

ASIAN JOURNAL OF KNOWLEDGE MANAGEMENT

Vol.6 No.2: 2019

PP 18417/02/2014 (033797)

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- **Blockchain technology and cryptocurrency**
By Dr Tan Thai Soon



Asian Institute of Knowledge Management Sdn Bhd

ASIAN JOURNAL OF KNOWLEDGE MANAGEMENT

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PRINTED BY

James Aries Printing Sdn Bhd
No. 40 & 42, Jalan TPK 2/5, Taman Perindustrian Kinrara
58200 Puchong, Selangor
Tel: +603-80752502

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Editor's Note

Blockchain technology will change the way we conduct our business and the way we live. The use and application of blockchain was originally linked to cryptocurrency. The invention of blockchain for Bitcoin made it the first digital currency to solve the double-spending problem without the need of a trusted authority or central server.

Currently, blockchain is being adopted into the financial industry. Major sectors of the financial industry are implementing distributed ledgers for use in banking. Banks are interested in this technology because it has the potential to speed up back office settlement systems. The Chinese Central Bank initiative to introduce digital currency is an example. In addition, blockchain technology can be used in various other industries, such as publication, music, gaming, accounting and real estate, to name a few.

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Blockchain technology and cryptocurrency

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1. Introduction

Blockchain is a growing list of records that are linked using cryptography. It is a time-stamped series of immutable records of data that is managed by a cluster of computers not owned by any single entity. Each of these blocks of data (block) is secured and bound to each other using cryptographic principles (chain).

The blockchain network has no central authority. It is the very definition of a democratized system. Since it is a shared and immutable ledger, the information in it is open for anyone and everyone to see. Hence, anything that is built on the blockchain is by its very nature transparent and everyone involved is accountable for their actions.

For use as a distributed ledger, a blockchain is typically managed by a peer-to-peer network, collectively adhering to a protocol, for inter-node communication and validating new blocks. Once recorded, the data in any given block cannot be altered retroactively without alteration of all subsequent blocks, which requires consensus of the network majority. Although blockchain records are not unalterable, blockchains may be considered secure by design and, exemplify a distributed computing system with high Byzantine fault tolerance. Decentralized consensus has therefore been claimed with a blockchain.

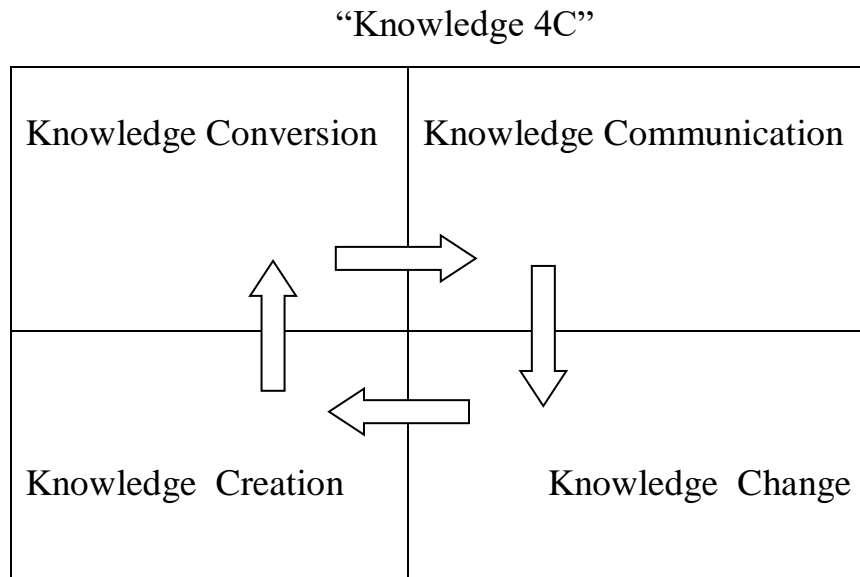
2. Knowledge Blockchain Process

Knowledge blockchain process is *a continuous process of blockchain development by creating, applying, communicating and changing the right blockchain product and service in the right place at the right time, and in the right marketplace.*

3. The Four Modes of the Knowledge Blockchain Process

This concept was first introduced in my book (Tan, 2013), by incorporating the four perspectives of knowledge management process. These were referred to as the “Knowledge 4Cs”: Knowledge Creation, Knowledge Conversion, Knowledge Communication and Knowledge Change, as shown in figure 1 below.

Figure 1 – The Four Modes of the Knowledge Management Process



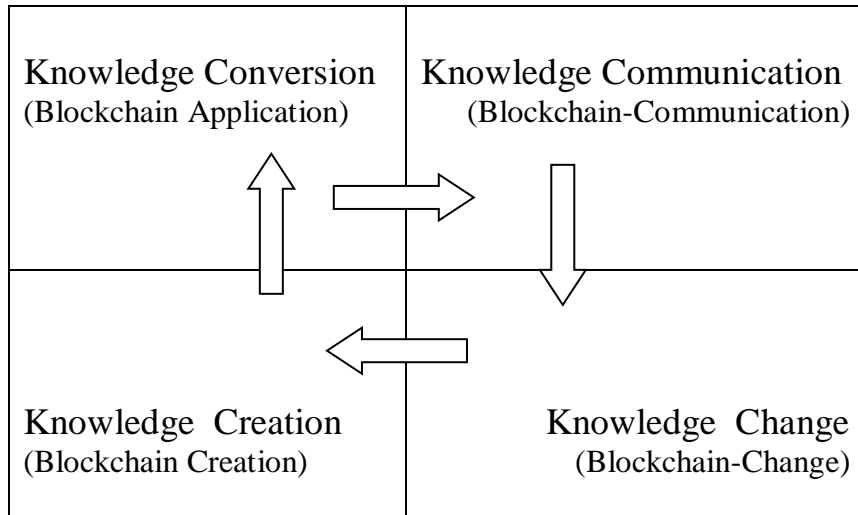
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Source: Tan, T.S. (2013) *Strategic Knowledge Management and Innovation – A Process Perspective*, TST Consulting Group

In applying the original four perspectives of knowledge management processes in knowledge blockchain process, as shown in figure 2 below, these include knowledge creation (blockchain creation); knowledge

conversion (blockchain application); knowledge communication (blockchain communication); and knowledge change (blockchain change).

Figure 2 – The Four Modes of the Knowledge Blockchain Process



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3.1. Knowledge Creation (Blockchain Creation)

The knowledge creation process in blockchain creation identifies the original sources of blockchain invention. The invention of blockchain is credited to a person (or group of people) using the name Satoshi Nakamoto in 2008 to serve as the public transaction ledger of the cryptocurrency Bitcoin. The identity of Satoshi Nakamoto is unknown. The invention of the blockchain for Bitcoin made it the first digital currency to solve the double-spending problem without the need of a trusted authority or central server.

The blockchain is a simple yet ingenious way of passing information from A to B in a fully automated and safe manner. One party to a transaction initiates the process by creating a block. This block is verified by thousands, perhaps millions of computers distributed around the net. The verified block is added to a chain, which is stored across the net, creating not just a unique record, but a unique record with a unique history. Falsifying a single record would mean falsifying the entire chain in millions of instances. That is virtually impossible. Bitcoin uses this model for monetary transactions, but it can be deployed in many other ways.

3.2. Knowledge Conversion (Blockchain Application)

The knowledge conversion process in blockchain application is concerned with its application. The primary use of blockchains today is as a distributed ledger for crypto currencies, most notably Bitcoin. Blockchain technology can be integrated into multiple areas discussed below.

Cryptocurrencies are currencies that use blockchain technology to record transactions. For example, the Bitcoin network and Ethereum network are both based on blockchain.

Smart contracts are contracts that can be partially or fully executed or enforced without human interaction. The primary use of smart contracts is in such use as automated escrows. The lack of widespread use and their legal status being unclear are currently holding back the viability of any smart contract system.

Blockchains are being adopted in the financial industry. Major portions of the financial industry are implementing distributed ledgers for use in banking. Banks are interested in this technology because it has the potential to speed up back office settlement systems.

The blockchain has also given rise to Initial coin offerings (ICOs) as well as a new category of digital asset called Security Token Offerings (STOs), also sometimes referred to as Digital Security Offerings (DSOs). STO/DSOs may be conducted privately or in a public, regulated stock exchange and are used to tokenize traditional assets such as company shares as well as more innovative assets like intellectual property, real estate, art, or individual products. A number of companies are active in this space, providing services for compliant tokenization, private STOs, and public STOs.

In addition, blockchain may make selling recorded music profitable again, for artists, by cutting out music companies and distributors like Apple or Spotify. Ebooks could be fitted with blockchain code. Instead of Amazon taking a cut, and the credit card company earning money on the sale, the books would circulate in encoded form and a successful blockchain transaction would transfer money to the author and unlock the book. They will eliminate bank accounts and practically all services offered by banks. Almost every financial institution will be forced to change fundamentally, once the advantages of a safe ledger technology without transaction fees are widely understood and implemented. Other uses can be video games, supply chain, domain names, etc.

3.3. Knowledge Communication (Blockchain-Communication)

The knowledge communication process in blockchain-communication is concerned with how, peer to peer communicates with each other. There are 3 major types of blockchain communication networks:

Public blockchains, where there are absolutely no access restrictions. Anyone with an internet connection can send transactions to it as well as become a validator. Usually, such networks offer economic incentives for

those who secure them and utilize some type of a Proof of Stake or Proof of Work algorithm.

Private Blockchains are permissioned. One cannot join it unless invited by the network administrators. Participant and validator access is restricted.

Hybrid blockchains have a combination of centralized and decentralized features. The exact workings of the chain can vary based on which portions of centralization and decentralization are used.

3.4. Knowledge Change (Blockchain-Change)

The knowledge change process in blockchain technology arose from the instability of financial markets and currency systems after the crisis in US financial system in 2008. In early 2009, an anonymous programmer or a group of programmers under an alias Satoshi Nakamoto introduced Bitcoin, generally considered the first decentralized cryptocurrency. Satoshi described it as a 'peer-to-peer electronic cash system.' It is completely decentralized, meaning there are no servers involved and no central controlling authority. The concept closely resembles peer-to-peer networks for file sharing.

The original application of Blockchains in cryptocurrency has a potential of expanding to digital applications in the financial industry. Major sections of the financial industry are implementing distributed ledgers for use in banking. The latest China centre bank initiative to introduce digital currency is an example of Blockchain change process.

4. The application of blockchain technology in cryptocurrency

The cryptocurrency is a type of digital asset designed to work as a medium of exchange that uses strong cryptography to secure financial transactions, control the creation of additional units, and verify the transfer of assets.

In a decentralized network like Bitcoin, every single participant needs to keep records of the balances and transactions. This is done via the Blockchain - a public ledger of all transactions that ever happened within the

network, available to everyone. Therefore, everyone in the network can see every account's balance. Bitcoin, perhaps the pioneer and the most popular cryptocurrency, is a decentralized public ledger, known as blockchain, for its decentralised payment.

As of May 2018, over 1,800 cryptocurrency specifications existed. Within a cryptocurrency system, the safety, integrity and balance of ledgers is maintained by a community of mutually distrustful parties referred to as miners: who use their computers to help validate and timestamp transactions, adding them to the ledger in accordance with a particular time stamping scheme.

Most crypto currencies are designed to gradually decrease production of that currency, placing a cap on the total amount of that currency that will ever be in circulation. Compared with ordinary currencies held by financial institutions or kept as cash on hand, crypto currencies can be more difficult for seizure by law enforcement. This difficulty is derived from leveraging cryptographic technologies.

In cryptocurrency networks, mining is a validation of transactions process. For this effort, successful miners obtain new cryptocurrency as a reward. The reward decreases transaction fees by creating a complementary incentive to contribute to the processing power of the network. The rate of generating hashes, which validate any transaction, has been increased by the use of specialized machines such as FPGAs and ASICs running complex hashing algorithms like SHA-256 and Scrypt.

The difficulty of the puzzles is constantly increasing, correlating with the number of people trying to solve it. So, the more popular a certain cryptocurrency becomes, the more people try to mine it, the more difficult the process becomes.

A lot of people have made fortunes by mining Bitcoin. Back in the days, you could make substantial profits from mining using just your computer, or even a powerful enough laptop. These days, Bitcoin mining can only become profitable if you're willing to invest in an industrial-grade mining hardware.

This, of course, incurs huge electricity bills on top of the price of all the necessary equipment.

In short, the main features of bitcoin is summarised below:

- It is a decentralized public ledger using blockchain technology;
- Bitcoin's rule caps the number of coins in the market;
- There is no third-party control over the ledger;
- When the transaction or a smart contract is done, the payment is transferred from one cryptocurrency wallet to another;
- A transaction cannot be changed, erased, copied or forged;
- The miners who verify and append the transaction by using coding cryptography, get rewarded with bitcoin;

4.1. Initial Coin Offering (ICO)

An ICO presents a means to the founder or issuer to raise funds by selling its digital tokens in exchange for other crypto currencies or fiat currencies. In an ICO exercise there will be a whitepaper which sets out the nature of the project, the type of technology, the costs, the duration of the ICO campaign and the crypto currencies that are accepted. After the ICO campaign, investors may elect to retain or trade their tokens in the market or platform.

4.2. The regulations on cryptocurrency

While crypto currencies are digital currencies that are managed through advanced encryption techniques, many governments have taken a cautious approach toward them, fearing their lack of central control and the effects they could have on financial security.

There is no uniform view of its acceptance by the regulators, some jurisdictions have adopted them, some have taken concrete regulatory measures to dissuade users, and some others only provide guidelines without an outright declaration of them being illegal.

Similarly, some of the traditional financial institutions are reluctant to support and accept the usage of crypto currencies and ICOs, while others are more receptive to the ideals and are prepared to accept some form of crypto currencies with blockchain technology.

4.3. The cryptocurrency and the Wallet

Cryptocurrency can be stored in a wallet. A cryptocurrency wallet stores the public and private "keys" or "addresses" which can be used to receive or spend the cryptocurrency. With the private key, it is possible to write in the public ledger, effectively spending the associated cryptocurrency. With the public key, it is possible for others to send currency to the wallet. All major exchanges offer wallet services. But, while it might seem convenient, it's best if you store your assets in an offline wallet on your hard drive, or even invest in a hardware wallet. This is the most secure way of storing your coins and it gives you full control over your assets.

4.4. The cryptocurrency and the tax

As cryptocurrencies are becoming more and more mainstream, law enforcement agencies, tax authorities and legal regulators worldwide are trying to understand the very concept of crypto coins, and, where exactly they fit, in existing regulations and legal frameworks.

Depending on the jurisdiction you live in, once you've made a profit or a loss investing in cryptocurrencies, you might need to include it in your tax report. In terms of taxation, cryptocurrencies are treated very differently from country to country. In the US, the Internal Revenue Service ruled that Bitcoins and other digital currencies are to be taxed as property, not currency. For investors, this means that accrued long-term gains and losses from cryptocurrency trading are taxed at each investor's applicable capital gains rate, which stands at a maximum of 15 per cent in the US.

4.5. The advantages and disadvantages of cryptocurrency

There are many advantages and disadvantages of cryptocurrencies as summarised below.

The advantages of cryptocurrencies are as follows:

- There is no middleman or intermediary;
- There is no central or third party that control the ledger; and
- It is easy to track ownership of asset or coins.

However, the main arguments against its usage are as follows:

- The coins can be easily used to fund terrorism or other illegal activities;
- Like any other asset class, such as equity stock, loan stock and fiat currency, over-trading or speculative activities in cryptocurrencies can result in a bubble and an eventual crash;
- While traditional financial products have strong consumer protection in place, with cryptocurrencies, there is no intermediary with the power to limit consumer losses, if bitcoins are lost or stolen. One of the features, cryptocurrencies lack in comparison to credit cards, for example, is consumer protection against fraud, such as chargebacks;
- Cryptocurrency private keys can be permanently lost from local storage due to malware, data loss or the destruction of the physical media. This prevents the cryptocurrency from being spent, resulting in its effective removal from the market.

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- Strategic creation and strategic plan

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- Business analytical skills;
- Management analysis; and
- Human resource management skills

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- Customer relation & communication mix;
- Economic resource planning;
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- Knowledge wealth management.

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