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**AN EXPLORATORY STUDY ON THE ‘DIGI RUPEE’ CONCERNING ITS  
ADVANTAGES AND DISADVANTAGES, AS WELL AS A VIABLE  
ALTERNATIVE TO CRYPTO CURRENCY**

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**ABSTRACT**

The paper researches the path to be followed for the adoption of a statutory digital currency with the same secure technology that is the basis for the rising demand for cryptocurrencies. Cryptocurrencies have their serious disadvantages, which to some extent, would be addressed by the Digi Rupee. The government too would have control over the ‘Digi Rupee’ and the type of activities in which these currencies are being used. There are still certain basic problems which this currency faces and would need to address.

**Keywords:** Digi Rupee, Cryptocurrency, Blockchain Technology, Legal Tender, Bitcoin

**Research Question:** An attempt will be made to understand the origins of cryptocurrency and its technology, the foundation being the blockchain technique. Besides this, the issues that crop up during the trading of this type of currency will be examined in detail with special reference to how most governments of the world treat it. ‘Digi Rupee’ as an alternative to cryptocurrency will be critically analysed, understanding in detail the advantages and disadvantages of the above.

**1. Introduction**

Cryptocurrency is a digital currency which is a viable alternative to paper money, as far as the users are concerned, and it is a form of payment that is created by using encryption algorithms. The above indicates that the technology behind cryptocurrencies functions both in the virtual accounting system and as a medium of exchange.

**Fig 1: Images of cryptocurrency**



Source: Google Images

The basic idea of crypto being called a currency indicates that it has followed the basic tenets that exist in the legal tender used in the real world. These are :

- Medium of exchange
- Store of value
- Unit of account
- Deferred payment
- Divisibility
- Liquidity

**Fig 2: Images of Currencies of Different Countries**



Source: Google Images

The underlying technical system upon which cryptocurrencies are based was created by Satoshi

Nakamoto. Satoshi Nakamoto may be a fictitious name for a group or a single individual. Bitcoin was the first known cryptocurrency. Bitcoins as currency ensured safety and integrity. The use of ledgers in such currencies was based on blockchain technology. This was maintained by 'miners'. The emphasis was on the safety aspect of this technology in the development of the newly emerging currency. The basic idea was the importance given to security. More than the currency, it was the use of blockchain which was most appealing to the masses.

The reason why this currency was developed was to avoid the unnecessary exclusivity that came with the existing forms of currency. The present system of currency in use has developed phenomenally over the centuries in addressing the lacuna that existed in earlier forms. The issue about the safety aspect of the transactions is yet to be addressed.

The use of blockchain in cryptocurrencies like Bitcoin, Ethereum, XRP, et cetera, has the additional features of complete security in their transaction, despite not earning the status of legal tender.

## **2. Definition**

To understand the working of the Digi Rupee, it is necessary to delve into the reason behind its inception. Before cryptocurrency became an important player in the world scene, the only type of currency in circulation was paper currency. There were inventions on paper currency such that they could not be counterfeited. Slowly, plastic paper currency was developed which could neither be damaged, nor replicated. To ensure the security and authenticity of the currency, there were various types of security watermarks which were incorporated in the printing of the currency. This was a legal tender and could only be issued by the central bank of a country, essentially meaning that it was backed by the government and was minted only when there were enough assets with the government. Bringing this currency into circulation without the required assets would lead to an excess supply of currency in the economy and be likely to cause inflation.

### **2.1 Cryptocurrency**

Satoshi Nakamoto was the first to develop the concept of cryptocurrency and the first cryptocurrency - 'Bitcoin'. This is a virtual currency using cryptographic principles and has been conceived by the blockchain and proof of work (PoW) mechanism in a distributed and decentralised environment. It was developed between mid-2008 and early 2009. Before that, there were concepts called 'Bit Gold' and 'B-Money' which were independently invented and distributed digital money schemes prevalent in the late 1990s. But the mining of Bitcoin is different from that of Bit Gold. The difference is that the Bitcoin address is a single-use identifier for each transaction, although the same address can be used multiple times. Some people say

Szabo is a crypto pioneer and the person behind ideas like Bit Gold. Nakamoto had envisioned that Bitcoin would be a token transaction that would be adopted by the world to hedge against inflation. The difference between Bitcoin and the currency that we use is that the latter is legal tender and is accepted by the Central Bank and well as the government, while Bitcoin is decentralised and has no statutory backing.

**Fig 3: Image of Bitcoin and its Possible Developer**



Source: Google Images

Bitcoin development used the proof-of-work (PoW) model and the use of mining blocks on the blockchain. This led to the discovery of the Ethereum blockchain which became the world's second-biggest cryptocurrency. The others that have been developed are Binance Coin, Tether, Solana, etc.

**Fig 4: Examples of Cryptocurrencies**



Source: Google Images

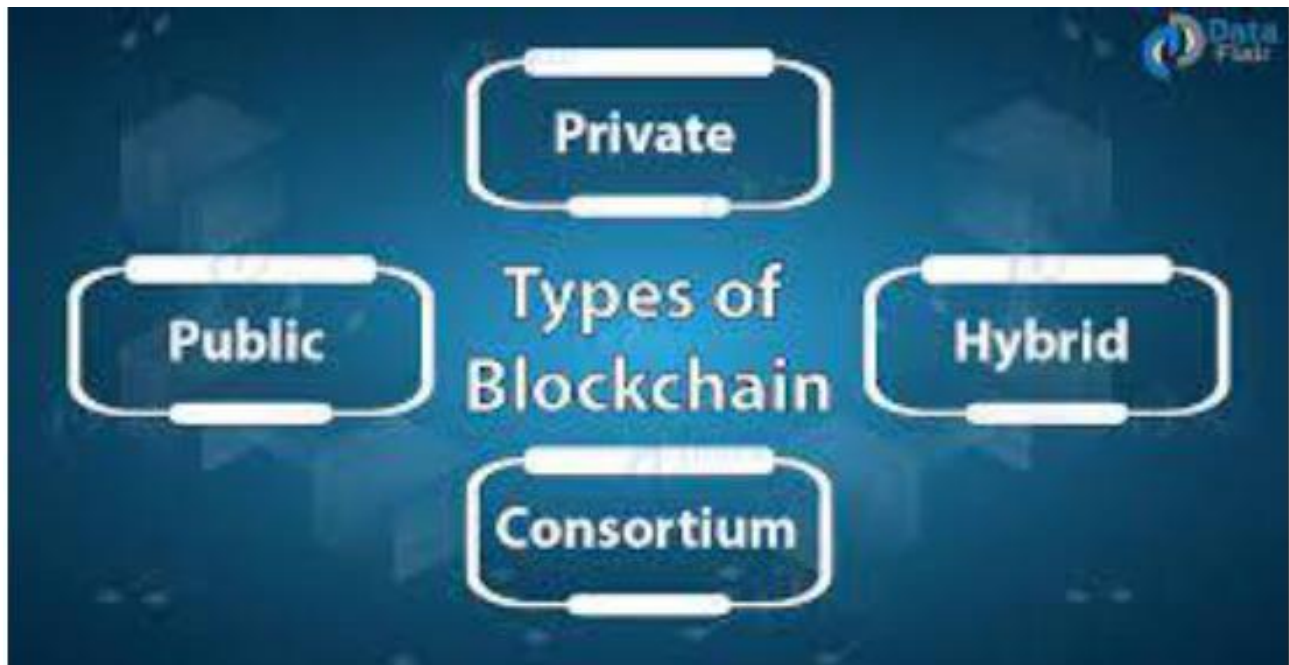
These currencies use encryption algorithms implying that they function as currency as well as a virtual accounting system. They also perform the functions of utility payment, security and stability as a currency, and various safety measures through cryptography codes which are locked using a public cryptographic system, where the owner has a private key.

They are digital currencies designed to work as a medium of exchange through a computer network and are not dependent on any central authority like the government or a bank. It is extremely difficult to counterfeit or double-spend the currency. This leads to cheaper and faster money transfers. The security of such currency entries is based on the elliptical curve encryption, public-private key pairs as well as hashing functions.

## 2.2 Blockchain

Blockchain technology is an advanced data-based mechanism that allows transparent information sharing within a business network. There are four main types of blockchain networks: public, private, consortium, and hybrid.

**Fig 5: Types of Blockchain Networks**



Source: Google Images

The purpose of blockchain is to share information amongst all parties that access it via an

application. This word is used as a broad term and is based on cryptographic hash functions. The first widespread implementation of a blockchain was the Bitcoin cryptocurrency, adequately resolving the double-spending problem of virtual currency. This means that the value was represented in a virtual currency, which prevents it from being used multiple times.

For the background of digital cash, the primary work was done by Chaum, while Lamport proposed the fault-tolerant signature. Chaum initiated the use of public keys, and smart contracts were proposed by Szabo. After Bitcoin, the most popular currency has been Ethereum, also known as 'Ether'.

### **2.3 Working of Blockchain**

This chain consists of a set of protected information blocks which are chained sequentially to one another. They form an 'immutable ledger' which is distributed over 'participating nodes'. These nodes are the computing platforms that interact with the final user. The main purpose of this is that information is shared among all parties via an excess, which is an application. Access to the ledger could be either restricted or unrestricted. If it is restricted, it is known as commissioned, and if unrestricted, it is known as commissionless. The main security of this technology is that the information is protected from any alteration or modification. Any person who is attempting to do either of these stated transactions is immediately detected. That is why one says that the moment information is recorded in a blockchain, it is permanent. The advantage of this technology is that one cannot tamper with existing information.

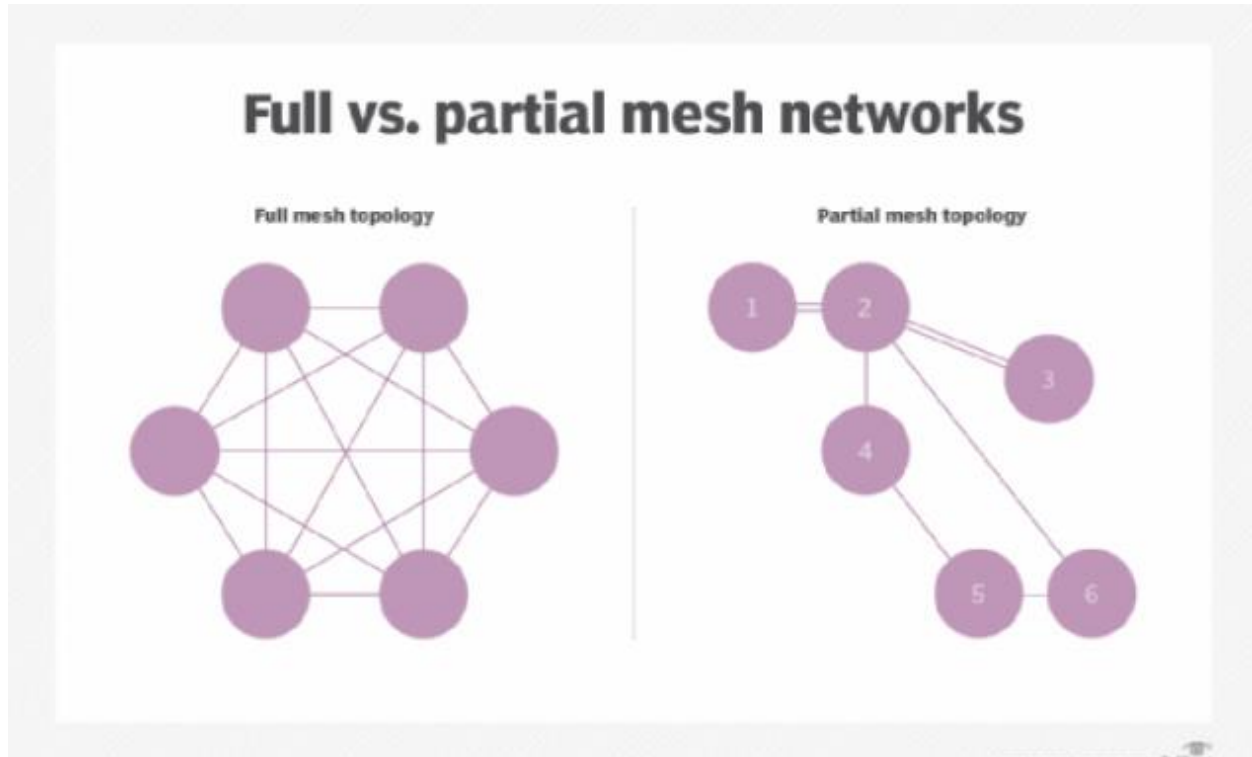
The main building blocks of a blockchain system are the data structures (that is the blockchain). There are 2 types of nodes -

- Full function nodes
- Partial nodes

Each full-function node has a complete copy of the blockchain. It executes transactions and contributes to extending the chain. These nodes are equivalent in terms of functionality and are connected in a peer-to-peer network. There is no such thing as a hierarchy - all nodes can communicate with each other.

On the other hand, a partial node is also connected to the network in a peer-to-peer fashion, but it does not contain a full copy of the blockchain and therefore needs the services of a full-function node to execute transactions and it cannot extend the chain.

**Fig 6: Full Function Nodes and Partial Function Nodes**



Source: Google Images

The blockchain starts from a genesis block and the new blocks are then added periodically. Each block records whatever transaction has been executed. The nodes are the ones which collaborate to connect these dots. They create a ledger that cannot change the backward blocks. If at any one point in time, it is required to be altered, then there needs to be a redoing of ‘proof of work’ (PoW).

Each block in a blockchain has a block number as well as a timestamp in the manner in which it is added to the blockchain and every block is connected to the previous block through hashing. It is this hashing which gives each block a unique number that is equivalent to a digital signature. The steps through which a blockchain transaction functions are

1. The trade or transaction is recorded.
2. This trade is checked for validity.
3. Each transaction is verified and if accepted as real, is added to a block.

4. Once the block is complete, and blocks can contain many transactions, it is then added to the chain.

Ethereum is a software platform which houses the ether (the cryptocurrency). This system of recording information is extremely difficult to change, hack or cheat. The five primary layers of blockchain are - the hardware infrastructure layer, data layer, network layer, consensus layer, and application layer.

**Fig 7: Five Primary Layers of Blockchain**



Source: Google Images

### **3. ADVANTAGES AND DISADVANTAGES**

There are various issues, both positive and negative, in the use of this type of system of hardware and software. Besides attempting to be an alternative to the legal tender which is issued by various governments, the technology itself has immense potential.

#### **3.1 Cryptocurrency**

As cryptocurrency is a type of virtual/digital currency and is secured by cryptographic systems (essentially from where the word 'crypto' comes from). Along with this, there are encrypted algorithms that secure these records such as hashing functions, elliptical curve encryption and public-private key pairs. The essential information for the public is that these currencies are not endorsed by the government. They are, hence, completely beyond the scope of any government



intervention. They are also decentralised, making them the fastest and cheapest way to transfer money. The disadvantage is that it is likely to be used for criminal activities (drug peddling, money laundering, terrorism, etc.) which are not possible to detect. By using this technology, money can be transferred without any involvement of banks and financial institutions. Besides this, several investors feel that cryptocurrency offers protection against inflation. This is possible because the number of a particular cryptocurrency, say Bitcoin, is limited. The growth of money supply (legal tender by the government) increases and overtakes the growth in the supply of Bitcoins, the price of Bitcoin increases and thus is hedged against inflation. This is true for all other cryptocurrencies as well. Along with this, it is possible that with an increase in demand, the value of these currencies increases and it may match the inflation levels in the economy.

Besides the above, the transaction speed is a mere few minutes. The transaction cost associated is minimum. It does not require the need for third parties, like VISA, to confirm transactions. The currency is free from any government control. Investors of cryptocurrency proclaim to have generated huge profits through dealing with this type of currency. There is greater accessibility - an investor just needs a laptop or mobile device and an active internet connection as there is no identification, credit check, or background check required. This system is safe, secure and transparent. It is also completely private as the investor has an identification and a wallet address, which is completely personal. Traders can purchase cryptocurrency by using dollars, rupees, or even euros. One can convert regular legal currency into cryptocurrency extremely easily.

The disadvantages are that though investors are anonymous and people use pseudonyms, they do leave a digital footprint which investigative agencies can decode. It is also possible that a minor or a group of them get control of more than 51% of the network mining hash rate in which case it is a risk of a '51%' attack.

As the blockchains work through PoW consensus which requires powerful computers, it requires excessive power consumption which harms the environment. The 'no refund' or cancellation policy is also a major drawback of the system.

### **3.1 Blockchain**

The main advantage of blockchain technology, also called distributed ledger technology, is that it is essentially tamper-proof. It is a set of protocols designed amongst different parties who do not trust each other but work together to achieve different purposes that benefit the whole group.

This is an open-access platform for anyone who wants to participate in the contribution of blockchain technology. It is used to store information in a decentralised manner so that everyone can verify the accuracy of the information by using zero-knowledge proof. The record or

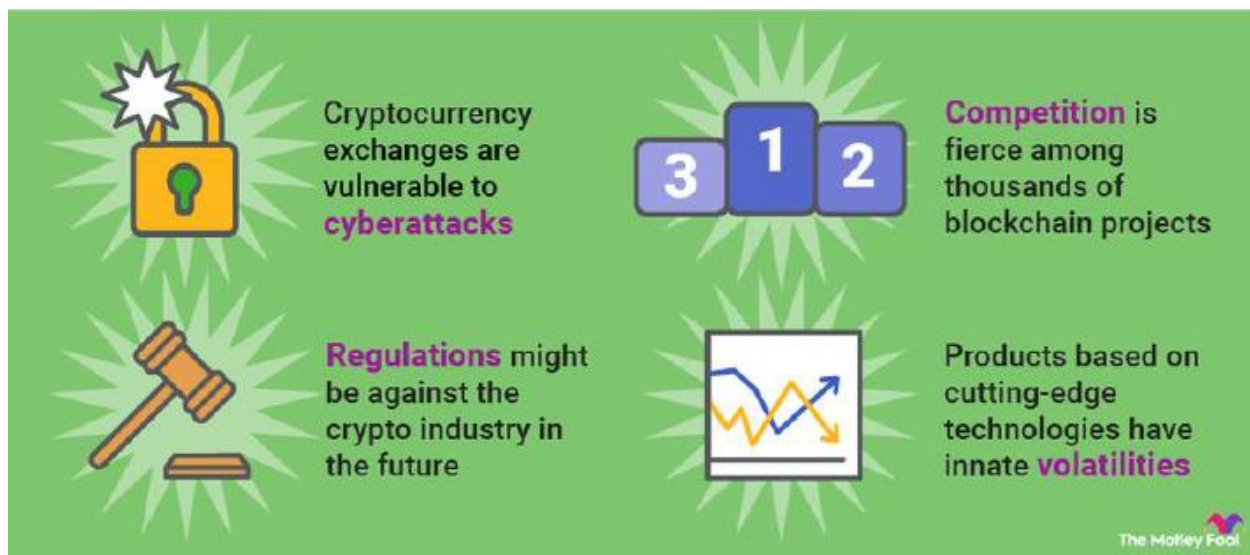
information in this technology is permanent. It is free from censorship, has tighter security, is transparent, efficient, cannot be tampered with and reduces cost.

The disadvantages are that the block cannot be scaled up or down. There is a severe lack of confidence as it is a comparatively new concept. It is energy-consuming and time-consuming, and most governments are attempting to regulate these currencies.

#### **4. Digi Rupee As A Viable Alternative To The Existing Set Of Cryptocurrencies**

Given the fact that any type of cryptocurrency is not a viable option for any government or central bank in the world as it has been used for nefarious activities that are beyond the radar of governments. These activities can lead to strife, disharmony, and disaster for the environment.

**Fig 8: Disadvantages of Cryptocurrency**



Source: Google Images

Due to the above issues, various countries have come up with alternative legal tenders. They follow blockchain technology but the resultant currency is legal, traceable, completely secure and inherits all the advantages of legal tender. The security aspect which this technology has shown is the one which would be inherited with similar types of currencies that are allowed by the central bank of a country and the government.

None of the governments doubts the technology behind cryptocurrency. This technology is so secure and safe that it is now being widely used by FinTech companies as well as insurance, health, etc.

Introduction of the Digi Rupee works in the following fashion. The Digi Rupee, or E-Rupee or eINR or e₹, is a tokenised digital version which is to be issued by the Reserve Bank of India (RBI), as a Central Bank Digital Currency (CBDC). It was proposed in January 2017 and the pilot was launched on 1st December 2022.

The first phase includes four banks - State Bank of India, ICICI Bank, YES Bank, IDFC First Bank - and subsequently, four other banks have joined - Bank of Baroda, Union Bank of India, HDFC Bank and Kotak Mahindra Bank.

**Fig 9: Digi Rupee**



Source: Google Images

The retail CBDC is available for only 50,000 users presently, out of which 5,000 are merchants. It is being offered on an invitation basis by 8 banks across 5 cities. The RBI is taking its time in the introduction of this currency as it favours a slow and steady adoption. The problem is that the CBDC is limited to the settlement of :

- I. Secondary market
- II. Transactions in Government Securities

This currency is expected to make the inter-bank market more efficient and settlements in the eRupee can reduce transaction costs dramatically by pre-empting the need for settlement guarantee infrastructure (it is an obligation based on trade and securities involved whereas

members are expected to maintain adequate balances in this account which are important for outstanding trade exposures and for members in settling their fund obligations) or even for collateral to reduce settlement risk. This is maintained with the RBI.

The e₹-W (Digi Rupee Wallet) is expected to make the interbank market more efficient. The basic function of the digital rupee is that it mimics the characteristics of banknotes and coins. It can be used for transactions legally and one does not need a bank account, the money can be stored in the digital wallet. People will gain with this type of currency and the risk is going to be minimal.

### **5. Advantages And Challenges Involved In The Digi Rupee**

The advantages of this currency are that it facilitates the seamless transfer of value and reduces transaction costs substantially. They accelerate financial transactions. As it is backed by the blockchain and other such advanced technologies, as well as attaining the status of legal tender, it gets the label of 'legitimacy' which essentially translates into security. This would hopefully prevent counterfeiting of the currency and help the government in its war against black money and corruption. The Digi Rupee has become another monetary instrument that the Central Bank of the country can target in its endeavour to achieve its policy goal. It would also reduce the need for card networks and payment gateways. Compared to the cryptocurrencies which are not backed by the Central Bank, this would have less volatility.

The challenge in the adoption of the Digi Rupee is that it could be a threat to financial stability as more and more people shift towards this system of currency. This could lead to an erosion in deposits, resulting in instability of the financial sector.

A huge shift to this type of currency is unlikely at present as a large proportion of retail transactions are already occurring digitally. There is a possibility of cyber security threats which may occur if the use of this currency increases. There are fears that a larger adoption of such a currency could lose the privacy aspect which exists in the conventional type of currency. Besides all of the above, there would be additional operational issues in the implementation of KYC (Know Your Customer) norms.

### **6. Conclusion**

The advent of the Digi Rupee is going to change the monetary scenario in the domestic economy, and pose strong competition to cryptocurrency. The additional advantage is that it is backed by the government and thus presents a comparatively secure alternative. The government is very keen to control the increasing spread of crypto as it is mostly being used for illegal and speculative activities. The fact that cryptocurrencies are backed by a very strong and secure

technology makes it an attractive proposition. But if the same technology is adopted by the government with full legitimacy, it is widely accepted that people would move to the use of the Digi Rupee rather than sticking to the uncertainty of other cryptocurrencies without any statutory backing. But there are disadvantages in the adoption of this currency as it is liable to cyber security threats. Thus, additional measures would need to be taken on a continuous basis to maintain optimal security.

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