

The Role of Cryptocurrency in Digital Economy: Applications, Challenges, and Solutions

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ABSTRACT

Money is undoubtedly a primary need of every human being because human needs are fulfilled by using money. Since now we live in a digital world, digital money is the logical demand of this era. The decentralized digital currency that is based on blockchain technology has created a lot of excitement recently. Cryptocurrency is a digital currency that can be transferred from person to person without the need of a central bank. In this transaction system, the blockchain serves as a digital ledger of all cryptocurrency transactions. In this paper, we have addressed the theme of cryptocurrency and cryptocurrency mining techniques, which play an important role in our economic growth. We have also discussed some important applications of cryptocurrencies in the present day. Apart from this, we discussed some of the challenges related to cryptocurrency and how to overcome them. This new approach is expected to bring huge benefits to the customers, the existing banking system, and the entire society in general.

1. INTRODUCTION

Cryptocurrency is an internet-based digital currency or money that uses advanced cryptography (Farell, R., 2015). Here cryptography is a process of encoding and decoding information that is used to create money called crypto. Cryptocurrencies are decentralized, meaning they are not subject to the control of governments or other central authorities (Mukhopadhyay, U., Skjellum, A., Hambolu, O., Oakley, J., Yu, L., & Brooks, R., 2016). Through this type of internet-based exchange, crypto makes it possible to transfer value online without the need for an intermediary such as a bank or other third party. The decentralized nature of blockchain technology makes cryptocurrencies theoretically immune and transparent.

Blockchain is a sequence of blocks that stores electronic information in digital format (Lee Kuo Chuen, D., 2015). Basically, a block contains information about all transactions, their dates, transaction amounts, and transaction times like a conventional public ledger. Additionally, it includes details on the participants involved in the transaction as well as particulars about the buyer and seller (Zheng, Z., Xie, S., Dai, H. N., Chen, X., & Wang, H., 2018). The data structure approach differentiates blockchain from a typical database. In a blockchain, information is gathered in groups called blocks, which hold sets of all information. It is constantly growing because completed blocks are added to it with a new set of recordings. Blocks have fixed storage capacity, are closed when filled, and are connected to previously filled blocks, creating a chain of data known as a blockchain (Nofer, M., Gomber, P., Hinz, O., & Schiereck, D., 2017).

The rest of the paper is organized as follows: Section II provides a brief history of cryptocurrencies. Section III provides the basic structure and mining technique of cryptocurrency. Section IV shows a list of popular cryptocurrencies and their current market value. Some great applications of cryptocurrency are presented in Section V. Various technical challenges and solutions are discussed in Section VI. Finally, this paper is concluded with Section VII.

2. HISTORY OF CRYPTOCURRENCIES

The story of cryptocurrency is not very old, but its story is eventful, interesting, and full of drama. In the early 1980s, the concept of digital currency or electronic currency came up, and initiatives were taken to create digital currencies. But this attempt failed completely because of the possibility of fraud and lack of trust (Farell, R., 2015). In 1983, a great cryptographer named David

Chaum developed anonymous cryptographic electronic money called e-cash (Huber, T. A., & Sornette, D., 2022). Later, in 1995, David Chaum implemented a digital cash framework, which allows the virtual or digital currency to be untraceable by the government, bank, or any other third party (Chaum, D., 1997).

Although the concept of digital currency dates back to the late 1980s, Bitcoin was developed in 2008 and publicly launched in 2009 by programmer Satoshi Nakamoto (Nakamoto, S., 2008). Bitcoin was the first successful decentralized cryptocurrency that gained widespread attention in early 2011. After that, many more cryptocurrencies showed up in the market, but they are called alternative currencies or altcoins (Milutinovic, M., 2018). Altcoins, short of alternate coins, is a general name for all other cryptocurrencies post-Bitcoin because they represent the mixing of Bitcoin alternatives.

Namecoin is a cryptocurrency that was released in April 2011 and originally forked from bitcoin software (Kalodner, H. A., Carlsten, M., Ellenbogen, P. M., Bonneau, J., & Narayanan, A., 2015). It uses the same proof-of-work algorithm as bitcoin. Namecoin was developed as a blockchain and token for a decentralized Domain Name System (DNS) (BitDNS and Generalizing Bitcoin, 2022).

Litecoin was released in October 2011, enjoying the largest cryptocurrency market cap after Bitcoin, with little success (Lee, C., 2011). Litecoin modified Bitcoin's protocol, increasing transaction speed with the idea that it would be more appropriate for day-to-day transactions.

From the beginning to the present year, many other cryptocurrencies emerged, but most experts and researchers think that they are similar to Bitcoin and are just a byproduct of Bitcoin.

3. CONCEPT OF CRYPTOCURRENCY AND MINING PROCESS OF CRYPTOCURRENCY

Cryptocurrency, or crypto, is a digital currency designed to work as a medium of exchange for purchasing goods and services. It cannot be touched by hand like paper money. In this section, we will discuss the basic structure of cryptocurrency and its mining technique.

3.1 Structure of Cryptocurrency

Cryptocurrency is a virtual or digital form of currency that uses cryptography. Generally, cryptography is a method that uses encryption algorithms, which is helpful for secure transactions. Cryptocurrencies act as both currencies and virtual accounting systems through the use of encryption technology. So a cryptocurrency is a digital form of currency, but in a decentralized manner, meaning there is no government or central banking authority intervention in the transaction process. To use cryptocurrency, of course, you need a cryptocurrency wallet. With the help of this wallet, cryptocurrency owners can withdraw their currency.

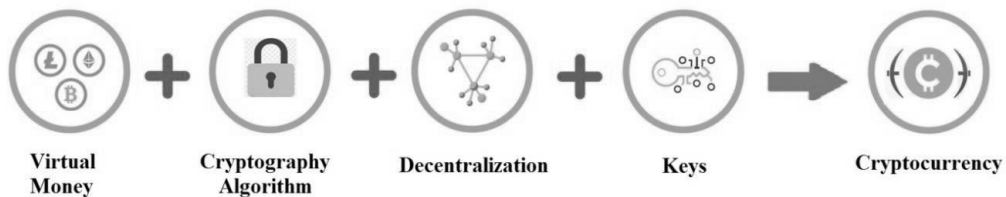


Fig. 1: General concept of cryptocurrency

3.2 Cryptocurrency Mining

In this subsection, we will discuss how mining works and the role of miners in creating cryptocurrency. Mining cryptocurrency is a process where different crypto users compete with each other to obtain new cryptocurrency and help include new cryptocurrency transactions into the blockchain. Cryptocurrencies are also validated through the mining process. Almost all cryptocurrencies are mined through a decentralized network of users' computers. Whenever a transaction takes place, someone receives or spends cryptocurrency and a broadcast is made within the network. It is necessary to store this transaction on the blockchain in order to make it irreversible or permanent. A cryptocurrency's blockchain is a digital ledger of all transactions regarding that crypto, which can be viewed and verified by anyone. A copy of the blockchain, which contains a digital record of all transactions, is stored and maintained by every computer in the network. Figure 2 illustrates how a cryptocurrency transaction (exchange) works.

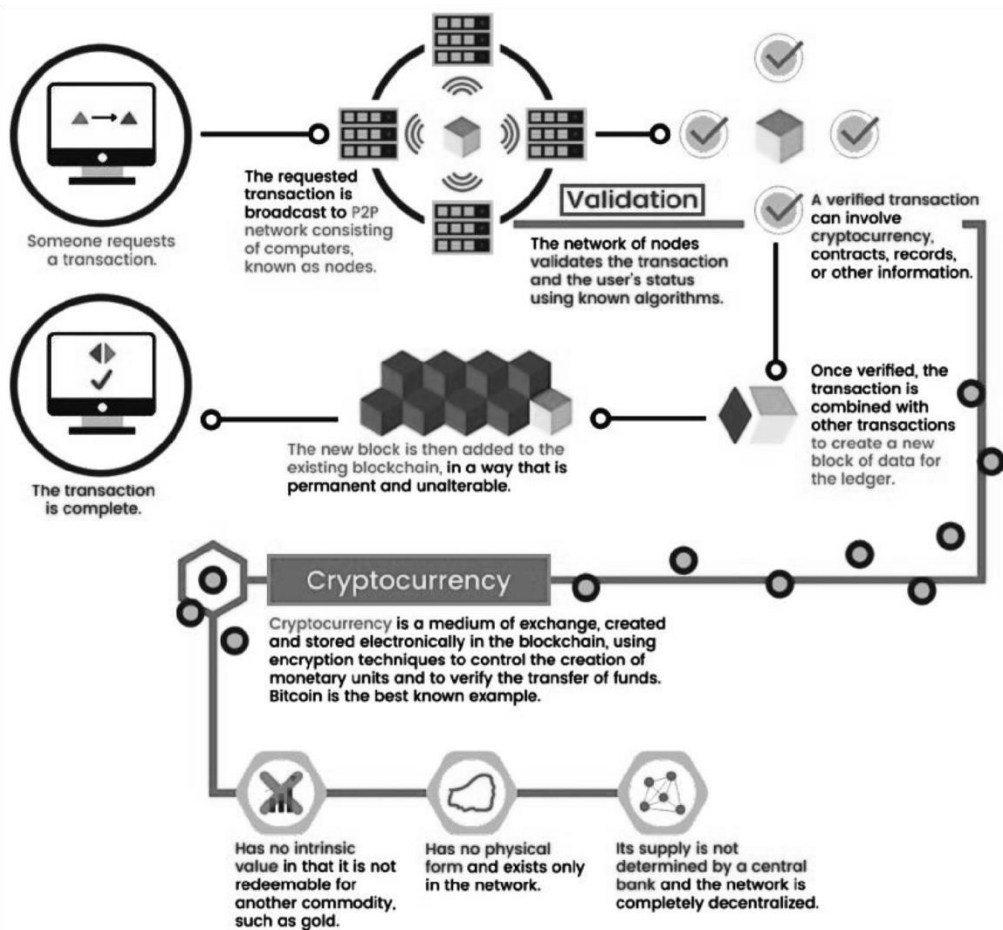


Fig. 2: How does cryptocurrency work (Milutinovic, M., 2018)

Now we will discuss miners and their work. Users who compete with each other to acquire new cryptocurrencies are known as miners. Basically, anyone with a computer and internet connection can be a miner. Once one has a computer and an internet connection, it is simply a matter of setting up a crypto account or wallet and some other mining-related software. The miners compete to solve a complex cryptologic puzzle or to crack a crypto algorithm, known as a proof-of-work scheme. After a solution is found by a miner, the miner is able to create a block and broadcast it to all channels where other miners are also present. This block is a compilation of all transaction details related to crypto.

Other miners on the network will then verify the puzzle solution, and if it is correct, it is added to the blockchain. This is the only way to generate a valid cryptocurrency and is considered successful mining.

4. POPULAR CRYPTOCURRENCIES

The rise in acceptance of cryptocurrencies in recent years has fueled their popularity. According to CoinMarketCap, there are now more than 16,000 cryptocurrencies in the market (CoinMarketCap, 2022). In this section, we will present the best traded and most popular cryptocurrencies of the present time.

Bitcoin, the most popular cryptocurrency, is a decentralized digital currency that enables instant payments to anyone in the world (Nakamoto, S., 2008). It is the most preferred coin from the beginning to the present time for anyone. Bitcoin has the largest market capitalization and is almost half of the total cryptocurrency market value. Ethereum is the second most popular decentralized currency, which has a \$26 billion market cap (Wood, G., 2014). Ethereum uses blockchain technology similar to Bitcoin, as well as enables smart contracts. Because of this smart contract, many corporations were interested in buying this cryptocurrency. According to the Ethereum website, there is no chance of downtime, censorship, fraud, or third-party interference. Ripple is another largest cryptocurrency by market capitalization, with a market cap of around \$6 billion (Schwartz, D., Youngs, N., & Britto, A., 2014). This cryptocurrency enables banks to make large global financial transactions safely, quickly, and cheaply, which is the primary purpose of this cryptocurrency. For this reason, banks worldwide are partnering with Ripple to enhance their cross-payment offerings. Some other most valuable cryptocurrencies that have the largest market capitalization are: Tether, USD Coin, BNB, Litecoin, Peercoin, Namecoin, Blackcoin, Dash, and Permacoin. The topmost cryptocurrency list is continually changing. In Figure 3, we have shown the most popular cryptocurrencies in the market at the present time (CoinMarketCap, 2022).















#	Name	Price	1h %	24h %	7d %	Market Cap	Volume(24h)	Circulating Supply	Last 7 Days
☆ 1	 Bitcoin BTC	\$22,338.70	▲0.56%	▲2.96%	▲13.00%	\$427,148,675,249	\$46,575,882,583 2,088,023 BTC	19,149,318 BTC	
☆ 2	 Ethereum ETH	\$1,718.45	▲0.43%	▼0.26%	▲4.38%	\$210,163,444,319	\$16,908,833,211 9,843,549 ETH	122,347,541 ETH	
☆ 3	 Tether USDT	\$1.00	▼0.00%	▼0.01%	▲0.01%	\$67,735,645,136	\$63,639,568,295 63,628,818,648 USDT	67,724,203,603 USDT	
☆ 4	 USD Coin USDC	\$0.9999	▼0.01%	▼0.00%	▼0.02%	\$51,489,160,299	\$6,341,374,143 6,342,299,449 USDC	51,496,673,373 USDC	
☆ 5	 BNB BNB	\$293.00	▲0.17%	▼0.00%	▲4.23%	\$47,251,937,226	\$984,375,201 3,361,056 BNB	161,337,261 BNB	
☆ 6	 Binance USD	\$1.00	▲0.02%	▲0.04%	▲0.00%	\$20,128,632,239	\$11,922,123,765 11,919,415,769 BUSD	20,124,060,214 BUSD	
☆ 7	 XRP XRP	\$0.3558	▲0.39%	▲1.32%	▲6.35%	\$17,674,705,388	\$1,079,427,112 3,042,967,767 XRP	49,826,021,773 XRP	

Fig. 3: Some popular cryptocurrencies and their current value in the market

5. APPLICATIONS OF CRYPTOCURRENCIES

There are many applications of cryptocurrency. In this section, we will highlight some awesome uses of cryptocurrency.

- i. Due to the explosive growth of the cryptocurrency ecosystem in the past years, the travel industry has also had an impact. Since Bitcoins are regarded as a global currency, you can use Bitcoin wherever you go without paying any additional banking or exchange fees. The rise of the Bitcoin ATM market means tourists are now able to exchange their cryptocurrency for local money in most major cities around the world. Since 2013, Bitcoin has been accepted by the travel agencies cheapair.com and Destinia, which allows customers to book hotels, resorts, flights, and rental cars (CoinMarketCap, 2022).
- ii. Nowadays, more and more schools, colleges, and universities are accepting payments in the form of Bitcoin. The University of Nicosia

accepts payments for tuition using Bitpay, a platform that let users pay for academic expenses with Bitcoins. Some universities in Switzerland, Germany, Cyprus, and the United States have also started accepting Bitcoin payments as academic fees. (Cryptocurrency: Risks and Benefits, 2022).

- iii. The good news for environmentalists is that the use of cryptocurrencies can make the world greener. It eliminates the cost of creating notes from trees. Since it is a digital form of money, there is no need for physical money, thus saving both paper-making and production costs. Moreover, there are several associations, such as Brooklyn Microgrid, that allow users who own solar panels to sell their environmental credits to other people who do not have direct access to reduce carbon emissions and promote green energy (Blockchain for Beginners, 2022).
- iv. Another good place to use cryptocurrency is with charitable organizations. Cryptocurrency facilitates anonymous donations. Donations made using cryptocurrency are cost-effective, quickly transferable, and, most importantly, transparent compared to traditional currencies. It makes the flow of information transparent due to the underlying blockchain technology. Donations made using cryptocurrency can reduce expenses both in terms of cost and time. Additionally, due to its ability to keep companies accountable, cryptocurrencies can be used in charities to avoid corruption, such as fund leaks and many other issues. So the World Food Program (WFP) is using cryptocurrency to safely deliver cash aid to needy people (Blockchain.Com, 2022).
- v. Cryptocurrencies can also be used in advertising and digital publishing. Today, advertisers and digital publishers are finding ways to increase their relevance to each other. Today, a common issue that every internet user encounters is the problem of irrelevant ads appearing on articles. To solve the problem of irrelevance, SolidOpinion launched a new type of pay-per-article advertising system where articles will have their own set of related ads. So advertisers can pay for valuable ads on top of a relevant article, the goal benefiting both publishers and audience members (The Global Treasurer, 2018).

- vi. Currently, several major retailers have accepted cryptocurrency as a legitimate means of payment. For example, Overstock.com, TigerDirect, and Zanga are the main retailers that accept Bitcoin (Virtual Currency Today, 2015). And the number of these retailers who accept cryptocurrency as payment is likely to increase significantly in the future.
- vii. The good news for all game-lovers is that these days, the combination of blockchain and cryptocurrency games has resulted in the rise of the gaming industry, which is never seen before. Crypto-based games are popular because they effectively solve transaction problems and fraud issues that are faced by players and game developers. Cryptocurrency-based games have advantages in terms of payments that are simplified and decentralized, and it provides players with actual ownership. Besides, the incentive received from the game is easily transferable, further encouraging the purchase (Blockchain Council, 2022).
- viii. Nowadays, many startups are using cryptocurrency to finance their ideas, products, and services. Startup leaders are looking to cryptocurrencies as a means of raising money for their needs as opposed to using conventional VC funding, or fund-raising websites like Kickstarter or IndieGoGo. Over the last two years, startups have raised over \$12 billion through cryptocurrency-based fundraising (Entrepreneur, 2022).
- ix. Another ethical use of cryptocurrency will be its ability to help fight electoral fraud. A non-profit organization called Democracy Earth, co-founded by Santiago Siri, is developing an app that will merge voting with blockchain technology. According to Siri, using cryptocurrencies will make it impossible to commit electoral fraud or any other type of malfeasance involving money (Entrepreneur, 2022).
- x. Notably, today you can buy a Lamborghini and other sports cars with your cryptocurrency. Some marketplaces also offer various luxurious goods such as antiques, art, premium wine, and real estate, in exchange for cryptocurrency. Also the most exciting thing lately, Elon Musk said that Tesla will soon accept payments in cryptocurrency for its cars (Brave Newcoin, 2022).

6. DIFFERENT TECHNICAL CHALLENGES IN CRYPTOCURRENCY

Despite growing popularity, cryptocurrencies still face some challenges. A major challenge is hacking and scams. Scammers are always searching for new tricks to steal people's money and assets. If you're interested in crypto, it's important to be aware of the risks. To that end, here are some tips on how to spot some common cryptocurrency scams and proceed with caution when trading cryptocurrencies.

- i. Investment scams often promise that you can "make lots of money" with "zero risk" or "low risk" on social media or online sites or dating apps. Usually, these scams can start with an unexpected call, text, or email.

Before investing in crypto, research the organization thoroughly. For security, search online for company names, person names, and cryptocurrency names. To search online, use words like "scam", "complaint" or "review".

- ii. Scammers guarantee that you will make money in a short period of time or they promise big returns within a short time.

In today's financial market, no one can guarantee you a return on your investment or double your investment in a short period of time. Be suspicious of online marketing sites or social services that promise high returns or unrealistic investment opportunities. Check everything, no matter how trustworthy it seems, even if a celebrity endorses or gives a testimonial. Although it sounds too good to be true, these are easily faked.

- iii. Scammers always promise money for free or without any work. Even though they promise it in cryptocurrency or fiat currency, the promise of free money is always a lie.

Don't trust people who promise you free money. Reject websites or services that promise to earn free money.

- iv. Scammers sometimes create fake cryptocurrency trading platforms or websites to trick victims. These fake websites usually look similar to the original site but have some differences. The end goal of these

phishing scams is sensitive data and login passwords, which are needed to trick victims.

Be alert for spelling or grammatical errors in website domain addresses, as this may be an indication of fraudulent activity. If necessary, double or triple-check the website URL because in phishing scams, scammers copy the URL of legitimate sites.

- v. Sometimes, scammers set up fake customer support phone lines and impersonate different companies, promising to provide technology, finance, and telecom services. Scammers may even make direct outbound calls to potential victims.

Never give support staff remote access to your computer or other devices because it effectively allows the scammer full access to your electronic devices, such as phones, computers, and even your online bank accounts.

- vi. Sometimes, scammers may also send unsolicited job offers, such as selling or mining cryptocurrency, recruiting investors, or helping convert cash to crypto. But this so-called job only starts when you pay a fee in cryptocurrency. Often, victims are asked to pay for training at the company. They are asked to pay in cryptocurrency for that training, which is never returned to them.

First of all, check if the job posting is on a legitimate job website. Generally, recruiters will contact you from a valid email address and they will never ask you to send personal sensitive information. Please report fake job recruitment scams to the appropriate authority.

- vii. In giveaway scams, scammers lure victims into sending money and promise that they will double or multiply the payment of whatever is sent to them. In that case, scammers usually use social media to make giveaway scams believable and perpetuate.

Avoid fake screenshots of cryptocurrency offers and giveaways on social media, even if the account looks familiar. Since legitimate companies will never contact you unsolicited for payment, if you receive a message on social media or messaging apps asking for crypto, ignore it.

- viii. In an impersonation scam, the scammer presents himself as a trusted source (like government authorities, banks, or a service provider) to the

victim to complete a cryptocurrency transaction. In this case, scammers communicate with an offer to help less knowledgeable people who have an interest in cryptocurrency trading.

Any legitimate business or government will never send you email, text, or social media messages asking you to buy or pay with cryptocurrency. So you should exercise caution whenever you receive email requests for crypto payments.

- ix. Some scammers may send emails and claim they have embarrassing information about you, such as private audio, videos, or photos. Then, they will ask you for cryptocurrency and threaten to spread it to everyone if you don't pay.

Don't get confused, but be alert. This is nothing more than blackmail and a criminal extortion attempt. You should immediately report it to the local authorities or police and eventually delete the messages.

- x. Another common way scammers trick cryptocurrency investors is through fake app downloads. As a digital payment transfer method, different cryptocurrencies have different apps, and fraudsters are able to replicate them. So often, thousands of people have downloaded these fake cryptocurrency apps and are being duped.

Only download apps from official sources like Google Play Store or Apple's App Store. Check app details before downloading to identify fake apps. To do this check out who is the developer, user reviews, number of downloads, and more.

7. CONCLUSION

Cryptocurrency is a digital asset that uses cryptography to secure its transactions. Cryptocurrencies are decentralized, meaning they are not subject to government or financial institution control. This makes them an attractive option for those looking for an alternative to traditional currency. While cryptocurrencies are still in their early stages, they have the potential to revolutionize how we interact with money. And the revolution is already happening. Many experts believe that cryptocurrencies will become more widely used in the future. Institutional investors are starting to buy cryptocurrencies. Cryptocurrencies are now being used to purchase goods and services. Several cryptocurrencies are accepted by major online retailers. It

offers the fastest, cheapest, easiest, safest, and most universal value exchange in the world. So, some believe that they will replace traditional forms of payment such as cash and credit cards. We hope that the innovation of cryptocurrency will change the financial system of the world step by step.

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