

# **RESEARCH ARTICLE**

# A SURVEY ON CHARACTERISTICS OF TOP CRYPTOCURRENCIES

Jilsa Chandarana, Rushit Ajudiya, Atharva Dattatreya and Rima Patel Charotar University of Science & Technology, Changa.

.....

# Manuscript Info

# Abstract

*Manuscript History* Received: 29 August 2021 Final Accepted: 30 September 2021 Published: October 2021

*Key words:*-Blockchain, Cryptocurrency, Bitcoin, Ethereum, Litecoin, Dogecoin, Ripple, XRP, Cardano, Ada In this fast-growing world, money has become a dominant asset. As the technology evolved, a new way of money transfer arose named Cryptocurrency. Cryptocurrency, also known as crypto, is a digital currency and has no physical form. Cryptocurrency is trending in finance and technical fields. It is very popular among investors as well. There is various cryptocurrency available in the market with different price and properties. The objective of this paper is to get familiar with cryptocurrency and compare different characteristics of top cryptocurrencies. The cryptocurrency listed in the paper were most likely to be found on any website about cryptocurrency. In this paper, an overview of all these cryptocurrencies was taken from indiatoday.com and it was verified by other online sources.[1]

Copy Right, IJAR, 2021,. All rights reserved.

# **Introduction:-**

Blockchain is an emerging technology. Blockchain is a decentralized and distributed data structure. Decentralization eliminates the possibility of single-point failure. It runs on a peer-to-peer network. The data is stored into blocks and blocks are chained together forming a similar structure as a linked list. Blockchain is widely popular for its openness. There are four types of blockchain. Public Blockchain: Anyone can join the blockchain network and every data is visible to everyone. Private Blockchain: A closed blockchain network where only selected members can participate. Consortium Blockchain: Multiple organizations collaborate and run the blockchain network. Hybrid Blockchain: The user can control which data to show publicly and the rest of the data can be kept confidential. There are certain predefined rules to add the new block in the blockchain which are known as a consensus mechanism. The concept of cryptography is used to secure the chain from various attacks in a distributed system. Blockchain has major applications in the fields of e-voting, crowdsourcing and supply chain. Blockchain is also the backbone of cryptocurrency.<sup>[13]</sup>

.....

In the case of fiat money, two individuals have to be present at the same place and at the same time for money transfer. To remove this barrier, digital currency came into play where transactions can be done from anywhere at any time. But digital currency is controlled by the central authority. On contrary, cryptocurrency is not constrained by the government. A cryptocurrency is a digital currency with no physical form.<sup>[12]</sup> Its value is volatile means its price differs from time to time. Cryptocurrency uses a peer-to-peer network so it does not require any trusted third party for secure transactions. Cryptocurrency uses blockchain to have a synchronized ledger that keeps track of all the transactions. The blocks of blockchain are linked together using hash values. Any modification in the block will alter its hash value resulting in the breakage of the blockchain. That's why the cryptocurrency is perceived as a secure environment where the adversary can not temper any data. A great advantage of cryptocurrency is its low

transaction fees.<sup>[15]</sup> As every coin has two sides, it also has some disadvantages. Due to the anonymous nature of transactions in cryptocurrency, it is also used in illegal activities in the black market and ransomware attacks. Many cryptocurrencies were also stolen due to poor underlying infrastructure. Even so, many people believe in the potential of cryptocurrency and consider it a great asset for investment.<sup>[10]</sup>There are many cryptocurrencies available in the market and each of them has its own characteristics. Here is some basic understanding of the terminology needed to describe various cryptocurrencies.

# **Consensus Mechanism:**

A consensus mechanism is a fault tolerance mechanism in a distributed network to agree on a single data value or single state.

## **Block Time:**

Block Time is a measure of time taken to add a new block in the blockchain.

## **Block Reward:**

Block reward is the additional reward gained by mining the new block in the blockchain.

## **Transaction Fee:**

Transaction fee is the amount charged to the user for performing transactions.

## Market Capitalization:

Market capitalization is the total value of all the coins of cryptocurrency.

## Hash Function:

The hash function is a function that maps the arbitrary size of the input to fixed-size output.

There are many consensus mechanism available today. Common consensus mechanisms are proof of work, proof of stack, proof of authority, proof of activity etc. Each cryptocurrency or blockchain can customize the consensus mechanism to meet their requirements.<sup>[6]</sup>

# **Proof of Work:**

Proof of Work is zero-knowledge proof which proves that a certain amount of computational operations were performed. Proof of work proposes a mathematical puzzle that is generally computationally hard. The miners of Bitcoin race to solve the problem and the winner gets the reward as well as a chance to add a new block to the network.<sup>[9]</sup>

# **Proof of Stack:**

Proof of stack authorizes a person to add or validate a block based on the stack they possess. Instead of miners, the validators are selected based on their holdings in the network who are responsible for adding a new block in the network. Since there is no competition in proof of stack, the resource consumption reduces drastically.<sup>[8]</sup>

# **Ripple Consensus Algorithm:**

Instead of other available consensus mechanism, Ripple uses its own XRP Ledger Consensus Protocol to add a new block in the network. Ripple nodes keep a list of UNL (unique node list) and listen to transactions broadcasted by users. When transactions reach a certain threshold of trust, it's added in the new block. The order of transactions is also decided by the protocol that's why every node can add transactions in the same order resulting in the same block.<sup>[11]</sup>

Now that we have covered the required basic knowledge, let's dive into different cryptocurrencies.

#### **Bitcoin:**

The dawn of blockchain brought bitcoin. The anonymous person or group named Satoshi Nakamoto founded the first generation of decentralized currency named Bitcoin in 2009. It was the first peer-to-peer electronic cash to be implemented. Since bitcoin is the oldest cryptocurrency in the market, it has seen the most rise and downfall over time as people have admired and criticized it a lot. Bitcoin has gained so much fame that the new term "altcoin" was introduced to refer to every other cryptocurrency which competes with Bitcoin.Bitcoin uses Proof-Of-Work with the

longest chain rule as its consensus mechanism. Bitcoin uses proof of work with the SHA256 hash algorithm which produces a variable amount of difficulty if blocks are added too frequently, the difficulty of the puzzle raises. In bitcoin, the new block is added after around 10 minutes which is known as block time. The initial block reward of bitcoin was 50 bitcoin which halves every 210,000 blocks. That's why only 21 million bitcoin will come into existence till around 2140. Till now, the highest price of bitcoin was noted as \$64,863 on April 14, 2021.<sup>[16]</sup>

# Ethereum:

The second generation of cryptocurrency gave rise to Ethereum. In 2015, VitalikButerin released this cryptocurrency with developers as the centre of attention. Buterin believed that blockchain had other applications than money and it needed a robust language for development. Ethereum also uses a proof of work consensus mechanism known as Ethash. The hash function used in it is called Keccak-256 which was also used for the development of SHA3. As proof of work is based on resources, the use of dedicated hardware like ASIC and FPGA can give an unfair advantage to a miner which could eventually lead to a centralized system taking over the network so Ethereum developers strongly disliked this idea. The block time of Ethereum is 15 seconds means a new block will be added to the network every 15 seconds.<sup>[5]</sup>

## Litecoin:

Litecoin is known as silver to Bitcoin's gold. It was founded in 2011 by Google's engineer Charlie Lee. Litecoin follows the proof of work consensus. For hashing, they use the Scrypt algorithm which is a password-based key derivation function. It increases the resources demand in order to repel ASIC and FPGA hardware. There is a limited amount of Litecoin. The block time of Litecoin is 1/4th of bitcoin and its total amount is 4 times of bitcoin. It shows that the amount of Litecoin will never exceed 84 million. The block time of Litecoin is 2.5 minutes. It also halves the reward after every 84,000,000 blocks. Therefore, it is estimated that around 2142, all the Litecoin will be mined.<sup>[3]</sup>

## **Dogecoin:**

Dogecoin is one of the cheapest cryptocurrencies. Dogecoin was invented as "joke currency" in 2013 by Jackson Palmer. The logo of Dogecoin resembles a Japanese dog breed called "Shiba Inu" which became famous as an internet meme. Unlike other cryptocurrencies, Dogecoin has an unlimited supply. Dogecoin also uses a proof of work consensus mechanism which is derived from Luckycoin. The interesting part is that Luckycoin itself is based on Litecoin so all of them uses the same mechanism as the Scrypt algorithm. Dogecoin's price has seen some sudden spikes due to numerous tweets of Elon Musk. On December 25, 2013, Dogecoin had experienced a major theft where millions of coins were stolen, which led to its first major crash and its price dropped by 80%. To make up for it, the Dogecoin community had started the "SaveDogemas" initiative to donate coins.<sup>[4]</sup>

# **Ripple:**

Ripple was introduced in 2012 by Chris Larsen and Brad Garlinghouse. The company created a digital currency named XRP for money transfer with negligible fees and transaction time. As we already saw before, Ripple uses its own customized mechanism. Due to this unique consensus algorithm, it's believed that new blocks are added instantly. Ripple uses hybrid blockchain and only validators are given authority to add new blocks into the network.<sup>[14]</sup>

#### Cardano:

Cardano came into existence in 2015. It was introduced by Charles Hoskinson, co-founder of Ethereum. The major problem he realized with cryptocurrency was the energy consumption due to proof of work. To solve that problem, the cryptocurrency called Ada was founded which uses Proof of Stack. It was named Ada in memory of a 19th-century mathematician who was the first computer programmer. Cardano uses a proof of stack-based algorithm called Ouroborus at its base. Ouroborus is a peer-reviewed research protocol. Ouroborus divides the chain into epochs which are further divided into time slots. For each time slot, the leaders are decided based on a Verifiable Random Function. Maximum one block can be added in each time slot. The proof of stack uses very few resources than proof of work that's why it's a more energy-conserving mechanism.<sup>[7]</sup> In Cardano, a new block is added after every 20 seconds which results in faster transactions. Unlike many cryptocurrencies which are written in C++, Cardano is written in Haskell to inherit a rich body of research already available in Haskell instead of reinventing the wheel.

To highlight the differences in features of each cryptocurrency and compare them side by side, table 1 is given as a summary.

|          | Founder                               | Year | Consensus Mechanism                      | Block time | Hash<br>Function |
|----------|---------------------------------------|------|--|------------|------------------|
|          |                                       |      |  |            |                  |
| Bitcoin  | Satoshi Nakamoto                      | 2009 | POW                                      | 10 min     | SHA256           |
| Ether    | VitalikButerin                        | 2015 | POW                                      | 15 sec     | Keccak-256       |
| Dogecoin | Jackson Palmer                        | 2013 | POW                                      | 1 min      | Scrypt           |
| Litecoin | Charlie Lee                           | 2011 | POW                                      | 2.5 min    | Scrypt           |
| XRP      | Chris Larsen and Brad<br>Garlinghouse | 2012 | XRP Ledger Consensus<br>Protocol Instant |            |                  |
| Cardano  | Charles Hoskinson                     | 2015 | Ouroboros                                | 20 sec     |                  |

 Table 1:- Characteristics of Cryptocurrency.

# **Price Charts of Cryptocurrency:**

As mentioned earlier, cryptocurrency is volatile which means its prices will vary over time. A chart of time vs price is given to visualize the pattern of rising and fall of all listed cryptocurrencies.

\*Data related to prices and market capitalization and charts were referenced from coinmarketcap.com.[2]



Figure 1:- Bitcoin Price Chart.



Figure 3:- Litecoin Price Chart.



Figure 5:- XRP (Ripple) Price Chart.



Figure 6:-Cardano Price Chart.

The summary of the highest price and lowest price with the corresponding date of each listed cryptocurrency is given in the table2 along with their market capitalization. The values are recorded on September 17, 2021.

| CURREN<br>CY | HIGHEST<br>PRICE | DATE OF HIGHEST<br>PRICE | LOWEST<br>PRICE | DATE OF LOWEST<br>PRICE | MARKET<br>CAP   |
|--------------|------------------|--------------------------|-----------------|-------------------------|-----------------|
|              |                  |                          |                 |                         |                 |
| Bitcoin      | \$64,863.10      | Apr 14, 2021             | \$65.53         | Jul 05, 2013            | \$894,379,232,4 |
|              |                  |                          |                 |                         | 72.49           |
| Ethereum     | \$4,362.35       | May 12, 2021             | \$0.4209        | Oct 21, 2015            | \$407,827,563,6 |
|              |                  |                          |                 |                         | 99.11           |
| Litecoin     | \$412.96         | May 10, 2021             | \$1.11          | Jan 14, 2015            | \$12,123,732,97 |
|              |                  |                          |                 |                         | 1.31            |
| Dogecoin     | \$0.7376         | May 08, 2021             | \$0.00008547    | May 07, 2015            | \$32,026,384,33 |
| -            |                  |                          |                 |                         | 6.64            |
| XRP          | \$3.84           | Jan 04, 2018             | \$0.002802      | Jul 07, 2014            | \$49,826,868,19 |
|              |                  |                          |                 |                         | 4.53            |
| Cardano      | \$3.10           | Sep 02, 2021             | \$0.01735       | Oct 01, 2017            | \$76,119,879,69 |
|              |                  | _                        |                 |                         | 2.05            |

Figure 2:- Price summary of Cryptocurrency.

# **Conclusion:-**

In just one decade, Cryptocurrency has become very famous. Many cryptocurrencies were invented and adopted by people and big organizations. Although currently there are over 8000 different cryptocurrencies but it only accounts for less than 5% of the world's money. Despite the volatile nature of Cryptocurrency, it has shown a profit in long run. It can be a great asset of investment depending on the risk factor. Every cryptocurrency has its own unique characteristic including access control, protocol to add new blocks and time to process the proposed transaction as mentioned in this paper. As blockchain is still emerging, it can potentially evolve cryptocurrency even beyond.

# **References:-**

[1]. <u>https://www.indiatoday.in/business/story/cryptocurrency-prices-on-august-25-check-bitcoin-ether-cardano-dogecoin-value-1845033-2021-08-25</u>

# [2]. <u>https://coinmarketcap.com/</u>

- [3]. [14]. Mustafa Lateef Fadhil Jumaili and Sulaiman M. Karim 2021. "Comparison of tow two cryptocurrencies: Bitcoin and Litecoin". J. Phys.: Conf. Ser. 1963 012143
- [4]. [14]. Chohan, Usman W., A History of Dogecoin (February 12, 2021). Discussion Series: Notes on the 21st Century, Available at SSRN: https://ssrn.com/abstract=3091219 or http://dx.doi.org/10.2139/ssrn.3091219
- [5]. U. Khan, Z. Y. An and A. Imran, "A Blockchain Ethereum Technology-Enabled Digital Content: Development of Trading and Sharing Economy Data," in IEEE Access, vol. 8, pp. 217045-217056, 2020, doi: 10.1109/ACCESS.2020.3041317.
- [6]. Zhu, Xingxiong. (2019). "Research on blockchain consensus mechanism and implementation". IOP Conference Series: Materials Science and Engineering. DOI: 10.1088/1757-899x/569/4/042058.
- [7]. AggelosKiayias Alexander Russell, Bernardo David, Roman Oliynykov. (July 20, 2019). "Ouroboros: A Provably Secure Proof-of-Stake Blockchain Protocol". <u>https://iohk.io/en/research/library/papers/the-bitcoin-backbone-protocol-with-chains-of-variable-difficulty/</u>
- [8]. Nguyen, Cong &Dinh Thai, Hoang & Nguyen, Diep &Niyato, Dusit &Nguyen, Huynh &Dutkiewicz, Eryk. (2019). Proof-of-Stake Consensus Mechanisms for Future Blockchain Networks: Fundamentals, Applications and Opportunities. IEEE Access. PP. 1-1. 10.1109/ACCESS.2019.2925010.
- [9]. Gemeliarana, I & Sari, Riri. (2019). Evaluation of Proof of Work (POW) Blockchains Security Network on Selfish Mining. 10.1109/ISRITI.2018.8864381.
- [10]. Jaysing Bhosale and Sushil Mavale, "Volatility of select Crypto-currencies: A comparison of Bitcoin, Ethereum and Litecoin" 2018 Symbiosis Centre for Management Studies, Pune Annual Research, Journal of Symbiosis Centre for Management Studies, Pune Vol. 6, March 2018, ISSN 2348–0661
- [11]. Chase, Brad, and Ethan MacBrough. "Analysis of the XRP ledger consensus protocol." arXiv preprint arXiv:1802.07242 (2018).
- [12]. Berentsen, Aleksander & Schär, Fabian. (2018). A Short Introduction to the World of Cryptocurrencies. Review. 100. 1-16. 10.20955/r.2018.1-16.
- [13]. R. Chatterjee and R. Chatterjee, "An Overview of the Emerging Technology: Blockchain," 2017 3rd International Conference on Computational Intelligence and Networks (CINE), 2017, pp. 126-127, DOI: 10.1109/CINE.2017.33.
- [14]. Armknecht, F., Karame, G. O., Mandal, A., Youssef, F. and Zenner, E. 2015. Ripple: Overview and Outlook. In: Proceedings of International Conference on Trust & Trustworthy Computing, 9229:163–180.
- [15]. ShaikShakeel Ahamad, Madhusoodhnan Nair and Biju Varghese, "A Survey on Crypto Currencies", Association of Computer Electronics and Electrical Engineers, 2013, DOI: 02.AETACS.2013.4.131
- [16]. Nakamoto, S. (n.d.). Bitcoin: A Peer-to-Peer Electronic Cash System. https://bitcoin.org/bitcoin.pdf.

# **Bibliography:-**

- [1]. <u>https://www.indiatoday.in/business/story/cryptocurrency-prices-on-august-25-check-bitcoin-ether-cardano-dogecoin-value-1845033-2021-08-25</u>
- [2]. https://bitcoin.org/bitcoin.pdf
- [3]. <u>https://ethereum.org/en/whitepaper/</u>
- [4]. <u>https://ripple.com/files/ripple\_consensus\_whitepaper.pdf</u>
- [5]. <u>https://vimeo.com/64405422</u>
- [6]. https://searchcio.techtarget.com/feature/What-are-the-4-different-types-of-blockchain-
- technology#:~:text=There%20are%20four%20main%20types,benefits%2C%20drawbacks%20and%20ideal%2 Ouses.
- [7]. https://www.investopedia.com/terms/c/cryptocurrency.asp
- [8]. https://en.wikipedia.org/wiki/Bitcoin
- [9]. https://coinmarketcap.com/currencies/bitcoin/
- [10]. <u>https://ethereum.org/en/</u>
  - [11]. https://en.wikipedia.org/wiki/Ethereum
  - [12]. https://coinmarketcap.com/currencies/ethereum/
  - [13]. https://en.wikipedia.org/wiki/Litecoin
  - [14]. https://www.investopedia.com/articles/investing/040515/what-litecoin-and-how-does-it-work.asp
  - [15]. https://coinmarketcap.com/currencies/litecoin/
  - [16]. <u>https://en.wikipedia.org/wiki/Dogecoin</u>
  - [17]. https://www.investopedia.com/terms/d/dogecoin.asp
  - [18]. https://coinmarketcap.com/currencies/dogecoin/

- [19]. <u>https://ripple.com/</u>
- [20]. https://en.wikipedia.org/wiki/Ripple\_(payment\_protocol)
- [21]. https://www.investopedia.com/terms/r/ripple-cryptocurrency.asp
- [22]. https://coinmarketcap.com/currencies/xrp/
- [23]. <u>https://cardano.org/</u>
- [24]. https://en.wikipedia.org/wiki/Cardano (blockchain platform)
- [25]. https://www.investopedia.com/cardano-definition-4683961
- [26]. https://coinmarketcap.com/currencies/cardano/