Chapter 3
Blockchain Introduced

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ABSTRACT

This chapter provides an introductory explanation of Blockchain technology and how it works, concentrating on its potential for social impact. It describes the history of the development of Blockchain, which is a form of distributed ledger technology.

INTRODUCTION

At its essence a Blockchain is a decentralised database. It is a secure chronological record of transactions made on a ledger distributed across multiple computers (called nodes) on a network. The number of nodes on the network may vary; a private Blockchain may have as few as three nodes and a public Blockchain, such as Bitcoin, may have millions. We will go on to explain the function of nodes and the distinctions between private and public Blockchains.

Blockchains are characterised by their distinguishing features of;

1. Transparency; a publicly auditable database
2. Security; cryptographically secured data
3. Immutability; the record of the transaction in the database cannot be changed
4. A decentralised network; thousands of computers validating each record of the ledger
5. Timestamped transactions; confirming the source of truth

DOI: 10.4018/978-1-7998-5351-0.ch003

The following example demonstrates how a transaction might find its way onto the ledger:

You want to send money to your Mother in the Philippines. You check your e-wallet, which has cryptocurrencies like bitcoin in it. Your Mother has given you her wallet ID. You transfer several bitcoins of parts of a bitcoin - to her wallet ID. This process is almost exactly the same as you transferring money to her bank account using internet banking, except this transaction is recorded on the public Blockchain. When you clicked 'Send' on your transaction your bitcoin was sent to the Bitcoin network as a package of data - a block. This block (your transaction) was added to all of the other blocks of data on the Bitcoin network, and as these are organised chronologically, these transactions form a chain known as the block chain.

Blockchain is known as a type of a distributed ledger technology. The distributed ledger is like a spreadsheet or a database, spread across nodes (computing devices) on a peer-to-peer network. Each node is responsible for replicating and saving an identical copy of the ledger every ten minutes. There is no central authority or administrator of the ledger, each node is autonomous. When a ledger update happens with each transaction, each node constructs the new transaction, and then the nodes vote by a consensus algorithm on which copy is correct. Once a consensus has been determined, all the other nodes update themselves with the new, correct copy of the ledger. On a public Blockchain the ledger is public; anyone can view it at any time, and it is encrypted using distinct hash functions. It is therefore said that the Blockchain is unhackable, for alterations to the ledger will easily be detected.

Every ten minutes or so (Tapscott & Tapscott, 2016) all the transactions on the nodes are verified, cleared and stored in a block that links to the previous block in the chain. This structure is time-stamped, preventing anyone from altering the ledger. If you wanted to steal a bitcoin, for example, one would have to rewrite the coin's entire history on the Blockchain in plain view of every person manning a node - practically impossible.

Once private institutions like banks realised that they could use the core idea of Blockchain as a distributed ledger technology (DLT) they began to create permissioned Blockchains (a private Blockchain with far fewer nodes on the network than a public Blockchain) to solve efficiency, security and fraud problems. There are over 200 banks in the world using Blockchains in their business practices at the moment. Some of which include (Mappo, 2018):

- Bank of America
- Bank of America Merrill Lynch
- Bank of England
- Barclays Investment Bank
- Citi Bank
- Commonwealth Bank of Australia
- Credit Suisse
- Deloitte
- Federal Bank of India
- Federal Reserve
- JP Morgan
- Macquarie Group
- Morgan Stanley
- National Australia Bank
- Royal Bank of Canada