

Developments are an essential part of our society and culture. We live in a digital world where technology has taken full control of the world. We live in a world where everything is done through technological devices. Technology has integrated with financial services to ensure transparency and reliability in transactions. Cryptocurrency and blockchain technology are new developments in financial services. This book aims to help the common man understand what cryptocurrency is and what blockchain technology is. This book includes the features, differences, and significance of cryptocurrency and blockchain technology. Drawbacks to cryptocurrency and blockchain technology are also mentioned in the book. This book includes how blockchain works, how blockchain operates in cryptocurrency transactions and a study on different types of cryptocurrency and blockchain. We hope the readers of this book will understand the basis of crypto and blockchain. This book will help the teachers and students to learn the fundamental concepts, operations and significance of cryptocurrency and blockchain technology.



Miracle's Research focuses on Public Health Technology, Big Data Interpretation, Artificial intelligence in health, Business Intelligence, Neural networks, Transitions and Trajectories, Image and Video Steganography with Cryptosystems. Adaobi's research interests include Public Health Technology, Symptom Science, Clinical Judgment etc.

Atianashie Miracle A  
Chukwuma Chinaza Adaobi

# Understanding Cryptocurrency and Blockchain Technology

Cryptocurrency and Blockchain Technology



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Cover image: [www.ingimage.com](http://www.ingimage.com)

Publisher:

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Dodo Books Indian Ocean Ltd., member of the OmniScriptum S.R.L  
Publishing group

str. A.Russo 15, of. 61, Chisinau-2068, Republic of Moldova Europe

Printed at: see last page

**ISBN: 978-620-4-74765-1**

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# **Understanding Cryptocurrency and Blockchain Technology**

**Atianashie Miracle A.  
&  
Chukwuma Chinaza Adaobi**

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## About The Authors

**Atianashie Miracle A.** has worked as a research analyst for Hightail Consult Limited in Accra, Ghana, as a Publishing Assistant in a peer-reviewed journal for the Catholic University College of Ghana, as a website manager for the Council of Independent Universities Ghana. He has also worked as a Data Operator, Course Team Writer, and Turnitin Plagiarism Software Evaluator for numerous research institutes, as one of His Illustriousness's inspection services specializing in Academic Journal Management and Software Development. He is currently working as a Neural Network Tutor, Freelance Writer, and Consultant, holding honorary fellowships, workshops, and conferences at various universities. Miracle's Research focuses on Public Health Technology, Big Data Interpretation, Testing and Penetration, Artificial intelligence in health, Business Intelligence, Content Management, Neural Network, Transitions and Trajectories, Image and Video Steganography with Cryptosystems.



**Chukwuma Chinaza Adaobi** is from Akwaeze in Anambra state, Nigeria. And the founder of Medicine Communication and Research Portals; which provides news, consulting services and perspectives on health. She speaks nationally and internationally on topics related to health professionalization; she is a distinguished scholar; she received the Best Research Award for her contribution and Honorable Achievement in Innovative Research from the International Research Awards for New Science Inventions (NESIN 2021 Awards). The prize is given in recognition of her outstanding contributions to scientific research and publishing. Adaobi research interests include Public Health Technology, Symptom Science, Clinical Judgment and Decision-making, Wellness, Self-Management, and End-of-life and Palliative Care. Adaobi research works have appeared in scholarly Journals like Journal of Health Nursing & Medicine, International Journal of Multidisciplinary Studies and Innovative Research, British Journal of Public Health Medicine and Nursing, Scholars Journal of Science and Technology, and Health Economics & Outcome Research: Open Access etc.

## PREFACE

Developments are an essential part of our society and culture. We are now living in a digital world where technology has taken full control of the world. We are live in a world where everything is done through technological devices. Technology has integrated with financial services to ensure transparency and reliability in transactions. Cryptocurrency and blockchain technology are new developments in financial services. The aim of this book is to help the common man to understand what cryptocurrency is and what blockchain technology is. This book includes the features, differences, and significance of cryptocurrency and blockchain technology. Drawbacks to cryptocurrency and blockchain technology are also mentioned in the book. How blockchain works, how blockchain operates in cryptocurrency transactions and a study on different type of cryptocurrency and blockchain are included in this book. We hope the readers of this book will understand the basis of crypto and blockchain. This book will help the teachers and students to learn the fundamental concepts, operations and significance of cryptocurrency and blockchain technology.

**Atianashie Miracle A.**

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## **CHAPTER - I**

### **CRYPTOCURRENCY**

#### **OVERVIEW**

In this chapter you will learn about the recent development in the virtual currency. This chapter discusses about the cryptocurrency, a virtual currency based on Blockchain Technology and protected by cryptography. The chapter begins with the history of cryptocurrency. This chapter includes the definition, features, benefits and advantages of cryptocurrency. Difference between the cryptocurrency and traditional currency are also mentioned in this chapter. A study conducted on the different type of cryptocurrencies is also highlighted in this chapter which give the authors knowledge about more cryptocurrencies available in crypto market other than bitcoin. Chapter 1 concludes with the drawbacks of cryptocurrency.

#### **SUB UNITS**

- 1.1 Beginning and History of Cryptocurrency.
- 1.2 Definition and Meaning of Cryptocurrency
- 1.3 Features and factors related to cryptocurrencies.
- 1.4 Benefits and significance of cryptocurrency.
- 1.5 Distinction between cryptocurrency and traditional currency.
- 1.6 Distinction between stock exchange and crypto exchange.
- 1.7 Different type of cryptocurrency.

- Bitcoin
  - Ethereum
  - Cardano
  - Binance coin
  - Tether
  - Solana
  - XRP
  - Dogecoin
  - Polkadot
  - USD (USDC)
  - Market capital of cryptocurrencies
- 1.8 Limitations and Drawbacks of cryptocurrency
- 1.9 Conclusion

### **LEARNING OBJECTIVES**

1. To understand the history of cryptocurrency.
2. To understand the meaning of cryptocurrency
3. To understand features of Cryptocurrency?
4. To study the benefits of cryptocurrency?
5. To know the difference between the cryptocurrency and blockchain.
6. To know difference between the stock exchange and cryptocurrency exchange.
7. To study the types of cryptocurrency.
8. To study about the first cryptocurrency the Bitcoin.

9. To understand the limitations and drawbacks of cryptocurrency.



Welcome to the World of Crypto! In this chapter you're going to learn about  
Cryptocurrency!

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## 1.1 BEGINNING OF CRYPTOCURRENCY

The concept of the cryptocurrency was first proposed in the 1980 with the aim of developing a currency that could be sent anonymously and without any intermediaries, government or centralised entities. In 1995, an American cryptographer named, David Chaum developed Digicash. Digicash is an anonymous cryptographic electronic currency. Digicash was an early form of cryptographic electronic payment that required user software to withdraw funds from a bank and encryption keys to send funds to a recipient.

In 1998, Nick Szabo invented Bit Gold. Bit Gold is frequently referred to as a direct forerunner of Bitcoin. Bit Gold asked users to solve cryptographic problems using computer resources, with those who succeeded earning a prize. When Chaum's and Szabo's concepts are combined, the result resembles "Bitcoin". Szabo was not able to solve the double-spending problem. He can't handle the double-spending problem without the help of a central authority like a bank or other financial institutions. Information or news about the bitcoin or subsequent cryptocurrencies did not begin until a decade later, when a mysterious person or persons, using the pseudonym Satoshi Nakamoto, published a white paper titled Bitcoin – A Peer to Peer Electronic Cash System.

On October 31, 2008, Satoshi Nakamoto published the white paper Bitcoin - A Peer to Peer Electronic Cash System. The paper includes significant details about the functioning of the bitcoin blockchain technology. On August 18th, 2008, Satoshi bought Bitcoin.org. He officially started working on the bitcoin project in the year 2008. Blockchain technology is the base of crypto trading

and functioning of the crypto transactions. Bitcoin and all other cryptocurrencies need the blockchain technology to exist. Satoshi Nakamoto mined the first block of the Bitcoin network in the year 2009.

Even if it wasn't worth much at the time, Bitcoin was establishing that it has real-world value. In 2011 the value of Bitcoin peaked at \$1.06 before it is dropping to around 87 cents. Year over year, value of bitcoin increased substantially. In January 2016, Value of Bitcoin raised from \$434 to \$998 in January 2017. In July 2017, a software upgrade to Bitcoin approved. The aim of the software upgrade was for supporting the Lightning Network and to improve scalability of Bitcoin. A week after the software upgrade, the value of Bitcoin rose to \$2700 in August 2017. By December 17, 2017 the value of Bitcoin shocked the entire world and it achieved an astounding all-time high value of \$20,000. Today, in 2022 Bitcoin value is \$40,000

## 1.2 CRYPTOCURRENCY



Cryptocurrency is a decentralised digital currency based on blockchain technology and secured by cryptography. Blockchain is a decentralised database which has peer-to-peer network that monitors and organises as well as serves as a secure database of transactions such as buying, selling, and transferring of cryptocurrencies.

A cryptocurrency is a virtual currency protected by encryption, making counterfeiting and double-spending practically impossible. Most of the cryptocurrencies available today are built on blockchain technology. Blockchain is a distributed ledger enforced by a global network of computers.

Cryptocurrencies are not issued by any central authority like Government or Bank. The concept of decentralisation makes them potentially impervious to government intervention or manipulation. For example, in India, RBI regulates Rupee. RBI manages and prints the currency notes. Cryptocurrency operates as a means of exchange over a computer network that has no central authority to regulate, monitor, or maintain it, such as a government or bank.

A cryptocurrency is a medium of exchange like Indian Rupee or US Dollar. Cryptocurrency is virtual or digital, encrypted, and decentralised. Unlike the US dollar or the Euro, the value of cryptocurrency is managed and maintained by no central authority. US Dollar and Indian Rupee are centralised currencies. Bitcoin was the first cryptocurrency. A paper titled "Bitcoin: A Peer-to-Peer Electronic Cash System." proposed by Satoshi Nakamoto in the year 2008. The concept is based on "cryptographic proof instead of trust".

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### 1.3 CRYPTOCURRENCY - FEATURES AND FACTORS

1. **Anonymity:** Personal and business data included in cryptocurrency transactions are associated with a random sequence of characters rather than the owner's identity. It is difficult to identify the identities of the participants in a transaction.
2. **Security:** Cryptocurrency transactions are secured with cryptocurrency and are based on blockchain technology. A private key is used to secure the crypto wallet. The owners of virtual currencies use encryption technologies on their storage devices to ensure security.
3. **Decentralised:** Cryptocurrency is decentralised digital money, and there is no centralised agency to control the cryptocurrency.
4. **Cryptography:** A secured communications system that enables only the sender and receiver of a message to read its contents is known as cryptography.
5. **Blockchain Technology:** A decentralised database shared across computer network nodes to store the information in a digital format with not able to change or hack is called Blockchain Technology. The financial statements recorded in the blockchain is known block. Block is used for the chronological ordering of the transactions in the database.
6. **Fast development:** Cryptocurrencies have the potential for fast development. It is very easy and possible to convert and exchange cryptocurrencies into conventional currencies like dollars or euros. The rate or value of

cryptocurrency is also increasing day by day, which inspires investors to invest in cryptocurrencies. For example, the development of Bitcoin.

7. **Crypto Mining:** Crypto mining is a competitive process for validating a cryptocurrency transaction. A cryptocurrency has a proof-of-work mechanism to verify and add the transactions to the blockchain.
8. **Hash:** Hash is a function in blockchain technology that meets the encrypted demands required for blockchain computation. Estimation of the length of a hash is practically not possible if someone were trying to hack the blockchain because hashes are of a constant length. The hashed value produced by the same data will always be the same.
9. **Private Key:** In cryptography, a private key is a secret number, which is similar to a password. Private keys are used to verify transactions and ensure ownership of a blockchain address. Symmetric cryptography is another name for the private key.
10. **Public Key:** A public key can be used by crypto users to make cryptocurrency transactions. It is linked to a private key with a cryptographic code. Through Public Key, anyone can make transactions, but they required private key to unlock the database for knowing the bitcoin received.
11. **Network Node:** A network node is a point of connection in a network of communication. Nodes are responsible for data transmission. Ability to identify, process, and sending data to other network nodes. A Node is essential for the efficient operation of blockchain technology.

#### 1.4 BENEFITS AND SIGNIFICANCE OF CRYPTOCURRENCY

1. **Fast Transactions:** Cryptocurrency transactions may be done in a couple of minutes. The network confirms the block that contains the transaction within a few minutes and the payment is settled immediately. There will be no third party like debit cards or credit cards, which are required for the transaction of funds.
2. **Low Transaction Cost:** The transaction cost of cryptocurrency is relatively low as compared to other online financial services provided by banks.
3. **High Accessibility:** Cryptocurrency has high accessibility. It can be used by anyone at any time in any place. A proper internet connection and a computer or smartphone are necessary for the transaction.
4. **Security:** Cryptocurrency is based on blockchain technology. Cheating, hacking, deleting, removing of any transactions or records are impossible in Blockchain.
5. **Privacy:** Cryptocurrency transactions are pseudonymous, which means the person involved in the transaction has a unique identifier on the blockchain, but it doesn't include any personally identifiable information.

## 1.5 DISTINCTION BETWEEN CRYPTOCURRENCY AND TRADITIONAL CURRENCY

- Cryptocurrencies are decentralised, it means cryptocurrencies are not controlled or managed by any financial institutions or government. Conventional or traditional currency is controlled, controlled and regulated by financial institutions.
- Cryptocurrencies have digital medium of exchange. In case of traditional currency, medium of exchange is physical.
- Cryptocurrency have unlimited supply but traditional currency have limited supply.
- Cryptocurrency is issued by computer or crypto miners. Traditional currency is issued by Government or Financial institution.
- Transaction cost of cryptocurrency is very low as compared to traditional currency. There is no hidden charges or additional fee is not required to spend while transaction. Traditional currency transaction through digital platform require additional fee which is high as compared to cryptocurrency.
- Transaction path of the cryptocurrency is monitored by ledgers in blockchain. Transaction path of the traditional currency is monitored by financial institutions like Banks and Government.
- Cryptocurrency have high portability but traditional currency has low portability.
- Cryptocurrency is highly durable. Traditional currency is moderately durable.
- Cryptocurrency have global acceptance. Global acceptance of traditional currency is less as compared to Cryptocurrency. Because, value of traditional currency varies in different countries.

## **1.6 DISTINCTION BETWEEN STOCK EXCHANGE AND CRYPTO TRADING**

- On the stock exchange, the investment represents a share of ownership in a company. The trading in crypto trading is in the form of digital currency or investment, which refers to the holding of multiple cryptocurrency.
- Stock exchange involves trading of shares or stock of companies. Crypto trading involves trading of bitcoin, Litecoin, Ethereum, etc.
- Stock exchanges are centralised and has regulatory body to control and manage. Crypto markets are decentralised and not controlled by any government or financial institutions.
- In stock exchange, there is a middle man called “brokers”. In crypto trading there are no intermediaries.
- In stock exchange, the stocks can be deliberately manipulated and counterfeited. In crypto trading, all cryptocurrencies are secured by cryptography and based on blockchain technology.
- The power lies with the investors and the company in stock exchanges but in case cryptocurrency, Power is distributed among the members of a community across a network.
- Stock exchange investors have knowledge and predictions about the share value. Cryptocurrency investors lack knowledge and predictions about the rate of cryptocurrency.

## 1.7 DIFFERENT TYPES OF CRYPTOCURRENCY

### 1. Bitcoin



A person or maybe a group using the pseudonym Satoshi Nakamoto created the first cryptocurrency Bitcoin In 2009. There were more than 18.8 million Bitcoin tokens in circulation, compared to a maximum ceiling of 21 million in September 2021.

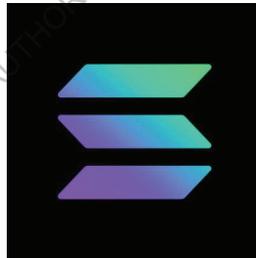
Bitcoin are decentralised, it means cryptocurrencies are not controlled or managed by any financial institutions or government. Blockchain is used in Bitcoin, which is a decentralised public ledger that records Bitcoin transactions. Bitcoin established the basic encryption and consensus which means peer-to-peer verification method. Peer-to-peer method is the core of cryptography.

The first cryptocurrency Bitcoin was developed in the year 2009 by a person or maybe a group using the pseudonym Satoshi Nakamoto. There were more than 18.8 million Bitcoin tokens in circulation, compared to a maximum ceiling of 21 million in September 2021

Powerful computers are used by the crypto miners for verifying and generating new bitcoin. Proof-of-Work (PoW) is complicated and time-consuming process. Every transaction in the blockchain is recorded permanently. Blockchain validates the transaction and ensure security of the each bitcoin in the entire network.

Massive energy which is harmful for the environment is required for crypto mining and manufacturing Bitcoin using algorithms is a difficult task.

## 2. Ethereum



Ethereum is another cryptocurrency like Bitcoin. Ethereum also uses blockchain network. Ethereum was built as a programmable blockchain. It means it do not support for built a currency, but to allow users to create, publish, monetize, and use decentralised apps.

Ether (ETH) is the native of Ethereum currency. It was developed as a means of payment on the Ethereum network. In September 2021, Ether was the second most popular cryptocurrency after Bitcoin.

There is no limit to how many ETHs can be created, unlike the bitcoin. Ethereum blockchain is used by numerous ICOs which means Initial Coin Offering.

Ethereum has assisted in the growth of many initial coin offers (ICOs) as well as the formation of several non-fungible tokens (NFTs), which are digital representations of art or collectibles that are tied to a blockchain.

### 3. **Cardano (ADA)**



Cardano is a serious contender and third-generation blockchain platform. To establish itself as a credible rival, Cardano portrays itself as a third-generation blockchain platform. Cardano uses proof-of-stake (PoS). Proof-of-stake (PoS) helps to eliminate the need for the complicated Proof-of-Work computations. Mining coins like Bitcoin requires a lot of electricity, which might make the network more efficient and sustainable. Ada Lovelace, a 19th-century mathematician, is the inspiration for Cardano's cryptocurrency, ADA.

Identity management and traceability are two of Cardano's key applications. The identity management can be used to improve data collection from several sources. The traceability can be used to inspect the manufacturing process of a product and also to prevent fraud and counterfeiting.

In order to achieve the aim of the network for generating a decentralised application (dApp) platform with a multi-asset ledger and verifies smart contracts cardano is being developed in five phases. The research-based methodology and peer-reviewed findings help in the development of cardano.

#### **4. Binance Coin (BNB)**



Binance Coin (BNB) is a cryptocurrency token developed by world's largest cryptocurrency exchange called Binance. It created to be used as a medium of exchange. It was originally developed on Ethereum. Today Binance Coin runs on Binance's own blockchain technology.

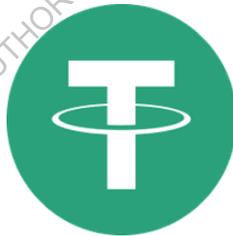
In 2017 BNB was launched as a utility token. BNB permitted traders on Binance to receive discounts on trading fees. Today it can now be used for

making payments, booking air ticket, entertainment purposes, online services, and for financial services.

During initial coin offering (ICO) BNB had a maximum of 200 million token, which is offered to the investors for accessing in ICO. On every quarter, Binance buys back and destroys every coin or burns it permanently as part of increasing high demand for the coin

On July 2021, Binance made its 16<sup>th</sup> burn. It burned around 1.29 million BNB. The 1.29 million BNB has a value equivalent to \$394 million at the time.

## 5. Tether



Tether was the first stable coin or cryptocurrency. Tether is a cryptocurrency backed by fiat cash. The value of Tether is determined by a fiat currency called US Dollar.

Tether offers transparency, stability and low transaction cost to the users. It gives tether the position a stable coin. Tether is not good for speculative statement.

Tether is utilised by investor those who want to escape from the severe volatility of the cryptocurrency exchange. In 2021 February, Tethers accounted for 57 per cent of bitcoin trading. Tether is a cryptocurrency which is tied with US Dollar and claims that it has a 1:1 ratio value with US Dollar. But Tether Ltd does not guarantee any tether redemption and it cannot be traded for US Dollars.

## **6. Solana**



Solana is a blockchain platform that produces the Sol cryptocurrency. The Sol is volatile cryptocurrency in recent years. Solana was trading at around \$191.00 on September 10, 2021, compared to \$3.42 a year before.

Solana has made significant progress in decentralised finance. Solana uses the contract technology, which consists of programmes that run on a database according to predetermined criteria (like contracts on papers, but without the intermediaries).

The “Degenerate APE Academy” a non-fungible token (NFT) is launched by Solana in August, 2021. Solana is a successfully running cryptocurrency

which is owned by million users. Solana is improving everyday on crypto trading exchanges.

## 7. XRP



XRP is created by Ripple Labs, Inc. The name is very confusing for many people. XRP and Ripple are two words which are interchangeable. Global money transfer network of a financial service company is called Ripple. On Ripple Network, XRP is cryptocurrency is used.

XRP can be used for many purposes. XRP can be used for investment purposes, or a coin to trade with other cryptocurrencies or to fund the transactions of Ripple.

Cryptocurrencies like Bitcoin and other cryptocurrencies can be mined. But XRP cannot be mined. Around 100 billion XRP Coins has been supplied.

Unlike the Bitcoin, XRP does not rely on a complicated digital verification procedure via blockchain. Participating nodes in Ripple network execute a poll to verify transactions, which is a unique technique for validating transactions.

Concluding that, XRP transactions are faster because of its unique technique for validating and verifying transactions. XRP is also less expensive than Bitcoin.

## 8. Dogecoin



Dogecoin is the first joke cryptocurrency which is introduced in the year 2013. The primary intention behind the creation of the Dogecoin is to mock Bitcoin. Interestingly, the Dogecoin got massive attention from the public. Another fact is many significant amount invested in Dogecoin by the public.

On April 2019, Billionaire Elon Musk made a tweet about Dogecoin and he thought that Dogecoin is an excellent idea and that help to improve the status and image of the Dogecoin. Elon Musk's tweet enhance the Dogecoin's status as a viable cryptocurrency.

Dogecoin is an altcoin. The function of Dogecoin is similar to the Bitcoin and Ethereum. Dogecoin is based on blockchain technology, which is decentralised digital ledger and uses proof-of-work (PoW).

Dogecoin mining has no limitations. Dogecoin has a market cap of 21 million. Dogecoin is linked to several high quality profile crypto events. Investor contributed the equivalent of nearly \$30,000 in Dogecoin to help the Jamaican Bobsled Squad to attend the 2014 winter Olympics.

The value of Dogecoin has trades at one of the lowest prices; it is around 24 cents as of the September 2021. But Dogecoin is valuable cryptocurrency still in the crypto exchanges.

## 9. Polkadot



Polkadot was developed by the co-founder of Ethereum, Gavin Wood. The aim behind the development of Polkadot was to expand the possibility of Blockchain network. The blockchain name of the coin is Dot.

Polkadot uses two blockchain technologies. First one is Main Relay Network and second one is Parallel Network. Main relay network is used for permanent transactions and parallel network is used for user creation blockchain called “parachains”.

Parachains is adjusted for different purposes, such as constructing apps that even support creation of other cryptocurrencies, and they benefit from the main security of the blockchain.

Polkadot is different from other cryptocurrencies. The fundamental objective of Polkadot is to solve the problems of interoperability by developing the blockchain bridges, polkadot stands apart from the blockchain.

Polkadot is not only a system, which attempt to operate as a translator to enable blockchain communicates with another blockchain. Polkadot has quickly grown into the larger networks since its inception in 2020.

## **10. USD (USDC)**

USD Coin is a stable coin which is based on blockchain technology and supported by Ethereum. The importance of USD is it has a permanent exchange rate with the US Dollar. It means USD Coin is worth one US Dollar, just like Tether, which is another stable coin.

The main objective of the USDC is to serve as a stable coin and to make the transaction efficient and less expensive. But there were concerns raised about the tether, if it is backed by US Dollar reserves. Some investors trust in USDC because they think that USDC has more stability and transparency.

This is because, the reserves of the USDC is overseeing by a major accounting company called Grant Thornton, LLC.

March 29, 2021 for settling the transactions on its payment network, Visa announced the adoption of USDC. On June 2021, the circulation of the USDC was 24.1 billion.

**MARKET CAPITAL OF CRYPTOCURRENCIES**

<b>Cryptocurrency</b>	<b>Market Capital</b>
Bitcoin	\$749 billion
Ethereum	\$313 billion
Tether	\$79.5 billion
Binance Coin	\$62.6 billion
USD Coin	\$53.2 billion
XRP Ripple	\$34.4 billion
Terra	\$32.9 billion
Solana	\$28.5 billion
Cardano ADA	\$28.4 billion

Avalanche	\$20.6 billion
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Data Source: Coinmarketcap.Com. Data as Of March 4, 2022.

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## 1.8 LIMITATIONS AND DRAWBACKS OF CRYPTOCURRENCY

1. **Lack of Knowledge:** It takes time and effort to learn about Cryptocurrencies. Because technical terms and theoretical studies related to cryptocurrency are complicated, the average person cannot understand them.
2. **Risks in Investments-** Cryptocurrencies have yet to demonstrate their worth as a long-term investment. Cryptocurrencies have the potential to be very volatile investments.
3. **Lack of acceptance:** Cryptocurrencies have a lack of acceptance around the world. Cryptocurrencies are not widely accepted because of the anonymity and complicated process of understanding cryptocurrency transactions.
4. **Cyber Crime:** Cryptocurrencies can be used for illegal and criminal operations like money laundering, tax evasion, and maybe even terror financing.
5. **Loss of money:** Lack of knowledge in crypto trading leads to a chance of losing invested money.
6. **Scalability Issues:** The capacity of the blockchain technology is limited to handle the large amount of transaction data on its platform for a short period of time.
7. **Cyber Attacks and Scams:** Cyber-attacks on cryptocurrency exchanges are common, and your money might be permanently lost. Cryptocurrency can be vulnerable to scams.

8. **Value Changes** - The value of cryptocurrencies like Bitcoins may fluctuate dramatically.
9. **No Regulatory Body:** Cryptocurrency is a virtual currency that functions as a monetary exchange over computer networks with no central authority to regulate, monitor, or maintain it, such as a government or bank.
10. **Private Key:** Losing private keys and cryptocurrency wallets leads to the loss of money.
11. **Legal formality:** Cryptocurrencies are banned and not recognised as digital currency in some countries. Many countries have started to implement a separate law for cryptocurrency to ensure data security and avoid loss of money.

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## 1.9 CONCLUSION

- On October 31, 2008, Satoshi Nakamoto published the white paper Bitcoin - A Peer to Peer Electronic Cash System. The paper includes significant details about the functioning of the bitcoin blockchain technology.
- Cryptocurrency is a decentralised digital currency based on blockchain technology and secured by cryptography. Blockchain is a decentralised database which has peer-to-peer network that monitors and organises as well as serves as a secure database of transactions such as buying, selling, and transferring of cryptocurrencies.
- A cryptocurrency is a virtual currency protected by encryption, making counterfeiting and double-spending practically impossible.
- Cryptocurrency transactions may be done in a couple of minutes. The network confirms the block that contains the transaction within a few minutes and the payment is settled immediately. There will be no third party like debit cards or credit cards, which are required for the transaction of funds.
- A person or maybe a group using the pseudonym Satoshi Nakamoto created the first cryptocurrency Bitcoin In 2009. There were more than 18.8 million Bitcoin tokens in circulation, compared to a maximum ceiling of 21 million in September 2021.
- It takes time and effort to learn about Cryptocurrencies. Because technical terms and theoretical studies related to cryptocurrency are complicated, the average person cannot understand them.
- Cryptocurrencies are banned and not recognised as digital currency in some countries. Many countries have started to implement a separate law for cryptocurrency to ensure data security and avoid loss of money.

## GLOSSARY

**1. Cryptocurrency** – A decentralised digital currency based on blockchain technology and secured by cryptography.

**2. Blockchain Technology** - A decentralised database shared across computer network nodes to store the information in a digital format with not able to change or hack is called Blockchain Technology. The financial statements recorded in the blockchain is known block. Block is used for the chronological ordering of the transactions in the database.

**3. Network Node** - A network node is a point of connection in a network of communication.

**4. Cryptography** - A secured communication system that enables only the sender and receiver of a message to read its contents.

**5. Crypto Mining** - Crypto mining is a competitive process for validating a cryptocurrency transaction.

**6. Hash-** Hash is a function in blockchain technology that meets the encrypted demands required for blockchain computation.

## SELF-ASSESSMENT QUESTIONS

1. What is cryptocurrency?
2. What are the features of cryptocurrency?
3. Explain the benefits of cryptocurrency.
4. What are the difference between the crypto exchange and stock exchange?
5. What are the difference between cryptocurrency and traditional currencies?
6. Explain Bitcoin.
7. Mention and describe about any 10 cryptocurrencies.
8. What are the drawbacks of cryptocurrency?

Congratulations dear reader, in the previous chapter, you have learned about the cryptocurrency. Next chapter you are going to learn about Blockchain Technology. Blockchain is the heart of cryptocurrency. Cryptocurrency is based on Blockchain, on this chapter you will learn everything related to Blockchain technology!

## CHAPTER - II

### BLOCKCHAIN TECHNOLOGY

#### OVERVIEW

The second chapter Blockchain technology discuss about a decentralised distributed database which work on computer network nodes on a peer-to-peer- method. This chapter begins with the meaning of blockchain technology. This chapter includes the features, advantages of the blockchain. The applications of blockchain in different sectors also explained in this chapter. This chapter discuss about the operation of blockchain technology and working of blockchain in cryptocurrency transactions. This chapter concludes with the disadvantages of the blockchain technology.

#### SUB UNITS

1. Blockchain Technology.
2. Features and advantages of the blockchain technology.
3. Difference between cryptocurrency and blockchain technology.
4. Operation of blockchain technology.
5. Blockchain process in cryptocurrency.
6. Blockchain technology applications.
7. Types of blockchain technology.
  - Private
  - Public
  - Consortium
  - Hybrid

8. Disadvantages and limitations of blockchain technology.

9. Conclusion

### **LEARNING OBJECTIVES**

1. To understand what is blockchain.
2. To understand the features and advantages of blockchain technology.
3. To study the difference between blockchain and cryptocurrency.
4. To study the operation of blockchain technology.
5. To study the applications of blockchain technology.
6. To learn the process of blockchain technology in cryptocurrency.
7. To know the limitations of blockchain technology.

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## 2.1 BLOCKCHAIN TECHNOLOGY



Source- Inc. Magazine

A blockchain is a decentralised, distributed database that is shared among the nodes of a computer network that stores information electronically in digital format and maintains an up-to-date list of all records. Blockchain are well recognised for their important role and function in keeping a secure and decentralised record of transactions in crypto currencies like Bitcoin. Blockchain is also known as Distributed Ledger Technology (DLT).

Blockchain is a decentralised distributed database and a public ledger which is difficult to cheat, hack or change. Blockchain is widely used by financial institutions, banks, insurance companies and hospitals. Blockchain operates on a peer-to-peer network where transactions are made directly between two unknown entities without the use of an intermediary agency like a bank.

## 2.2 BLOCKCHAIN TECHNOLOGY - FEATURES AND ADVANTAGES

1. **Decentralised:** Blockchain is a decentralised technology which is not controlled by any central authority or government.
2. **No corruption:** Every node on the computer network has a copy of the digital ledger. Every node checks the validity of the transaction. So it creates transparency in its operation.
3. **High Security:** Blockchain Technology is extremely secure because it employs cryptography and is based on a decentralised process and consensus.
4. **Distributed Ledger:** Everyone gets access to the same database of information at all times since the ledger is shared with all participants.
5. **Transparency:** The data stored in the ledger is available to all participants, which means transparency in its operation.
6. **Fast settlement:** Transaction involved in the blockchain technology can be done in a few minutes. Blockchain has fast settlement as compared to traditional or other financial services.
7. **Peer-to-peer:** There will be direct peer-to-peer transactions of data available on blockchain technology. Users can exchange the data privately without any intermediary.
8. **Traceability:** Every piece of data added to the blockchain may be tracked back to its source.

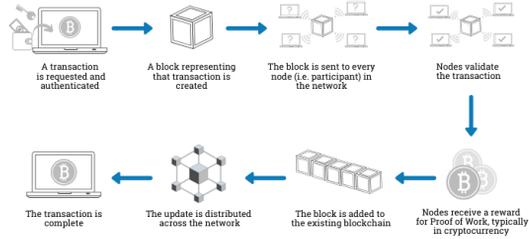
9. **Immutability:** information is stored in an immutable manner on the blockchain ledger. Data on a ledger cannot be changed, modified, or deleted.
10. **Cryptography:** Every piece of data added to the blockchain technology is secured by cryptography, which validates every transaction.

### **2.3 DIFFERENCE BETWEEN CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGY**

- Nature of Blockchain technology is recording transactions and cryptocurrency is used in crypto exchanges.
- Use of blockchain is to record the transactions in a peer-to-peer network. Cryptocurrency is used for It is used for making payments and investments.
- Blockchain has no monetary value. Cryptocurrency have monetary value.
- Blockchain cannot be transferred but cryptocurrency can be transferred.

## 2.4 OPERATION OF BLOCKCHAIN TECHNOLOGY

### How does a transaction get into the blockchain?



Source – Euromoney Learning 2020

A blockchain is a decentralised, distributed database that is shared among the nodes of a computer network that stores information electronically in digital format and maintains an up-to-date list of all records. A decentralised network made up of several nodes or users is referred to as a blockchain. It lacks a centralised authority. Control of the network is spread among various members. If the primary node of a centralised system is hacked, the entire system fails. A decentralised distribution ensures that the blockchain network continues to operate even if one or more nodes are hacked. On a peer-to-peer network, members engage directly with one another.

On the Bitcoin blockchain, for example, transactions are made directly between two unknown entities without the use of an intermediary agency like a bank. Similarly, two unknown organisations can trade finance or data directly without the need for a mediator, creating confidence among the participants and removing the necessity for a middleman.

The blockchain ledger is a decentralised network that keeps data. Data is saved on the hardware of numerous nodes in the system rather than in a centralised cloud structure. Every time the cloud is assaulted, data in the cloud stays susceptible to hackers. Hackers cannot take control of the blockchain network's data since it is scattered among several nodes with distributed storage. Blockchain is also known as "Distributed ledger technology" because it contains a distributed database that does not require a central authority.

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## **2.5 BLOCKCHAIN TECHNOLOGY PROCESS IN CRYPTOCURRENCY**

Step 1: A transaction is requested by a user on the blockchain technology.

Step 2-The transaction that represents a block is created.

Step 3-The block will be transferred to the node in the network.

Step 4-Node validates the transaction.

Step 5-In cryptocurrency, every node receives a reward for its operation. It is called proof-of-work.

Step 6-The newly created block will be transferred to the existing block.

Step 7: The distributed network will be updated every time a new block is added.

Step 8: The transaction is finished.

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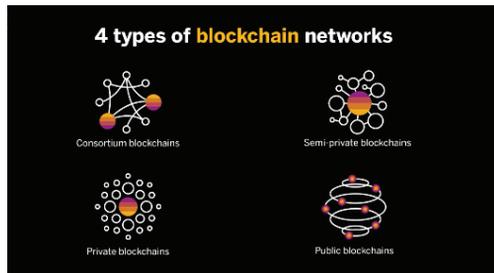
## 2.6 BLOCKCHAIN TECHNOLOGY APPLICATIONS

1. **Financial Institutions:** If financial institutions use Blockchain Technology, Financial transactions will be less expensive and faster than banks. Blockchain enables fast settlement of payments.
2. **Insurance Companies:** Fraud customers can be prevented from filling repeated claims for the same accident or occurrence. Blockchain technology helps the insurance companies to make smart contracts which benefit the customers and the insurance companies.
3. **Real Estate:** In real estate business, documentation process is very high in verifying financial information, ownership, transferring the deeds and titles to the owners. Real estate business can save money by using blockchain technology to record all the transactions, verifying documents and safe transfer and ensuring accessibility in the operation.
4. **Healthcare Services:** Blockchain Technology is very helpful in hospitals. Doctors and medical officers can store or keep the reliable and up-to-date information of the patients to ensure proper treatment to the patients. Blockchain technology guarantees the patients to get immediate and better treatment on emergency. It also helps in the fast retrieval of medical documents and allow for faster treatment in serious circumstances.
5. **Shipping and Logistics Management:** Block chain technology helps the logistics and supply chain companies in the transmission of products and services. The data regarding the exports will be stored on a public ledger and it help in the communication between the exporter and recipient. Blockchain

enables a communication link between the traders. The data stored on blockchain cannot be hacked, changed or manipulated. Blockchain provides higher security and data integrity to the stored data. Logistics and supply chain partners can collaborate more freely without any intermediaries which help them to know the exact data.

6. **Voting:** If the personal data of every individual is stored on a blockchain, the entire world is on only a step away from being able to vote using blockchain technology. Blockchain never allow anyone to vote twice. Blockchain using voting procedures never allow a person to vote twice and the vote registered in the blockchain technology never be manipulated or changed.
7. **The Internet of Things (IoT):** Storing the passwords and other data on a blockchain technology rather than storing passwords in a centralised network or single server provide high transparency, reliability and security.
8. **Data Storage:** Blockchain is decentralised data bases which help the companies and individuals to keep the data anonymously and safely. Wipe away, delete or manipulation of stored data is not possible because it is stored on a decentralised database instead of centralised data base.
9. **Personal Information:** Keeping personal data and information can be stored in the blockchain database to ensure high security and avoid hacking or preventing the data from internet thieves.
10. **Non-fungible tokens:** Storing the Non-fungible tokens or NFTs in blockchain prevents the copy of a work of digital exists or data from duplication.

## 2.7 TYPES OF BLOCKCHAIN TECHNOLOGY



Source – Sap Leonardo

### 1. Public blockchain

Bitcoin and other cryptocurrencies were developed in public blockchain. They developed to promote distributed ledger technology (DLT). Centralised blockchain is not secure and has less transparency. Public blockchain ensure high security and transparency in storing data. It eliminated the limitations of centralised database.

DLT distributes data throughout a peer-to-peer network rather than storing it in a single location. Because of its decentralised nature, it necessitates some method of data authentication. That approach is a consensus algorithm that allows blockchain participants to agree on the present state of the ledger.

### 2. Private Blockchain

A private blockchain is a blockchain network that operates in a restricted database, such as a closed network, or is controlled by a single entity. While it functions similarly to a public blockchain network in terms of peer-to-peer

connectivity and decentralisation, this blockchain is substantially smaller. Private Blockchain, rather than allowing everyone to join and supply computer power, is often run on a small network within a company or organisation.

### **3. Hybrid Blockchain**

Hybrid blockchain is a type of blockchain that includes characteristics of both private and public blockchain. It allows businesses to create a private, permission-based system alongside a public, permission less system, letting them to regulate who has access to certain data stored on the blockchain and what data is made public.

In a hybrid blockchain, transactions and records are typically not made public, but they can be validated when necessary, for as by granting access through a smart contract. Inside the network, confidential information is kept secure yet remains verifiable. Even if a private entity owns the hybrid blockchain, it is unable to modify transactions.

### **4. Consortium Blockchain**

Consortium Blockchain is also known as a federated blockchain, is similar to a hybrid blockchain in that it combines private and public blockchain capabilities. However, it differs in that it involves various organisational members working together on a decentralised network. In addition, a consortium blockchain is a private blockchain with restricted access to a specific group, removing the hazards associated with a private blockchain controlled by a single business.

Consensus methods are regulated by present nodes in a consortium blockchain. It has a validator node, which is responsible for initiating, receiving, and validating transactions. Transactions can be received or initiated by member nodes.

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## 2.8 DISADVANTAGES AND DRAWBACKS OF BLOCKCHAIN TECHNOLOGY

1. **Cost of Implementation:** Implementation of the blockchain technology is an expensive process. To implement and operate blockchain technology, specialised skills and knowledge are required.
2. **Unemployment:** If Blockchain technology is implemented, many employees will lose their jobs. Blockchain may replace the jobs of accountants working in financial institutions.
3. **Scalability:** Blockchain technology uses a consensus method that is harder to scale.
4. **Energy Consumption:** The operation of Blockchain Technology necessitates a high level of energy consumption.
5. **Slow Process:** If too many users are available on the blockchain, it makes the process slow.
6. **Immutable:** Data once added to the database cannot be changed or deleted.
7. **Decentralised:** There is no regulatory body or central authority to control blockchain technology. The jurisdiction of the legal system is not available when an offence happens.
8. **Storage:** High storage and fast internet connectivity are necessary for the operation of the blockchain technology in order to add large amounts of data or information.

9. **Private Key:** If someone loses the private key, it is very difficult or impossible to restore or recover the data.

## 2.9 CONCLUSION

- A blockchain is a decentralised, distributed database that is shared among the nodes of a computer network that stores information electronically in digital format and maintains an up-to-date list of all records.
- Implementation of the blockchain technology is an expensive process. To implement and operate blockchain technology, specialised skills and knowledge are required.
- There is no regulatory body or central authority to control blockchain technology. The jurisdiction of the legal system is not available when an offence happens
- Bitcoin and other cryptocurrencies were developed in public blockchain. They developed to promote distributed ledger technology (DLT). Centralised blockchain is not secure and has less transparency. Public blockchain ensure high security and transparency in storing data. It eliminated the limitations of centralised database.
- Blockchain technology uses a consensus method that is harder to scale.
- Hybrid blockchain is a type of blockchain that includes characteristics of both private and public blockchain. It allows businesses to create a private, permission-based system alongside a public, permission less system, letting them to regulate who has access to certain data stored on the blockchain and what data is made public.

- Consortium Blockchain is also known as a federated blockchain, is similar to a hybrid blockchain in that it combines private and public blockchain capabilities. However, it differs in that it involves various organisational members working together on a decentralised network.
- A private blockchain is a blockchain network that operates in a restricted database, such as a closed network, or is controlled by a single entity.
- If the personal data of every individual is stored on a blockchain, the entire world is on only a step away from being able to vote using blockchain technology. Blockchain never allow anyone to vote twice. Blockchain using voting procedures never allow a person to vote twice and the vote registered in the blockchain technology never be manipulated or changed.
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## GLOSSORY

- **Blockchain** - A blockchain is a decentralised, distributed database that is shared among the nodes of a computer network that stores information electronically in digital format and maintains an up-to-date list of all records.
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## SELF-ASSESSMENT QUESTIONS

1. Define blockchain.
2. Explain the features of blockchain.
3. Explain the benefits of blockchain.
4. What are the drawbacks of blockchain?
5. What is the difference between blockchain and cryptocurrency?
6. Describe different types of Blockchain.
7. What is public blockchain?
8. What is private blockchain?
9. What is consortium blockchain?
10. What is Hybrid blockchain?
11. Explain the procedures involved in cryptocurrency transactions based on blockchain technology.
12. Explain how blockchain operates.
13. What are the applications of blockchain?

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