Computational Economics
https://doi.org/10.1007/s10614-020-10050-0

Blockchain-Based Cryptocurrency Regulation: An Overview

Satya Prakash Yadav[1] · Krishna Kant Agrawal[1] · Bhoopesh Singh Bhati[2] · Fadi Al-Turjman[3,4] · Leonardo Mostarda[5]

Accepted: 20 September 2020

Abstract

Governments and industry leaders have already carried out programs to fully evaluate the strengths of blockchain and how it needs to be incorporated into everyday practices. Several segments performed faster than others. The integration of blockchain technologies into everyday activities within large multinationals was officially communicated, with the money part being the snappiest out of the squares, the promotion and the market part. Where integration of blockchain technologies can provide secure, accessible digital versions to all parties in a transaction, and smart contracts can be used to manage the workflow of approvals and automatically transfer payment upon all signatures being collected. As indicated by Gartner, blockchain innovation has just reached the height of the advertisement process and entered a time of decline, which is recognizing the authenticity of blockchain innovation. The perspective for innovation in blockchain looks magnificent and the increases created by acquiring the innovation are unforeseen. The general consensus is that passing the time of swelled desire was a significant advance in the transformation of blockchain across the infomercial process. The viewpoint for blockchain innovation looks splendid and the increases produced using receiving the innovation will be inconceivable. How the innovation is grasped will be the way to how it benefits the monetary markets and the world when all is said in done.

Keywords Blockchain · Spectrum sharing · BTC · Cryptocurrency · Bitcoin

✉ Bhoopesh Singh Bhati
bhoopesh.cse@gmail.com

[1] ABES Institute of Technology (ABESIT), Ghaziabad 201009, India

[2] Ambedkar Institute of Advanced Communication Technologies and Research Govt. of N.C.T Delhi, Geeta Colony, New Delhi, Delhi, India

[3] Artificial Intelligence Engineering Department, Near East University, Nicosia, Mersin 10, Turkey

[4] Research Centre for AI and IoT, Near East University, Nicosia, Mersin 10, Turkey

[5] Computer Science Department, Camerino University, Camerino, Italy

Published online: 12 October 2020

1 Introduction

Blockchain has been around since the advancement of Bitcoin. However, Bitcoin Founder Satoshi Nakamoto raised concerns about the emerging virtual money in the midst of the last global budgetary emergency. During the old times, the emphasis remained generally on the cryptographic money itself and not the innovation behind it. In general, the benefits of a bitcoin will definitely make it a powerful transaction method. A lot has changed ever since and the Bitcoin costs may keep on breaking into an unchartered area, the innovation behind Bitcoin and numerous digital currencies which have been driven since then it all the rave. This innovation is called a blockchain. The blockchain is a shared archive of the transactions made over time. The entire idea was to decentralize away from national banks through Bitcoin and various encrypted types of money, for the reasons behind digital forms of money (Courtois and Mercer 2017). It's a movement against centralization and fiat cash regulation in this way. While the national banks are responsible for the record with fiat currency, with cryptographic. A remarkable advancement is noticed in the blockchain innovation since both private and open segment associations have opened their eyes and seen the light. What blockchain innovation can offer isn't just ever observed; however, will move toward becoming extraordinary for the present age and be considered as one of the best development of the current times. Currently, organizations have been investigating the unlimited potential outcomes of blockchain for the private division for several years; however, it may be in the course of the most recent years that the commotion has started to crescendo. It's everywhere throughout the news wires, and the continuing interest from government offices has unquestionably added to the promotion. As usual, new advances draw out the analysts and diagrams have been doing their rounds, which speak for the promotion cycle of developing innovations. Gartner, a prominent information and analysis provider in the information and technology sector, has created an extremely fundamental practical, which can be a centralized server as shown in Fig. 1. However, blockchain network provides the necessary security, authentication, and privacy in a decentralized and distributed manner based on consensus response by the users of the network as shown in Fig. 2.

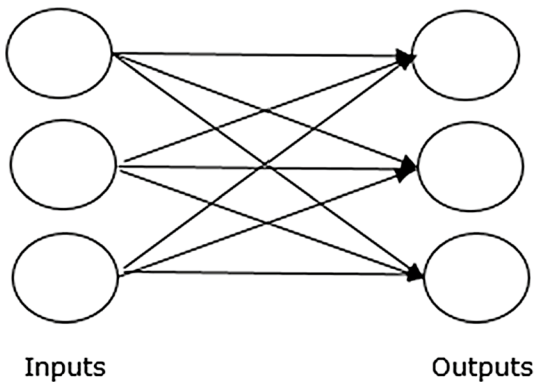

Fig. 1 Centralized blockchain network

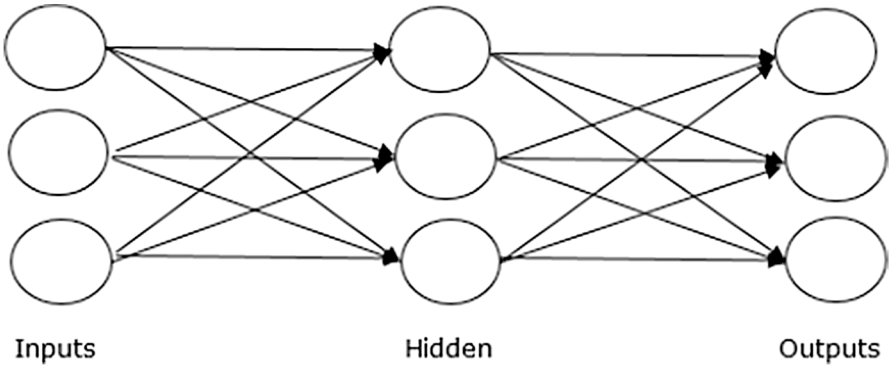

Fig. 2 Decentralized blockchain network

According to Liu et al., "a black market is a notion that refers to economic activity that takes place outside the government-sanctioned channels" (Liu et al. 2020). A black market deals with drugs and killers who are hired to kill someone, the black market of the cryptocurrency also follows the same trend but with more dangerous consequences. The currency revolves around financial interests; the danger lurks in the form of money being taken away without consent. Tax evasion is a glaring example of black market in cryptocurrency; legal help is hired to make transactions of cash so linear that there is no trace of tax to be paid to the government (Valenta and Rowan 2015). The fraudulent services line up under this jurisdiction and can damage the honest working of cash transfers.

2 Literature Survey on Bitcoin Versus Blockchain

Blockchain is the technology that underpins the Bitcoin cryptocurrency, but Bitcoin is not the only market implementation of a centralized blockchain ledger framework. Several other cryptocurrencies are available with their own blockchain and distributed ledger architectures. In the meantime, technology's decentralization has also led to several schisms or forks within the Bitcoin network, creating offshoots of the ledger where some miners use a blockchain with one set of rules, and others use a blockchain with another set of rules.

A bitcoin also known as BTC as well as Cryptocurrency is a digital asset which has its base in cryptography. It is based on the blockchain technology and provides a secure and transparent mode of transferring funds and their exchange to its users. The decentralization features guarantee no reliance on a single authority.

The year 2007–2008 This year witnesses recession at its highest form. The mortgage crisis was at its prime. As a result, there was mass reduction in employment opportunities and debt crisis followed. Consequences were that the people were losing confidence and faith in the running government of that time. The currency

was also at its all-time low, incurring huge business losses and less monetary benefits in multiple forms of businesses.

The emergence of cryptocurrencies in October 2008 Online currencies used as digital assets were started before bitcoin. Some of them which made it were B-Money and BitGold which were secured using encryption at their ends. However, they could not make an edge and were soon forgotten. It was in August 2008 that Satoshi Nakamoto registered a domain name Bitcoin.org and his white paper with the title "Bitcoin: Peer to Peer Electronic Cash System" which was published (Ruffing and Pedro 2017). The author had taken ideas from the existing cryptocurrencies with new additions. The additional features included no involvement of a third party, the consensus algorithms like Proof of Work, usage of hash codes, and formation of block chains. The idea of a blockchain heightened the features of a cryptocurrency and it was touted to work without trust.

January 2009, Bitcoin block development It is also termed as the year of bitcoin genesis. The network of bitcoins was brought forward by Nakamoto starting with block number 0 and the reward was declared as 50 bitcoins for the first entry of block.

The year 2010, market value of bitcoin was declared With no history of trade associated with the bitcoin as it was only mined, adding monetary value to it was not possible. The year 2010 saw more than one miner working to get the block added; this concept was called a mining pool. As a result, the market cap of bitcoin crossed $1 million in November 2010 (Sun SF 2017). A glitch was also noticed in the bitcoin which caused serious security concerns.

2011–2014, cryptocurrency exchanges and new cryptocurrency Altcoins another cryptocurrency which worked on the same concept of encryption and decentralization found its way along with bitcoin. It had more advantages than a bitcoin like anonymity and more speed.

2014–2016, bitcoin and its rise The cryptocurrency exchange Mt.Gox and BitPay were started. Apart from this many launches were made like Ethereum, Coinbase, Bitcoin fork etc. There was a constant rise in the rate of network. The value of the bitcoin increased to $14billion as a result of which they were recognized by the governments for real money exchanges.

The fluctuation in the market off cryptocurrency 2017 The cryptocurrency market was booming with investors and traders. Its market capital was at its all-time high and was growing by 100%. However, the boom was not permanent by the end of the year as the market of bitcoins and altcoins fell drastically.

Bear Market, new regulations, growing adoption The year 2018 saw the fall in the prices of cryptocurrencies by 80%. The bitcoin was reduced to $4000 and the Ethereum was below $100 (Biswas and Muthukkumarasamy 2016). Retail investors and merchants however still continue to put their money in the cryptocurrency and there is hope it will rise back. New regulations are in place to check the potential of the currency.

2019 Even though there has been a huge downfall in the bitcoin value, it is still not completely taken it away from the market. The less value is prompting many new investors to identify the potential of the cryptocurrency. It is a state of wait and watch.

Hence, blockchain is a recent technical development. It is a digital blockchain, where cryptography is used to encrypt transactions. Bitcoin is a currency working on the principle of encrypted transactions. Bitcoin facilitates pair-to-peer transactions without a middleman being required. However, this is only possible via the decentralized blockchain ledger. Blockchain has even more functionality from an application point of view when compared with Bitcoin. Blockchain has potential applications in e-commerce, banking, insurance, and many other industries. For instance, IBM offers blockchain as a service to the metals and mining industry. This network tracks shipments of Cobalt and makes it easy to handle the supply for all parties involved. However, while Bitcoin is a digital asset that has value, when it comes to application it has restricted applications.

3 Legal Aspects-Cryptocurrency Exchange

A currency deals with monetary valuation; therefore, it is necessary to identify its market worth. Cryptocurrency can be brought through exchanges. The exchanges are classified into following:

Trading Platforms It consists mostly a website that is used to link a buyer and a seller and they charge a fee for the transactions that follow on the platform.
Direct Trading It is direct mode of working. People from different countries can exchange currencies. However, the exchanges will not have a fixed price and each seller mostly sets his own rate of exchange.
Brokers These are similar to foreign exchange dealers whose job is to act as middlemen. The broker has the authority to fix a price of the currency which is further bought by the traders. With so many options available for investment, it is imperative that the interested party conduct some research before investing their money. The key points to consider are (Ethan et al. 2017; Hasan and Salah 2018):

- *Reputation* Any exchange will always have a review and a feedback attached to it by its users. The websites such as Bitcoin Talk and Reddit also have questions and answers for a better perspective.
- *Fees* Many exchanges list out their fees and the information associated on their websites. Before being its part, it is better to clearly have an idea about the deposit, transactions, and withdrawal fees.
- *Payment Methods* The process of buying a cryptocurrency can involve credit or debit card, a wire transfer, or PayPal. The credit or debit transfer will extract the identity of the owner which can make frauds easier. Banks will decrease the speed of transfer if done through wire transfer.
- *Verification Requirements* Even though bitcoin is processing money inputs as anonymous but in case you are putting your money through an exchange, it is better to be identified. This reduces the risk of scams and fraud through an illegal exchange.
- *Geographical restrictions* The user functionality of many exchanges are limited to certain counties, Therefore, before proceeding, it is better to know

whether that exchanges has all its resources in the same country in which you reside.

- *Rate of Exchange* Different exchanges offer different art of exchange transfer. It is always advisable to research on the market value for more than one exchange to land a better deal financially.

4 Global Economy

Let us look at Blockchain in detail and study its effect on the global world. The blockchain is a shared record of time-stepped exchanges. For the motivations behind digital forms of money, the entire purpose was to decentralize Bitcoin independently from the national banks and different cryptographic forms of money (Chaudhry et al. 2020). In this way, it is a presidential race toward centralization and currency control of the cash system. National banks are responsible for the record sometime on the fiat cash. With the cryptographic forms of money and blockchain innovation, the client keeps up their very own duplicated records which are synchronized through an accord calculation. Figure 3 shows the growth of the blockchain as the retailers has upgraded them to new technologies and consumers can now easily connect to the retailers be it physically or online. Now as the retail chain industry is growing so fast in this digital world and the consumer are more interested in buying the products online, sometimes, the customer receives a wrong product or a fake product (Hasan and Salah 2018). Thus, it becomes necessary to bring the retail industry into blockchain network.

There is such a great amount of promotion over the blockchain innovation since both private and associations with open segments have understood how relevant it is. What blockchain innovation can offer has remained unobserved; however, it will move toward becoming extraordinary for the present age and be considered as one of the best developments of the current times. For the private division, organizations have been investigating the unlimited potential outcomes of blockchain for various years; however, it may be in the course of the most recent years that the commotion has started to rise.

Fig. 3 Blockchain in retail chain

5 Banks Securities of Blockchain

Cost funds inside the financial business have been evaluated to run from $16 billion to $20 billion every year through the appropriation of blockchain innovation. Towards any case, it is not even the cost-reserve funds. It is advisable to step backwards so as to collect money approaches from debt capital markets and open inaugural contributions to Initial Coin Offerings (ICO). In the event that we make it a stride further, would there be any requirement for the value advertised as we probably are aware of them today? Cryptographic forms of money could supplant customary offers of organizations, recorded or archived, and the invention of the blockchain will then record the exchange of offers on a transparent record for the given entity.

Middle people would never again be required and it could see the end of the involvement of the conventional agents of today. A movement from physical to virtual cash would then simply appear to be inescapable—showcase estimation driving the estimation of cryptographic forms of money as financial markers drive paper monetary forms today. The utilization of paper cash drops for virtual cash might be the reason for the national banks. Japan has just held onto cryptographic forms of money as legitimate delicate. As the market keeps on advancing, others will pursue. Figure 4 is showing the entire blockchain mechanism where A decides to give the quantity to the receiver B. Sender A is continuing to make a transaction, so the transaction is represented as a network block (Heilman et al. 2016). The block is transmitted on the network and all other network stakeholders have been given the block to be checked as a legal transaction.

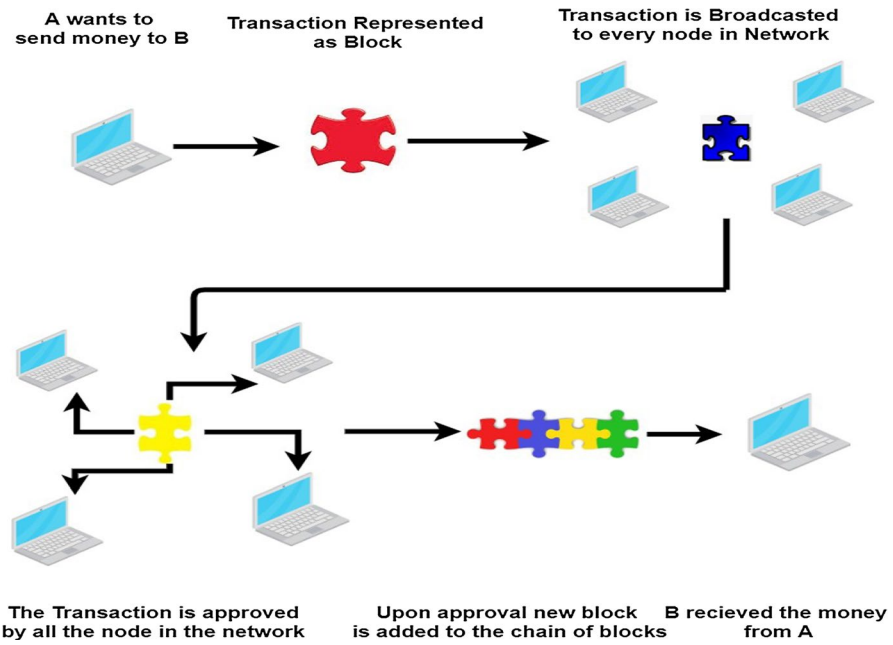

Fig. 4 A blockchain process

On the off chance the national financiers need to keep making the most of their days in the spotlight, they need to gear up the speed. One capability that still lack is the administrative side. Removing the control from the administrations will eventually result in the national banks being equal to advisory groups. They will draw the administrative structure and map out the dynamic incorporation of blockchain innovation into the budgetary framework. Some would contend that such a capacity would be of far more prominent esteem.

The viewpoint for blockchain innovation looks splendid and the increases produced using receiving the innovation will be inconceivable. Figure 4 shows how the innovation is grasped will at last be the way to how it benefits the monetary markets and the world when all is said in done. The world's largest banks and national banks have begun pouring massive money into the use of blockchain technologies. Although bank CEOs were generally pretentious about Bitcoin, the perception of fundamental innovation is quite special as shown in Fig. 5.

First movers are likely to be the world's largest banks having to commute around the bend to abstain from abandonment. In October, JPMorgan Chase & Co (JPM: N) reported that it had launched another installment peace agreement with the Royal Bank of Canada (RY: TO) & Australia and the New Zealand Banking Group (ANZ: AX) to use blockchain technologies throughout the business.

The three banks are not the only one with IBM being doled out by different gatherings to repair procedures within using the blockchain breakthrough. Microsoft is still present, and may be one of the team members. The speed at which banks move means how terrified they are about what blockchain could mean to them.

Blockchain is not just Bitcoin, it is considerably more than that. Having examined the positive effect that innovation blockchain can have on the structure of majority laws, there are countless different areas where innovation in blockchain can have a dramatic impact. Some examples include:

Supply Chains The ability to track sustenance's from home to retirement is one that has made the news as of late. IBM has officially confirmed that it has started to

Fig. 5 Price action with volume theory on bitcoin [https://www.tradingview.com/]

work collaboratively with the significantly smaller suppliers, including Nestle and Walmart, to leverage progress in blockchains. Specifically noteworthy to nourishment, providers are having the option to distinguish the wellspring of sustenance sullying, just as having the option to follow the maker inside the nourishment inventory network. Past sustenance, the straightforwardness of blockchain can likewise give purchasers the genuine wellspring of manufactured products, which has turned out to be significant in the present society.

Vitality division The transaction of vitality; including, the use of blockchain may allow the consumer to sell their neighbors' overabundance vitality, thereby expelling power from the service organizations. Unlike the money related markets, even before free market intervention regulate costs, there may also be a variety of costs.

Governments Governments have just established pilot projects to integrate revolutionary blockchains into their day-to-day activities. The goal is to pick up the output the invention can convey. In the United Kingdom, the legislature has used progress in blockchain in the provision of understudy credits and, respectively, in promoting the provision of benefits to the underprivileged. The view of the administration is that blockchain will lessen debasement, the quantity of cases of extortion, and expenses by shifting away from present paper usefulness.

Governments over here are planning to use the software to hold records; including land-ownership deeds. As a matter of fact, the use of the record may be used to record the exchange of property ownership and deeds.

Human services The exclusion of the paper trail inside the social security system and making restorative records of patients are available to the patients without the possibility of hacking or spilling. In addition, a consolidated record of clinical information might also have the option of supplying the key information that focuses to help prevention of infection and diseases.

Music Industry Protection of rights and profit redistribution within the music industry is a crucial concern, as the company sees ways to accept the creativity. Evacuating the stealing ability and enabling members of the audience to download music put away on the blockchain will be one of the improvements in the market outlook.

The principal craftsman to connect with cryptographic forms of money in the music business was Bjork with an arrival of another collection that furnishes purchasers with 100 Audio coins (Liu et al. 2018).

These are only few models. Blockchain innovation is being investigated over the majority of the real areas and with numerous ventures effectively taking off pilot extends, the doubters may need to try to go.

6 Proposed Impacts of Blockchain-Based Cryptocurrency

Cryptocurrency is a modern, mainstream e-cash innovation. Anonymity is among cryptocurrencies' most critical and attractive features. Bitcoin privacy isn't solid enough, but in this article we discussed privacy-enhancing strategies and

privacy-centric altcoins (Deebak and Al-Turjman 2020). At the other side, we have outlined the methods used to track cryptocurrency. We also proposed some possible solutions to balance the privacy of blockchain-based cryptocurrencies and their regulation. Future testing is underway in real-world settings to apply the suggested solutions. Cryptocurrency is a new technology, which can change the way business is done. According to a survey conducted, 44% of the bitcoins used for transaction were illegal. However, this point was later disapproved. Till date the use of cryptocurrency is not seen with much significance. The cryptocurrency has no doubt grabbed the attention for any kind of transaction but it still does not rule the black market. With more lawful regulations being drafted for bitcoin, it will come under strict supervision and its illegal use can be curbed. As Gartner pointed out, blockchain innovation has just reached the height of the advertisement cycle and entered a time of frustration, which is recognizing an authenticity of blockchain innovation (Mut-Puigserver et al. 2018). The general opinion is that passing the time of increased desire was a substantial development in the advancement of blockchain across the ad period. Table 1 is showing that the blockchain industry has the same advantages as a private blockchain has, even though in a blockchain private equity firm ownership is not governed by a collective entity or a collective operates under consortium leadership.

Governments and business leaders have now set out on activities to thoroughly assess the capabilities of blockchain and how it needs to be integrated into everyday practices as shown in Fig. 6.

Since even before Bitcoin and other virtual currencies have been focused on Blockchain, Blockchain-based cryptocurrency regulations have been successive attacks, leaving users unaware of Bitcoin's protection and blockchain. Even though there are many credibility disputes, Bitcoin is becoming increasingly popular and has a healthy number of participants. Both the Bitcoin development team and Bitcoin players often try to solve and reduce the threats that this virtual currency can encounter. The convergence of blockchain engineering into daily activities within massive multinationals has officially articulated itself, with the money part being the snappiest out of the squares.

This method aims to reduce the difficulty of clustering by avoiding consideration of the knowledge about the location of the nodes. Excluding distance information may not, however, produce accurate clustering (Chithaluru et al. 2020). Hence, a

Table 1 Comparison between Public, Private, and Consortium Blockchain (Ethan et al. 2017)

Property	Public	Private	Consortium
Consensus determination	All miners	One company	Selected nodes
Read permission	Public	Public or restricted	Public or restricted
Immutability	Impossible	Could be tampered	Could be tampered
Efficiency	Low	High	High
Centralized	No	Yes	Partial
Consensus process	Permission less	Permissioned	Permissioned

Fig. 6 BCH/USD retesting the resistance [https://www.tradingview.com/symbols/BCHUSD/]

novel methodology with high precision is suggested. Also, the extraction techniques of the application sometimes lead to inaccurate tests. Therefore, extraction features are used in the proposed method, and it increases the accuracy of the method by using the artificial neural network. When the features are correctly measured then the probability of producing a highly reliable result increases and thus the computational cost reduces (Kumar et al. 2020).

7 Result Analysis

Bitcoin Simulator is based on ns3, the popular discrete simulator for events. We also used rapidness to promote communication between nodes. The project aims to analyze the impact on the scalability, protection, and blockchain-based cryptocurrency regulation of working driven blockchains by consensus criteria, network characteristics, and protocol changes. Our goal is to make the simulator realistic. We obtained and implemented real network statistics in the simulator. We explicitly rummaged common explorers such as blockchain.info to estimate the distribution or blocks and block sizes, and used the bitcoin crawler to find out about the average number and the geographical distribution of nodes within the network. In addition, we used the data given by the coin scope on node connectivity. The used parameter symbols are used in the result table explained in the Table 2.

7.1 Impact of Number of Miners

Bitcoin mining is the validation of transactions on every Bitcoin block. The decentralized Bitcoin design ensures that transactions are transmitted on the peer-to-peer

Table 2 Parameter symbols and their description

Abbreviations	Description
t_{mean}	Mean Block Propagation Delay
t_{mediam}	Median Block Propagation Del ay
$t_{10\%}$	10% Block Propagation Delay
$t_{25\%}$	25% Block Propagation Delay
$t_{75\%}$	75% Block Propagation Delay
$t_{95\%}$	95% Block Propagation Delay
S_r	Stale Block Rate
t_{ps}	Throughput in Transactions/second

network and once they have been transmitted, it must be validated that the transaction is legitimate and then registered on the Bitcoin blockchain public transaction database. Miners are basically involved in the processing under verification of transactions before the transactions on the Bitcoin blockchain are registered. Miners would collect transaction fees as new Bitcoins. As explained in the Table 1 miner used it publicly. We will now assess the output attained. Up to this point, block size varies from 0.1 to 0.5 MB, interval variation of block ranges from 10 s to 1 min, to capture a huge no of blockchain instances and Miners (16 to 256) with the simulator. Here, we are assuming that network relies on an efficient propagation mechanism. Both the Tables 3 and 4 are designed for the Miner change on the Throughput in transactions/second. According to the transaction/seconds state block rate (%) are changing over Block size and interval variation (0.1 to 0.5) und (10 s to 1 min) respectively (Fig. 7).

7.2 Impact of Block Generation Interval

This section represents the impact of the block generation interval on the bitcoin system. Here, differentiate the block generation interval from (30 s to 10 mints) and measure the mean, median block propagation delay and 10%, 25%, 75% und 90% block propagation delay. Here, standard bitcoin network considered. In this scenario bleak size is fixed. Both the figures given below show the standard propagation time variation with respect to the block generation interval. Figures 8 and 9 are design

Table 3 State block rate (%) and throughput in transactions/second over block size and interval variation (0. 1 to 0.5) and (10 s 1 min) respectively for 128 Miners

Block state (MB)	Block interval	Sr	Throughput (tps)
0.25	30 s	0.84	32.4
0.1	10 s	1.8	4 1
0.25	20 s	1.21	5.1
0.25	15 s	I.7	65.7
0.5	30 s	I.08	65.7
0.1	I mins	0.77	65.7

Table 4 State block rate (%) and throughput in transactions/second over block size and interval variation (0.1 to 0.5) and (10 s to 1 min) respectively for 256 Miners

Block Size (MB)	Block Interval	Sr	Throughput (tps)
0.25	30 s	0.97	32.4
0.1	10 s	I.8	41
0.25	20 s	1.21	51
0.25	5 s	I.7	65.7
0.5	30 s	I.08	65.7
0.1	I mins	0.77	65.7

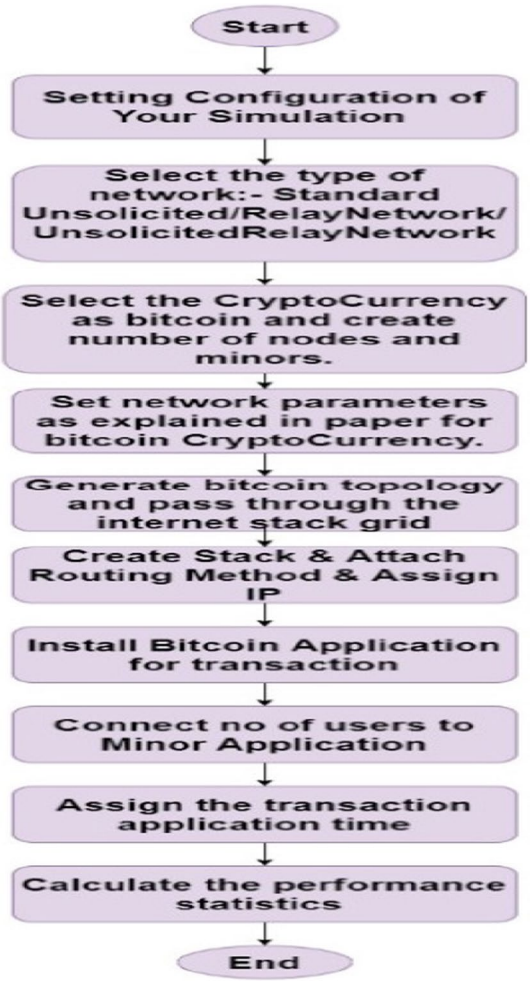

Fig. 7 Proposed flowchart for blockchain-based cryptocurrency as bitcoin

based on the block generation interval, if block size is 2 MB and block generation interval is 0.25 s its pans that 2 MB block will take 0.25 s to generate. Figures 8 and 9 showing the impact of block generation interval on the block propagation delay.

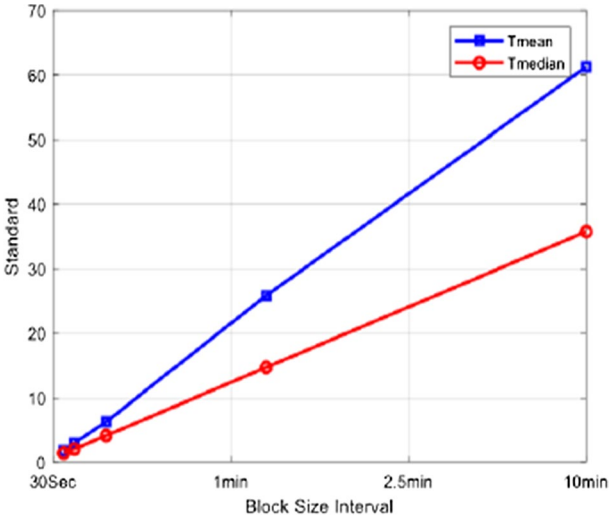

Fig. 8 Mean and median propagation delay on the variation block generation interval

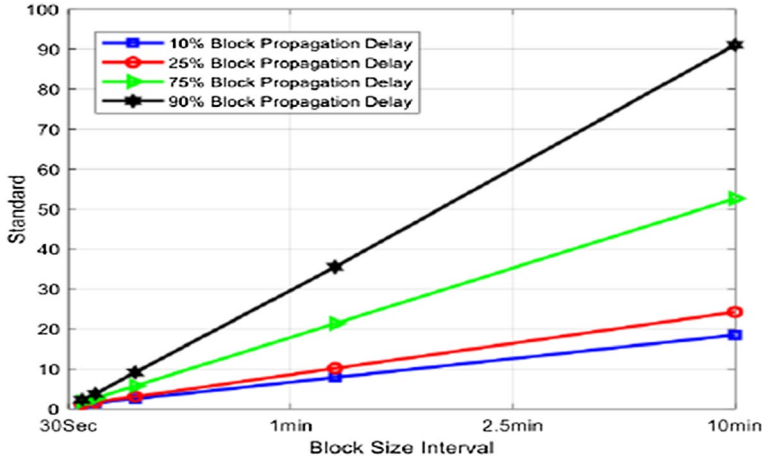

Fig. 9 10%, 25%, 75% and 90% propagation delay on the variation block generation interval

7.3 Impact of Block Size

We reach the block size limit in the Simulation World, and we extrapolate the probably distribution of the number of transactions per node, taking into account the average number of transactions over the last two years on Bitcoin as Hedge or Safe Haven (Kang et al. 2020), if the block size limit is 1 MB, then we can take the number of transactions from the probability distribution as we know from Bitcoin (Han et al. 2020), but when the user chooses to model a world with a block of 2 and

Table 5 Bitcoins transaction performance variation at 2 MB block size

Interval	$t_{mean(s)}$	$t_{median(s)}$	$t_{10\ \%}$	$t_{25\ \%}$	$t_{75\ \%}$	$t_{90\ \%}$	S_r (%)	Bandwidth (kbps)
25 min	91.27	53.7	27.03	35.77	81.65	138.58	3.15	20.45
10 min	87.35	56.79	31.8	38.5	83.06	144.35	6.14	52.92
25 min	220.22	122.37	84.02	97.46	156.89	231.14	26.36	665.39
1 min	7078.53	940.48	6877.62	6904.89	6945.27	7057.85	72.89	2821.09

Table 6 Bitcoin transaction performance variation at 4 MB block size

Interval	$t_{mean(s)}$	$t_{median(s)}$	$t_{10\%}$	$t_{25\%}$	$t_{75\%}$	$t_{90\%}$	S_r (%)	Bandwidth (kbps)
25 min	174.05	112.23	57.96	75.32	164.29	283.94	4.72	42.03
10 min	236.55	132.3	75.18	94.22	189.62	351.43	11.75	147.19
25 min	13,123.2	12,909.7	12,780.3	12,834.4	12,990.9	13,127.8	73.44	2140.04
1 min	14,737.2	14,614.3	14,537.3	14,571.9	14,678.7	16,038.4	75.22	6207.44

4 MB. We multiply the transaction number by two. This helps us to see the output at different block size limits. Bitcoin Simulator simulated this case successfully in 4 min and 55 s. The findings shown in the Tables 5 and 6 indicate an estimated increase in block sizes of 2 MB and 4 MB between executions. This rise is equal to an additional 100 transactions. We may also note a change in the interval tor increasing output and calculate the variance of the propagation delay respectively. Tables 5 and 6 shows the impact of block size change on bitcoin transaction. Figure 10 shows the state block rate (%) over the block size interval based on block size, in which block size vary from 0.5 to 4 MB.

8 Conclusion and Future Scopes

This work offers a deliberate writing survey of different areas of blockchain-based applications. The objective is to analyze the present status of the blockchain innovation and its usage and to emphasize how unique aspects of this new technology will revolutionize "business as normal" activities. The blockchain innovation has come up as a transformation in the most recent couple of years and different organizations want to execute this innovation in their business as the innovation will give an ideal security and protection for the system. The blockchain innovation will go to give a development in various parts of the business. Currently, the businesses in each nation are confronting issues in various zones of their organizations. The blockchain innovation will help in diminishing the intricacy that is there in the business which includes various gatherings in the system making it complex. The primary issue with the business is the contribution of center man at each stage. Through the use of blockchain, the center man can be disposed of and the exchange between the meetings that are a piece of blockchain coordinate to sue the inventive contracts may take

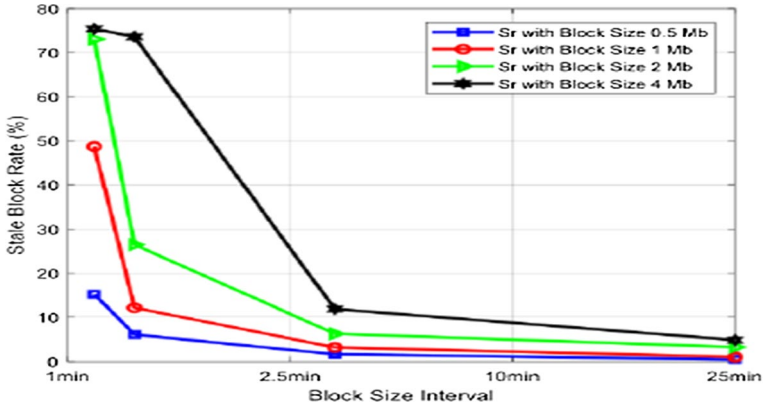

Fig. 10 Performance of state block rate (%) versus block size interval

place. We can say that with blockchain innovation we can expel superfluous people from the system. There are numerous highlights of blockchain which may help each business industry in getting profits by the innovation. Presently, all the group working or some portion of the innovation can really observe all the exchanges, all the records and information trade as the innovation gives a straightforward domain to all the system individuals. We have perceived how a blockchain can be gainful and how we can develop the business procedure utilizing the blockchain innovation in different areas of the business. Utilization of Internet of Things (IoT) with blockchain innovation can be useful for a business industry. These gadgets assume significant job in following the item from the maker to the shopper and furthermore for controlling the nature of the existence sparing medications by detecting the temperature.

The blockchain innovation is extremely new for each industry or association to actualize. In business industry the fundamental substances of the system are maker, producer, retailer, and shopper. In this way, in future we can consider constructing and executing a solitary blockchain arrangement which can be utilized for the business be it a land, nourishment store network, piece of clothing production network, car industry, pharmaceuticals organization, or any such organization, so it would turn out to be anything but difficult to send the blockchain organize.

Acknowledgements The author would like to express his sincere thanks to the editor-in-chief for his valuable suggestions to improve this article.

References

Biswas, K., & Muthukkumarasamy, V. (2016). Securing smart cities using blockchain technology. In *Proceedings of IEEE 18th international conference high perform. computing communication IEEE 14th international conference smart City, IEEE 2nd international conference data science system (HPCC/SmartCity/DSS)* (pp. 1392–1393).

Chaudhry, S. A., Alhakami, H., Baz, A., & Al-Turjman, F. (2020). Securing demand response management: A certificate-based access control in smart grid edge computing infrastructure. *IEEE Access, 8,* 101235–101243. https://doi.org/10.1109/ACCESS.2020.2996093.

Chithaluru, P., Al-Turjman, F., Kumar, M., & Stephan, T. (2020). I-AREOR: An energy-balanced clustering protocol for implementing green IoT for smart cities. In *Sustainable cities and society* (p. 102254). https://doi.org/10.1016/j.scs.2020.102254

Courtois, N. T., & Mercer, R. (2017). Stealth address and key management techniques in blockchain systems. In *Proceedings pf ICIS-SP* (pp. 559–66).

Deebak, B. D., & Al-Turjman, F. (2020). A hybrid secure routing and monitoring mechanism in IoT-based wireless sensor networks. Ad Hoc Networking, vol. 97, ISSN 1570-8705, https://doi.org/10.1016/j.adhoc.2019.102022

Ethan, H., Baldimtsi, F., Alshenibr, L., Scafuro, A., & Goldberg, S. (2017). Tum- bleBit: an untrusted tumbler for bitcoin-compatible anonymous pay- ments. In *Proceedings of network distributed system security symposium (NDSS)* (pp. 1–15). San Diego, CA, USA.

Han, J., Kim, S., & Jang, M. (2020). Using genetic algorithm and NARX neural network to forecast daily bitcoin price. *Computing Economy, 56,* 337–353. https://doi.org/10.1007/s10614-019-09928-5.

Hasan, H. R., & Salah, K. (2018a). Blockchain-based solution for proof of delivery of physical assets. *Blockchain* (Vol. 10974, pp. 139–152)., Lecture Notes in Computer Science Seattle: Springer.

Hasan, H., & Salah, K. (2018b). Proof of delivery of digital assets using blockchain and smart contracts. *IEEE Access, 5,* 65439–65448.

Heilman, E., Baldimtsi, F., Goldberg, S. (2016). Blindly signed contracts: anonymous on-blockchain and off-blockchain bitcoin transactions. In *Financial cryptography and data security* (pp. 43–60). Berlin, Germany: Springer.

Kang, S. H., Yoon, S., & Bekiros, S. (2020). Bitcoin as hedge or safe haven: evidence from stock, currency, bond and derivatives markets. *Computing Economy, 56,* 529–545. https://doi.org/10.1007/s10614-019-09935-6.

Kumar, M., Alshehri, M., AlGhamdi, R., Sharma, P., & Deep, V. (2020). A DE-ANN inspired skin cancer detection approach using fuzzy C-means clustering. In *Mobile network and applications* (Springer). https://doi.org/10.1007/s11036-020-01550-2.

Liu, J., Li, W., Karame, G., & Asokan, N. (2018). Toward fairness of cryptocur-rency payments. *IEEE Security Privacy, 26,* 81–89.

Liu, Y., Zhang, W., & Fu, J. (2020). Multifractal analysis of realized volatilities in chinese stock market. *Computing Economcy, 56,* 319–336. https://doi.org/10.1007/s10614-019-09920-z.

Mut-Puigserver, M., Payeras-Capellà, M., & Cabot-Nadal, M. (2018). Blockchain-based fair certified notifications. In *Data privacy management, cryptocurrencies and blockchain technology* (pp. 20–37), Lecture Notes in Computer Science, vol. 11025. Barcelona, Spain: Springer

Ruffing, T., & Pedro, M. –S. (2017). ValueShuffle: mixing confiden- tial transactions for comprehensive transaction privacy in bitcoin. In *Proceedings of international conference financial cryptography and data security* (pp. 133–54). Springer, Cham.

Sun, S. F. et al. (2017). RingCT 2.0: A compact accumulator-based (linkable ring signature) protocol for blockchain cryptocur- rency monero. In *Proceedings European symposium on research in computer security* (pp. 456–74). Springer, Cham.

Valenta, L., & Rowan, B. (2015). Blindcoin: blinded, accountable mixes for bitcoin. In *Proceedings of international conference financial cryptography and data security* (pp 112–26). Springer, Berlin, Heidelberg.