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A literature review on Bitcoin: Transformation of crypto currency into a global phenomenon

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***Abstract*— Bitcoin is a crypto-currency based open-source technology that operates in the peer-to-peer grid as a private payment mechanism. Bitcoin works on sophisticated cryptography supported by a local community in a peer-to-peer network. This study reviews scholarly articles to understand how bitcoin is addressed in the literature. The study reports on the attributes of bitcoin through a systematic literature review. The paper is based on primary data from existing literature and secondary data from relevant case studies in the public domain. Unlike other currencies, Bitcoin seems to have faced many hurdles and with many applications in day-to-day life, created unique challenges for the end user community. When Bitcoin came into existence, it seemed to signal hope for a better future, but the growth of bitcoin is hard to predict. Bitcoin opens up an entirely new world for both practitioners and academicians. Further, this study presents an idea about the 'potential' of bitcoin, highlights the prerequisites, needs, implications, and challenges faced by bitcoin in processing business transactions.**

***Index Terms*— Bitcoin, Wallet, Transaction, Block Chain**

I. INTRODUCTION

THE biggest thing that hit the global market since the invention of currency is the concept of "Bitcoin". Bitcoin is an information technology breakthrough that facilitates both a secure, decentralized payment system and a tool for the storage, verification and auditing of information, including digital representations of value. (Simser, 2015) A bitcoin is also the intangible unit of account that facilitates the decentralized computer network of Bitcoin users. Bitcoin is not a company or a company product. Contrary to many news reports, it is not anonymous and was not built for bad actors, though bad actors have, at times, brought Bitcoin into the headlines. It is a platform that allows two individuals to transact money without involving a third-party and without *mediation* costs involved in commerce through the internet (Nakamoto, 2009). There arose the need for an innovative electronic payment system based on cryptographic proof instead of trust. Bitcoin is a decentralized peer to peer (P2P) network-based virtual currency note that is not issued by a government or any organization (Kaminski, 2003; Hurlburt and Bojanova, 2014). Bitcoin relies on cryptographic protocol and a distributed network of users, allowing users to mint, store and transact. It was invented by a group of programmer or an unknown programmer under the name Satoshi Nakamoto and released as open source software in 2009. Since then, Bitcoin has emerged as the most trusted and widely used cryptocurrency (Ron & Shamir, 2012). According to the research produced by Cambridge University in 2017, there are 2.8 to 5.8 million unique Bitcoin users (William, 2017). Bitcoin is currently accepted as a payment method among many legitimate retailers. However, this also attracts criminals to use this unique decentralized P2P network-based virtual currency, since there is no centralized authority to monitor suspicious activity, allowing user to transfer funds anonymously (Carrick, 2016; Dallyn, 2017).

II. BACKGROUND

A digital currency, Bitcoin evolved from the concept of cryptocurrency. Bitcoin is also a type of virtual currency. (Metz, 2013) Virtual currency is unregulated digital money which is issued by the central authorities and also controlled by the developers. It is used by the members of virtual community. Digital currency is a form of virtual currency, but unlike virtual currency it is electronically created and stored. (Gilpin, 2014). Cryptocurrency is a subset of a digital currency designed to work as a medium of exchange, and uses cryptography to secure the transaction and control the additional creation of cryptocurrency.

Satoshi Nakamoto proposed the idea Bitcoin on 31 October 2008 in a paper called "Bitcoin: A Peer to Peer Electronic cash system". Later in 2009, Nakamoto implemented Bitcoin as open source code to become with one decentralized peer-to-peer cryptocurrency (Antonopoulos, 2015). In January 2009, the Bitcoin network came into existence with the first Bitcoin clients and the first issuance of Bitcoin was witnessed with

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Satoshi Nakamoto mining the first block of Bitcoin known as the genesis block, and receiving 50 Bitcoin reward. Hal Finney, a programmer is one of the first supporters, adopters, contributors and receivers of the first Bitcoin transaction; he received 10 Bitcoin from Nakamoto (Nakamoto, 2009). In the beginning, there were only a few supporters for bitcoin. Early supporters included Wei Dai who then created b-money, a predecessor of bitcoin, and Nick Szabo who created bit gold later which is also a predecessor of bitcoin. In the early days, bitcoin founder Nakamoto was estimated to have mined 1 million Bitcoin in 2010 within one year (Valfells and Egilsson, 2016). During the first Bitcoin transaction, the value of the Bitcoin was discussed on the Bitcoin talk forums. One of the most notable transactions was that of 10,000 BTC used to purchase two pizzas delivered by papa Jones indirectly (Bonneau, et al., 2015; Peterson, 2014; Popper, 2016).

Bitcoin soon became immensely popular among the public, press, and other media. The unique features of bitcoin such as its ease of handling, and as a decentralized virtual cash system, and privacy attracted more users. The main threat that users face with regard to this famous cryptographic cash is cybersecurity (Carrick, 2016). On August 2010, a major issue came to light, that is, the vulnerability in the Bitcoin protocol was spotted. Transactions were not verified properly and entered in the transaction log blockchain, which led a uses to bypass the restrictions and create an infinite number of Bitcoin (Eyal and Sirer, 2014). On 15th August 15, 2010, over 184 billion bitcoins were generated in a transaction and sent to two addresses on the network. The transactions of generated Bitcoin were stopped and erased from the transaction log within hours. The bug was fixed and Bitcoin came up with an updated version of protocol. The number of users using Bitcoin increased in 2017 and the number of businesses accepting Bitcoin also increased. The transactions rate grew three times more than that of the previous year 2016, and the usage of Bitcoin extended to P2P supply chain payments. According to Heston, (2018) bitcoin transactions worth 2 billion USD happen every day and approximately over 300 million transactions have occurred till 2017. Starting August 1, 2017, bitcoin split into two derivatives - classic bitcoin (BTC) and hard fork bitcoin cash (BCH) (Maurer et al. 2013; Eyal, and Sirer, 2014).

III. Methodology

The study focuses on exploring the impact of bitcoin in our day to day life. To understand the role of bitcoin in daily life, the researchers conducted a literature review of scholar articles. The literature review methodology was based on the Tranfield approach (Tranfield et al. 2003). The review consists of three phases, where in phase one, the articles were chosen from databases such as IEEE, Springer, Science Direct, and Taylor and Francis. Next, an article search was carried out using multiple keywords like Bitcoin, Cryptocurrency, Digital coin, Digital Currency, Cyber currency, and Block Chain in combination, dating from January 2009 till July 2018.

In the second phase, the articles were meticulously reviewed by the researchers to understand the principles of bitcoin. Due to the myriad articles found in the article search, the author filtered the search content through inclusion criteria such as ‘articles published in English language only’, followed by review of the title and abstract. Further, the articles were evaluated by the concepts reported in the pieces of literature to avoid duplication.

The third phase involved finalizing the articles for review. The researchers proposed the following research question (RQ):

A. What is bitcoin and how it has been reported in the literature?

Keeping the RQ in mind, the researchers focused on referring to the seminal articles to ensure the validity of information. The review yielded a bundle of information on bitcoin in the form of technology, utility, banking policy, etc. However, the researchers were motivated to report the normative perspective of bitcoin. Therefore, they focused on addressing the common attributes of bitcoin such as need, working concept, prerequisites, and day to day implications. A detailed analysis of these attributes was made and this is discussed in the following sections.

IV. Need for Bitcoins

The Internet has become a widely used platform for all business-related work, leading to the emergence of commerce on the internet or e-commerce. -Ecommerce relies exclusively on financial institutions serving as third parties to process payments via the internet (Simser, 2015). This system works well for almost all the transactions, but it still follows the trust-based model for the transaction, which is a weakness of traditional electronic payment and non-reversible transactions are not possible. Since financial institutions cannot avoid mediating disputes, this increases the service charge for all the financial transactions (Folkinshteyn and Lennon, 2016; Dallyn, 2017). The disadvantages of the traditional banking system such as lack of transparency, high costs due to bank fee, and high risk of manipulation. Thus, there arose the need for more efficient and transparent system (Nakamoto, 2009).

V. How Bitcoin Works

Bitcoin is more than like a mobile app for common users in that it provides users with a personal wallet called the bitcoin wallet. People use bitcoin for political and philosophical reasons. Payments are done through the bitcoin network using the bitcoins issued by the network (Grinberg, 2012). The data of all transactions are validated with a proof of work system and then updated in a public ledger called blockchain, which is maintained by the bitcoin network. This blockchain is visible to all clients (users of bitcoin are called as a clients), but their identity will not be available (Grinberg, 2012).

Clients using bitcoin should first acquire a bitcoin wallet and one or more bitcoin addresses. A bitcoin address is like an email address and required to send or receive bitcoin. Any client, regardless of nation, region, and location can transfer bitcoin. It is claimed that bitcoin is the first global currency which does not discriminate against users based on citizenship

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or region. It is easy to use and secure. However, the low usage fees of bitcoin have been misused to buy illegal items. Moreover, it is easy to steal bitcoins from a user's wallet. A person can own an unbounded number of addresses for the transaction (these addresses are characterized by a public/private key). The transaction in a bitcoin network is a generalized transaction process that happens in the bank. It allows multiple sending addresses and multiple receiving addresses in the same transaction. It will specifically note down how many bitcoins are taken from the sending address and how many are credited to the receiving address, regardless of the identity of the sender or receiver. All the records will be available in the blockchain; Blockchain is a major part of Bitcoin (Ron & Shamir, 2012).

A. *BlockChain*

The blockchain is a publicly distributed and decentralized form of the ledger that keeps track of all transaction data securely using cryptography. Each block in the chain is time-stamped and synchronized, thus creating a non-redundant ledger constantly updated and hoisted across millions of computers. Blockchain, the underlying technology of cryptocurrencies, eliminates any ambiguity regarding transactions. Every transaction will be updated in the blockchain database along with the information regarding the payer and the payee. There is no delay between payment and settlements, as payment itself is the settlement when it comes to blockchain technology (Karame et al. 2012; Androulaki et al. 2013)

Blockchain was first conceptualized in 2008 after the 2007-08 financial crisis. Satoshi Nakamoto, an anonymous author in his paper Bitcoin, devised it: A Peer-to-Peer Electronic Cash System, Blockchain has been kept alive since then and grew to 130 Gigabytes of data as of October 2017. How does Blockchain works and why is it secure? For any transaction to take place, the transaction requests need to be validated and approved by checking with previous transactions in the blockchain. Once approved the transaction takes place. Every 10 minutes, transaction data is created in the form of a data block and added to the blockchain. Each block has a hash pointer that links it to the previous block which is again linked to a chain of blocks, thus making up an infinite ledger with the entire history of transactions (Nakamoto, 2008). Therefore, hacking into blockchain to duplicate currency would require anyone to hack a particular block and all preceding blocks linked to it, all heavily encrypted and spread across millions of computers worldwide. Currently, this is considered a challenge. However as the technology evolves, the future of things may change (Valfells and Egilsson, 2016).

Although blockchain is deemed one of the most secure technologies to handle new age currency. The possibility of a powerful decryption tool with the capability to hack into millions of computers cannot be overlooked. The fluctuating value of bitcoin, along with its questionable security, can explain why it is not the most popular currency yet.

B. *Double spending*

One of the benefits of bitcoin is that peers can double spend the bitcoin. Tricking blockchain is possible and also spending the same bitcoin twice, an action known as double spending. Double spending can be done in a number of ways. If the merchant does not wait for the confirmation of the transaction, bitcoins can be double spent by attackers. (Karame et al. 2012; Heston, 2018).

C. *Bitcoin Wallets*

A Bitcoin wallet is a software program that allows each user to store bitcoins. A user must have his own bitcoin wallet to take part in any transaction. Wallets do not actually store bitcoins, but are instead only their formats generally; wallets will contain a public key that is used to receive funds (Barber et al. 2012; Hurlburt, and Bojanova, 2014).

VI. Storing Bitcoin Offline

Usually, bitcoins wallets are stored digitally or online, and there are many secure ways to store the bitcoin. One way is to store bitcoin as a paper wallet. A paper wallet is a piece of paper in which both public key and the private key are printed and can be stored as paper. The other way to store bitcoin is using a hardware wallet. Here, the key information is stored in offline hardware. The hardware wallet is more secure as the key data is stored in the protected area of microcontroller; it is also immune to viruses and software that can steal the wallet information. Unlike the paper wallet, the bitcoin stored in the hardware wallet can be used directly, while in the case of the paper wallet, the information needs to be keyed in or imported to software (Yeoh, 2017). One of the main challenges faced by bitcoin is security. In October 2013, online bitcoin wallet services were hacked twice and 4100 bitcoins worth $1.2 billion was stolen from a firm via social engineering. The hackers gained access through the cloud-hosted services of the firm (Mcmillian, 2013).

VII. Benefits of Bitcoin

Bitcoin protocol is not about sending money from point A to B. It has many features and possibilities, opening up a new field of research. The most exciting use of bitcoin is still being explored. However, it has transformed into actual products and services.

A. *Control against fraud*

Bitcoin now comes with an unprecedented level of security. The network provides consumers protection against the most prevalent frauds, such as a chargeback or unwanted fee, and makes duplicating bitcoin difficult (Androulaki et al. 2013). Users can backup and encrypt their wallet, preventing money loss. Moreover, Bitcoin is designed to enable user's full control over their money.

B. *Global Reach*

All payments in the business can be completely interoperable. Bitcoin allows any bank, firm or individual to securely transfer and receive payments anywhere at any time,

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with or without a bank account (Grinberg, 2012; Vergne and Swain, 2017). Moreover, Bitcoin can be used in countries were conventional banks remain out of reach. Bitcoin increases global access, and can help international trade to grow.

C. Cost Efficiency

Cryptography enables secure payments and avoids slow and costly intermediaries. In addition, Bitcoin transactions are cheaper and faster than the conventional alternatives (Walch, 2015). Therefore, Bitcoin holds the potential to become a standard for currency transfer in the future. Further, Bitcoin could reduce the transaction and service fees on payments for the working class.

D. Tips and donations

Bitcoin can be a practical solution for tips and donations in many cases. The payment can be sent with a click and received through a QR code (Grinberg, 2012). Further, the donations can be visible to the public, creating transparency for non-profit organizations. In the event of crises such as natural calamities, Bitcoin could contribute to allowing donations to be made in a faster manner across the globe (Walch, 2015).

E. Crowdfunding

Bitcoin can be a kickstarter in crowdfunding campaigns, where the money that individuals intend to donate for a project taken from them only if adequate pledges are received to reach the target (Simser, 2015). Such contracts can be monitored through Bitcoin protocol, which restricts a transaction from happening until all the requirements have been met (Yeoh, 2017).

F. Micropayments

Imagine listening to Internet radio paid by the second and viewing web pages without ads for a small fee. Besides, buying internet bandwidth from the Wi-Fi hotspot as per requirement. Bitcoin can make all these ideas possible (Vergne and Swain, 2017).

G. Multi-Signature Accounts

Multiple signatures permit a transaction to be allowed by the network only if a specific and fixed group of people authorize the business transaction (Yeoh, 2017). Further, the board of directors could use bitcoin to prevent members from overspending the funds from their treasury without other members' approval. Moreover, banks theft could be avoided by blocking payments above the threshold value (Simser, 2015).

H. Trust and Integrity

Bitcoin provides a solution to the trust problems that affect the banks. Bitcoin paves the way for selective accounting transparency, irreversible transactions, and digital contracts (Barber et al. 2012; Vergne and Swain, 2017). Further, Bitcoin can be used as a platform to restore trust and agreement in banking operations.

I. Resilience and Decentralization

The high degree of decentralization in bitcoin creates a different form of payment system with an increased level of flexibility and redundancy. Bitcoin can manage millions of dollars in trading with less protection. With no central point of access to a data center, attacking the network is a difficult task. Bitcoin could secure the local and global financial system (Simser, 2015).

J. Automated Solutions

Usually, automated services have to deal with cost limitations in cash and credit card payments. Bitcoin can be used in electronic services for cutting operating costs. Imagine a store where your basket allows you to pay for your purchases without waiting in the queue (Vergne and Swain, 2017).

VIII. Managerial Implications of Bitcoin

A. Transaction Secrecy

Currency that gets into the transaction is the sole redemption of engaging persons in the chain. The sender and the receiver in the chain do not have to reveal their identity to anyone in the link. Only the private key is used to transfer amounts in the network chain. Any authorized person may have the access to the sender and the receiver, but without the access key it is virtually impossible for any third party to oversee the transaction parties in the chained network. Moreover, in case of any suspicious transaction activities can be traced and flagged as shown in Fig. 1.

B. High Alert

Once the authorized loop chain for the bitcoin transaction is linked with the larger hubs, the private key which is unique for each transaction is generated from the sender side. The key generated is used for all the transactions until the chain reaches its receiver. The private key on the receiver end must release the access to the sender transaction or else the sender will immediately halt the process with his authorized key. Once the double chain process stops or is halted due to any miscellaneous action by both the parties or by any other third party, the system chain and the encrypted key generated will be replaced with a new key. Thus the sender and receiver can always keep a watch over their online transaction.

C. Smart Key Authentication

In addition to the private key for transaction, the sender or any party conducting bulk transactions can get a smart key which is available on a conditional usage basis. The particular authenticated transaction will have to go through two authentications and keying by the receiver as well. To monitor the process of transaction at any given time, the sender needs to verify the smart key. At the same time, the receiver might get notified with an alert security check from the chain network hub data centre.

D. Bank-Customer Integrity

Managing customer transactions would be a tedious task for

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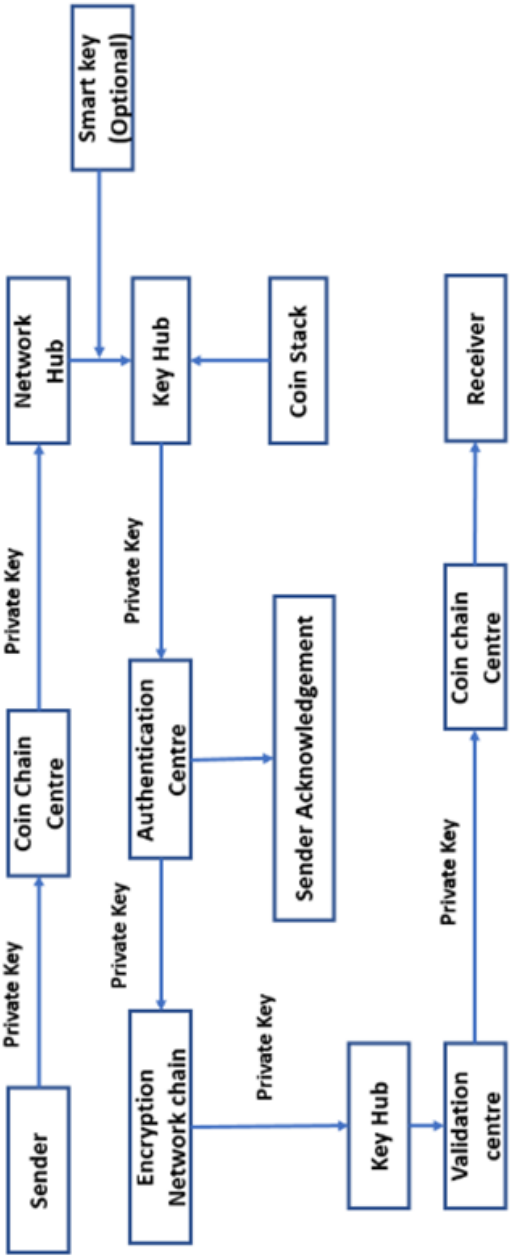

Fig. 1. Bitcoin Transactions among peers

banks unless they get the private key data from the customer. However, no third party banking unit has the rights to check the customer secret key without proper authentication from the stack holder. The encryption during the transaction is mandatorily done in the banking systems which are highly confidential and requires customer authentications.

E. End-End Money Transfer

Since every transaction in the system is purely open window and point-point (P-P), there is no third party in the chain. Once the key is loaded in the prescribed database, the sender leaves the shelf to the chained network system and the chain leads directly to the receiver. At the receiver end, the key for authenticated access makes the wallet available for delivery.

IX. Challenges of Bitcoin

Though every educated/corporate individual is familiar with the term Bitcoin, many do not clearly understand the concept and its functions. The idea of cryptocurrency is a novel one, and its learning is now limited due to different usages in the day-to-day life. Bitcoin is just one of the cryptocurrencies in the world, but the most familiar one around. (Simser, 2015). Many identify it as a digital currency, but its functionality is undefined to the majority of people. To make it practical to use Bitcoin, this is the first challenge that needs to be overcome. In the 1990s, studying the simple computer programming languages was so classed that it was entirely apart from the curriculum. Now, students start learning the programming language right from high school, and they are familiar with the matter. Likewise, an age would come, where cryptocurrencies would be determined (mining and other functionalities) so that their application is globalized.

The traditional banking system is the biggest challenge the Bitcoin has to overcome. The conventional banking system, as we know, works by imparting services and charges a service fee for that. Bitcoin does not do that, and this could destroy the Banking sector. But it would create a new mode of handling currency. This is evident in the latest ban on Bitcoin in China. The Bank of China had banned Bitcoin in September 2017 which had a significant impact on the cryptocurrency. The value of Bitcoin which was more than $5000 came down to $1000 due to this even though the banning it in one nation does not affect the overall working of the cryptocurrency. Nevertheless, there is a need to understand the concept and recognize the potential upsides of bitcoin over the traditional banking sector (Greebel et al., 2015).

X. Conclusion

The study conducted a review of scholarly articles to report the impact of bitcoin and to understand its role in our day to day life. Based on the review, this article attempted to provide a normative perspective of the bitcoin. The study discussed how the need for bitcoin arose, and the requirements for the functioning of bitcoin as well as its implications and challenges. To answer the RQ, various attributes of bitcoin have been reported from the literature. Further, the study focused on providing a normative perspective of bitcoin. Therefore the author may not have reviewed some scholarly articles. The main limitation of bitcoin is that it is vulnerable to quantum computing. However, quantum computers and graphene processors are not yet available and will probably take a while to develop. However, once quantum computing is developed, cryptocurrencies would be under imminent threat (Walch, 2015; Valfells and Egilsson, 2016). Therefore, the developers and Bitcoin users have to review bitcoin adoption for business practices. Conservative economists are already opposing cryptocurrencies, arguing that terrorist organizations and criminal groups (Reynolds and Irwin, 2017) mine and misuse the mode. From the study, it is evident that bitcoin offers a host of opportunities and researcher can focus on

exploring these and developing a policy for bitcoin usage in operations such as healthcare, educational institutions, worldwide travel and tourism, and global logistics.

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