it gets written to the blockchain and synchronized to all the nodes, and becomes part of the immutable record.

The net effect is that a blockchain is extremely resilient to manipulation because if any transaction is altered, even in the slightest way or in many thousands of transactions in the past, the hash of that transaction, the hash of the block it is in, and all subsequent block hashes will change. This change is immediately obvious to all stakeholders because the altered blockchain is out of sync with all of the other copies of the blockchain. This makes the contents of a blockchain not only immutable, but virtually unhackable.

AUTOMATION

Another important feature of a blockchain stems from the fact that you can put application logic (code) on a blockchain. This feature turns a blockchain into a distributed application platform with a built-in consensus mechanism, where all stakeholders can be assured of not only the immutability of the data, but also the immutability of application logic that stores, retrieves, or manipulates the data. These distributed applications are called "smart contracts." Smart contracts can emulate the terms and conditions of real-world contracts and as many real-world contract conditions can be made to execute and enforce automatically upon some contracted condition or conditions.

Smart contracts can be a very powerful way to drive high degrees of automation into simple or complex transactions. Very sophisticated business logic can be encoded and deployed onto the blockchain resulting in very efficient and cost-effective business processes. In the extreme, smart contracts can incorporate so much business logic that entire business processes or even entire companies can be automated. Smart contract–orchestrated organizations are known as decentralized autonomous organizations.

The insurance industry, because of the well-defined conditions of insurance policies, will be an early and aggressive adopter of smart contracts. Supply chains and the shipping and real estate industries are other areas where smart contracts will have a significant impact.

Smart contracts are a very powerful feature of blockchains. They are more secure than traditional contracts and can streamline and reduce the cost of the execution and enforcement of a contract. Great care must be taken in authoring smart contracts to ensure that "intent" is properly encoded into the smart contract because the terms of a contract will get executed in very literal "as written" way.

DISRUPTION

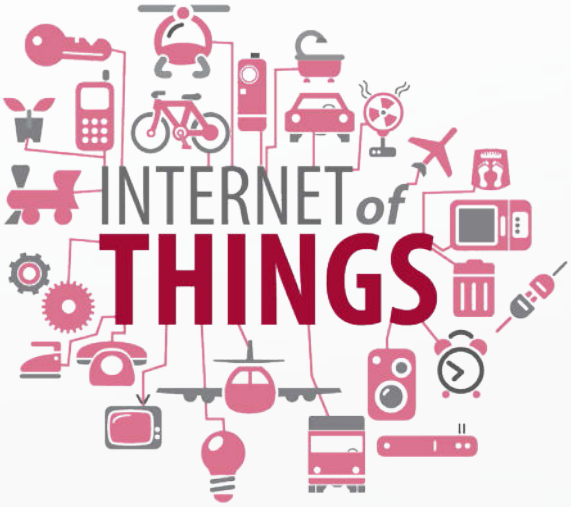
A common version of the truth, enabled by blockchain technology, will disrupt many existing business processes and potentially even entire industries. Many new opportunities will be created and the economics of addressing niche markets will become much more feasible. Ecosystems that move around value, in many forms, will also benefit from the cryptocurrency capabilities of a blockchain in situations where it is advantageous for value to be represented by some currency or medium of exchange that is distinctive to that ecosystem. The units of currency may be some common cryptocurrency such as Bitcoin or may be native to and vary by ecosystem. These proprietary currencies are commonly referred to as "tokens."

Blockchain will be most compelling where there is:

- A network with third parties who introduce cost, complexity, and latency;
- Need for a common version of the truth among multiple stakeholders;
- A divergence of stakeholder incentives;
- A complex or ridged regulatory environment;
- An audited environment;
- A need for enforced privacy; and
- Value in the tokenization of assets and activities.

Blockchain is also going to be a significant enabler of innumerable new use cases that leverage Internet of Things (IoT) devices. Blockchain provides key enabling features to IoT such as:

- The ability for devices to exchange information and contracts;
- Proven cryptography;
- The ability to ensure compliance and governance for autonomous systems;
- Simplification of complexity; and
- Proof of originator (digital identity).



Exciting new solutions become possible when IoT devices can interact with one another with great confidence in the authenticity of the identity, capabilities, and competence of each party and according to contracted rules. Supply chains can detect variance in proscribed conditions, such as temperature in shipment, and have smart contracts initiate mitigation actions and enforce penalties for contract noncompliance. Electric utilities will be able to negotiate and execute discrete contracts with intelligent devices and electric cars to help balance grid load. Entire industries will be transformed when IoT devices can reliably interact with business systems with high degrees of automation.

TAKING HOLD

Just as the Internet disrupted many traditional industries and created space for new ones, blockchain technology will change the economics of how business is conducted. Some businesses will adapt to this new reality and prosper, some will not, and some brand-new players will take advantage of this new ecosystem dynamic and grow rapidly both in revenue and influence.

Blockchain technology has already begun impacting the financial services industry in a significant way. The efficiency and transparency offered by blockchain technology means that sophisticated financial transactions can happen faster and cheaper, likely disintermediating many banking functions.

The supply chain is another area being impacted by blockchain technology. The ability for all participants in a supply chain to see a common version of the truth and apply smart contracts to automate transactions is improving efficiency, reducing cost, and providing an immutable provenance record. This capability is especially relevant with high-value items, such as art and diamonds, or in situations where it is important to be able to react very quickly and precisely to events, such as in the case of food safety and contamination.

The healthcare industry will be transformed by blockchain-based electronic health care records, clinical trials, and prescription fulfillment.

The real estate market will be transformed by efficient, transparent, and binding bidding markets.

The public sector will be transformed by blockchain-backed mobile voting systems, immutable property registries, and a streamlined court system.

The insurance industry will be transformed by streamlined onboarding, more efficient catastrophe swap and bond markets, automated claims payment, fraud reduction, improved and more granular risk assessment, and access to new IoT-enabled parametric-driven markets.

MUCH THE SAME, BUT FASTER

The Internet disruption saw some well-established brands fall into bankruptcy and new multibillion dollar companies rise to global prominence, seemingly overnight. That disruption was built on the back of some relatively basic data and networking infrastructure. The blockchain disruption is being built on top of the Internet itself. The technology is being financed with much more efficient capital markets, its code is being collaboratively developed using community repositories, and best practices are being shared on social networking platforms. All this suggests that the emergence of blockchain-driven value networks, the automation of many business processes, and the introduction of entirely new innovative ideas and business models will happen at an accelerated rate.

It is important for companies to understand the impact that blockchain will have on their organizations, the competitive landscape, and emerging opportunities. Companies must improve their literacy in this new technology, develop internal strategies to adapt organizational structure and culture, and determine the best place to take the first steps into a world were a common version of the truth enables parties to transact with one another within a trusted business network.

The Burnie Group

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