

# Opportunities and Challenges of Cryptocurrency as an Alternative Payment Option: Indian Construction Industry Perspective

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**Abstract** Forecasting or exploring the alternative options in any industry for progressively improving previous practice, to be unique, to realistically achieve tangible benefits will certainly help to be better in the key industry. Alternative options convenient and emerging in the industry has some pros and cons, having some background research on it and exploring can benefit the industry to move forward. Payment practices in the construction industry have witnessed a drastic change from bartering/cash to the bank transfer system. The trend of cryptocurrency usage in the market has emerged a few years back, and its considerable expansion in the other markets has been witnessed and heard globally. This empirical study is carried out to carefully explore the opportunities and challenges of cryptocurrency as an alternative payment option: Indian construction perspective. The study consists of a literature review to find the research gap, basic discussion on the cryptocurrency with a brief case study from the informative articles published, the questionnaire survey was floated among the construction industry professionals to get their insights on the topic stated such as current payment practices in the construction industry, awareness, the construction industry-related challenges and opportunities are covered concerning cryptocurrency as an alternative payment option. This study will be valuable for learning graduates, construction professionals looking for alternative payment options, blockchain technology adoption, challenges, and opportunities of cryptocurrency.

**Keywords** Cryptocurrency, Construction Project, Blockchain

## 1. Introduction

Human history has witnessed the evolution of currency from barter to digital payments. Acquiring resources required a standard mode of transaction like “medium of exchange, measurement unit, wealth security” [1] to trade goods and services. The medium of an exchange witnessed is bartering system, metallic money, paper money, credit money, mobile payment mode, virtual currency [2].

The business activity in the construction industry involves billions of transactions over a period based on the construction project timeline. The construction project deals with many stakeholders that offer goods and services to the employer to develop a unique structure during this course of time the medium of exchange deals from lakhs to billions in rupees. *We have come across a common way of payment to the employee from the employer through bank transactions which might be* Net banking services such as real-time gross settlement (RTGS), National electronic fund transfer (NEFT), Immediate payment service (IMPS), Cheque’s

mode, cash. During the transaction, the employer/contractor faces a few issues from the bank, higher transaction fee, security, frauded transaction, a transaction failure, unethical activity, fraud records. To tackle the issue as much as possible there is an opportunity to go with the other medium of exchange called Cryptocurrency as an alternative payment option.

**Table 1.** Medium of exchange

Medium of exchange	Description
Bartering system	Exchange of goods to goods
Metallic	Coins-gold, silver, metal-stainless steel
Paper	Notes
Credit	Cheque
Plastic	Debit card, Credit card
Online e-transaction	Net banking: National electronic fund transfer (NEFT), Real-time gross settlement (RTGS), Immediate payment service (IMPS).
Mobile wallet and Bank transfer interference (Know Your Customer [KYC])	Paytm, PhonePe, Google pay, Amazon pay
Virtual currency	Cryptocurrency: Bitcoin, Ethereum, Tether.

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Cryptocurrency remains a medium of exchange virtually / digital currency which is encrypted by cryptography based on the blockchain technology to record the transaction which makes a secured payment platform. *The cryptocurrency is unissued by the central authority, resistant to any government interference, manipulation* [3]. People around the world have started investing in cryptocurrency. Since 2009 Bitcoin emerged as the first cryptocurrency and utilised as a medium of exchange for buying/selling, the transaction for the goods/services in some parts of the countries like India, Japan, the US, Nigeria, Germany, Canada, Philippines, France, Australia, Peru, Singapore which is legal and with some added conditions like taxable, regulations [4]. The increase in the trend of cryptocurrency and acceptance can be a way forward to adopt this change. With the note mentioned earlier the usage of cryptocurrency in some countries considering the Indian construction industry where the cryptocurrency can be a way of alternative payment option for the employer, employee, customers where the Indian government is in the mission of adopting ‘digital India’ which provides an opportunity to adopt cryptocurrency.

With the Indian construction industry context, the paper tries to understand the cryptocurrency and its market in India: People’s viewpoint, human perception/psychology and its factor, few minor case studies, to discuss the current payment practices in the construction industry, to analyse the challenges and opportunities of using cryptocurrency as a payment option in the construction industry.

The structure of the paper consists of, section two literature review, section three discussion, section four methodology, section five data collection, section six results and discussion, section seven conclusion.

## 2. Literature Review

The literature review of the paper is carried out to accomplish the objectives stated and to understand the amount of study that happened on cryptocurrency which is relevant to the study. The descriptive review method is used for the study. A total number of seven papers are reviewed. The reviews are limited to the papers approached if the number of paper reviews is increased the more aspects can be found out but for the study, we have considered seven literature papers.

[5] described the cryptocurrency as a new venue for investment like gold. The paper was all about cryptocurrency in the Indian economy and educating the public through the “Digital assets and Blockchain foundation”. The paper concluded with a note stating that cryptocurrency is an opportunity for investors, great technology, and tool. Indian cryptocurrency users are growing, and there is a future hope in it. [7] explained, the cryptocurrency ‘Bitcoin’ as a reference and its challenges, opportunities in India. The research methodology of the paper is totally on secondary data references. The paper concluded with the note stating that cryptocurrency can fetch revenues, boost companies’

growth, alternative payment methods for financial transactions, opportunities to e-business.

[8] explained the history of ‘Bitcoin’ and its characteristics like transaction fee, payment time, risk, decentralized and its mining information, application of bitcoin and its users in the businesses. Also explained about the blockchain technology where the banks are showing interest in it and exploring. The research methodology is based on the secondary data reference. The paper concluded with a note stating the internet era, e-platforms and new technologies emerging, the usage of digital currency as an alternative payment method can be an opportunity. [9] explained, the cryptocurrency history, threats-cybercrime, risks, unethical users, also explained about the fiat currency and banks by comparing them with cryptocurrency. The research methodology is based on secondary data. The paper concluded with a note stating bitcoin and blockchain technology has a bright future, cryptocurrency can eliminate the rate of exchange, can come up as a global currency and its education to the public users is necessary.

[10] explained, the cryptocurrency history and its characteristics. The research methodology is based on secondary data with data analysed using a simple statistical tool. The paper concluded with a note stating cryptocurrency is an innovative payment, adoption of crypto is very thin from the public and acceptance criteria of cryptocurrency is a challenge. [11] explained, the cryptocurrency market, virtual currency, and its future. The paper also discussed the laws and regulations from 21 countries regarding cryptocurrency. The research methodology used for the paper is of qualitative method which includes a questionnaire survey for collecting the data, secondary data to explain a few concepts. The paper concluded with a note stating cryptocurrency can be an attractive method of payment, the main concern about cryptocurrency is the lack of legislation, financial risk.

[12] explained, the factors that resulted in unfair payment issues in the construction between main contractors and sub-contractors such as interest, transparency, competition, getting paid after the works get done, agreement, late payment, subcontractor rate. The study also showed that the main contractor accounts for 86% of unfair means of payment practices, sub-contractor accounts for 9% and 5% by clients. The research methodology used for the paper is of the combination of qualitative and quantitative analysis, sampling: stratified random, SPSS software for analysis, the study is in preceptive of UK construction industry. The paper concluded with a note stating to minimize these unfair means and suggested an alternative payment method ‘ring-fenced bank’ as a possibility that still required some validation among stakeholders.

From the above literature reviews context, the research gap findings are not many studies happened about the cryptocurrency usage in the Indian construction industry perspective, most of the study is about the cryptocurrency information such as history, types, its common basic challenges, issues. But from the construction project perspective, the information is less so considering the

research gap the objectives are stated and the paper is on the cryptocurrency as an alternative payment option: Indian construction industry perspective and its associated challenges and opportunities.

### 3. Discussion

#### 3.1. Cryptocurrency People's Perspective and Its Status

##### (a) People's thinking:

'New normal' is something that makes people think about the life they need to live further to cope with the conditions happening around them to achieve the work they used to do before the new normal. But the new normal has taught people to take care of health more often when they are going through their work, social life. People deal with day-to-day transactions for goods and services that they need as a resource consumption/service using the cash in hand were used more often by the public with the small vendors to large merchants, but people have witnessed some cases during the pandemic the virus can also transfer through the fiat money, so people started more involvement in e-transaction, digital wallets when compared to earlier usage. Even the government of India is on a mission of digital India. The global pandemic has created turbulence in the economy and financial products.

**Cryptocurrency:** The new normal has created a platform for digital currency to emerge. But many people are unaware of the cryptocurrency in India however cryptocurrency is legal in India but the awareness among the public has not reached much. The computer and internet access comes in handy to the people and its usage is quite more in numbers which have created an environment for the digital currency. The people's viewpoint on cryptocurrency as a new normal is that it is been considered as a good investment and a great way to have an asset which has created a tremendous opportunity for the people to have an investment in the cryptocurrency for example Bitcoin has seen value rise of 500% in six months and it is a most valued asset of 2020 [13].

**Plastic money:** Debit and credit cards comes to mind when we come across plastic money. During the new normal people are much concerned about their health, when people come across the payment method, they are tending to have contactless payment where the plastic money in terms of debit/credit cards comes into the picture. Nowadays the cards are embedded with a high technological chip that can be used for wireless transactions with the merchants/vendor's payment machines.

**e-transactions:** It has emerged as most often used by the people in the new normal condition where the online platforms are encouraging the people to use e-transactions like e-wallets, Unified payment interface (UPI), net banking, third-party payment wallets, debit/credit cards in the merchant's checkout page. The awareness from the social media platform, service providers, merchants regarding the e-transaction and awareness from the people about the

contactless payment has been a new normal way of payment practices. "The digital payment grew about 82% by volume in India in the second quarter of 2020" [13].

So, the people's thinking about digital payments like cryptocurrency, plastic money, e-transaction in the new normal has been tremendous growth and an opportunity for the economy to grow. The government of India is on a mission of 'digital India' which acts as a key aspect for the people to think about the future of digital currency as a new normal.

##### (b) Awareness among the people:

Most of the people in India are unaware of the cryptocurrency picture [13]. But many people have access to the high-speed internet and are aware of 'digitalization' which is one of the programmes by the Indian government. There are 10 million cryptocurrency users in India as per the article from 'Business Line Forex' [14]. Apart from these 10 million cryptocurrency users in India awareness among people is less. So, to tackle this the awareness of cryptocurrency among the people are brought up with social media news, articles, blogs. Cryptocurrency service providers like coinswitch kubar have taken the initiative has one of their company mission to educate, empower about the cryptocurrency through a learning centre called 'Kuberverse' [13], through 'Digital asset and blockchain foundation of India' (DABFI) [15], through advertisement, infographics article are the few modes of technique and steps taken by the social media platforms to make aware of the cryptocurrency to the people. The awareness of the people gives hope for the cryptocurrency market growth [5].

##### (c) Cryptocurrencies legitimacy in India:

As of January 2021, there are more than 4000 cryptocurrency existences [16] out of them only a few are popular and good at trading volume. The supreme court of India lifted the ban on cryptocurrency trading (2018 Reserve Bank of India circular which banned cryptocurrency) on March 4, 2020, and allowed the banks to provide the service to the users for the cryptocurrency trading interference.

**Table 2.** Cryptocurrency Market Price

Cryptocurrency	Market Price (Indian Rupee (INR))
Bitcoin	2540000
Ethereum	150600
Tether	77.51
Cardano	93.5649
Binance Coin	21900
Dogecoin	15.6510
Ripple XRP	48
USD Coin	74.24
Polkadot	1245
Uniswap	1290.79

Secondary data source: Cryptocurrency price from WazirX as of 22 June 2021 12:08 PM.

The few cryptocurrency trading exchange platforms in

India are WazirX, CoinDCX, Zebpay, CoinSwitch Kuber, UnoCoin [17]. These exchange platforms provide trading to global cryptocurrencies. Cryptocurrency trading in India is not illegal and it is not legal tender. Since the government does not have a regulatory framework to handle cryptocurrencies. The person can choose cryptocurrency and can trade but the earnings are taxable [18].

Bitcoin, Ethereum, Tether, Cardano, Binance Coin, Dogecoin, XRP, USD Coin, Polkadot, Uniswap are the top 10 types of cryptocurrencies in India [19].

(d) Cryptocurrency implementation:

*Companies adopted/ in process of adoption:* Few international companies are paying their engineer employees with cryptocurrency; freelancers are also accepting cryptocurrency payments. A developer in Gurugram receives salary payment as cryptocurrency from the Singapore based company and converts them to Indian rupees (INR) through exchange platforms to the bank and paying the taxes applicable. 'Desicrypto' receives payment as cryptocurrency from their clients [20]. As per the website 'SpendBitcoins' Neumatic Tubes Pvt. Ltd a building supplier based in Chandigarh, India accepting Bitcoin for goods and services [21]. In India, there is no data of how many companies adopting or in the process of adopting cryptocurrency payments, but people are seen investing in the cryptocurrency market.

*Guidelines:* As per the Reserve Bank of India circular May 31<sup>st</sup>, 2021, on virtual currency that the banks can't use the circular dated April 06<sup>th</sup>, 2018, which is ruled out/ no longer valid for the banks for reference for cryptocurrency transactions after the supreme court order on March 04<sup>th</sup>, 2020. The circular also stated that the banks can carry out the process of customer due diligence with the governing standards: Know your customer (KYC), Anti-Money Laundering (AML), Combating the financing of terrorism (CFT), Prevention of money laundering act, 2002 (PMLA), Foreign exchange management act (FEMA) for the transactions in virtual currencies. Other than this there are no such guidelines from the government.

(e) Cryptocurrency Usage and Limits:

The cryptocurrency users in India are around 10 million + increasing [14]. The level of usage of cryptocurrency is employee salary, goods, and services. The vendors like restaurant chain 'Kolonial' pizza in Mumbai are accepting bitcoin [11], few international crypto techy consultants accept bitcoins from their foreign clients. Individuals use cryptocurrency in gaming platforms. There is 15,174 business around the world that accepts bitcoin [22]. We have heard a piece of news from Tesla that accepts bitcoin for car purchases but later the company changed their mind to not accept bitcoin payment until the miners use 50% clean energy.

As per the CoinDCX the limits are applicable for withdrawal interference i.e. for non-Know your customer (KYC) there is a limit of 4 Bitcoin (BTC) /day for deposit + withdrawal, and there is no limit for Know your customer

(KYC) authorized individual [23], taking an example for bitcoin in the Wazirx platform the minimum withdrawal limit is 0.001 Bitcoin (BTC) and maximum withdrawal limit is 3 Bitcoin (BTC) [24]. So, the limits of cryptocurrency usage depend on the type of cryptocurrency service platforms.

(f) Cryptocurrency Ethical Aspect:

The cryptocurrency is encrypted with the use of blockchain technology where every transaction is recorded in blocks as a ledger and forms a chain from its previous transactions. Since the cryptocurrency is a decentralized system where the involvement of regulations is not intervened by the government. The transactions are not in control of the service providers where the transactions go from person to person (P2P).

The ethical aspect of cryptocurrency usage is less carbon footprint in the environment, but unethical practices are emerging gradually taking the advantage of the cryptocurrency where the transactions are used for the black market, drugs, criminal activities, child pornography, blackmailing, money laundering is being heard [25]. But the control over these unethical practices in which the government regulations regarding the criminal activities are applicable.

(g) Pros and Cons of Cryptocurrency:

*Pros:* Easier fund transfer from P2P person to person without third-party interference like banks, a secured transaction with the public and private key, the transactions are followed through incentive system called proof of work, proof of stake, minimum processing fee, runs with blockchain technology [3].

*Cons:* Unethical practices like money laundering, criminal activities unless and until the cryptocurrency is more secured. If we consider bitcoin where the unethical practices taking place are very less and the blockchain technology made easier to arrest the criminals performing unethical ways of transactions, miners requires a lot of high-end computer setup and high electricity to run the machines where the electricity demands increases, Risk in the investment [3], losing private key for cryptocurrency login can block the account and there is no way of re-setting new private key which can leads to currency loses.

(h) Status of cryptocurrency in a developing country:

Access to the internet has become easy for people in developing countries and its global access created people to exchange activities, ideas. The developing countries are looking for economic development from their records. Few developing countries have considered the cryptocurrency market as one of the pillars of economic development. The boom of cryptocurrency in developing countries is witnessed as per the economists based on their research. Middle-class people in developing countries have found the cryptocurrency is affordable due to its less process, exchange fee. The cryptocurrency deals with the internet to process, and the requirement of infrastructure facilities can be

reduced in developing countries. The few retail businesses have initiated to use of blockchain technology and prioritize the small amount of cryptocurrency. Awarding virtual currency to people to connect others for the transactions, with this idea Russia and Indonesia response was higher. As per the statical global survey, Nigeria people have the most cryptocurrency usage where they are following the cryptocurrency path [26]. The status of cryptocurrency in India where the users are about 1.5 crores, and it accounts for Rs 15,000 crores [27]. The users in India are investing more into the cryptocurrency market and the financial market can witness the trend of cryptocurrency unless some government regulations that hurdles the virtual currency market.

#### (i) Cryptocurrencies Investment:

We know that mutual funds/shares are handled professionally by putting the investors' money into equity, fixed income, mixed-equity and debt, real estate. The investors' money is also used to buy securities and assets. Mutual funds work based on the objectives/schemes chosen by the investors. Mutual funds are market risks, and it is a platform in which the people who have money do not have much knowledge about the market to invest in. The mutual fund's professionals collect the pool money from the investors and invest them with their professional team who are well versed with the investment market. Profitability depends on the mutual fund's objectives chosen and the higher the risk more can be the profitability [28]. When it comes to cryptocurrency it is all about virtual currency traded among the peers where miners generate the cryptocurrency and it is decentralized, uses blockchain technology, (P2P) person to person transactions. The cryptocurrency market deals with trading where the fluctuation of prices is observed. People are investing in cryptocurrency as a long-term asset to earn potential profit with risks associated, noticing the cryptocurrency market trend which can be used for transactions across the countries [29]. Cryptocurrency is different from mutual funds/shares but the main scope of it is to earn profit out of an investment.

The cryptocurrency trend in the last six months has witnessed tremendous growth like bitcoin but also with a fall. The adoption of cryptocurrency in many countries has started with legalizing it. Few countries have projected a good future and growth in the adoption of cryptocurrency, like the people of Nigeria have more adoption of cryptocurrency. Few experts or public views say that there is a promising future of cryptocurrency, and few are not. The uncertainty might happen in the cryptocurrency market from the powerful nations [30]. In India, we have noticed the removal of the ban on cryptocurrency trading. There might come up some unbalanced news from the government regarding the cryptocurrency in future. RBI is exploring the possibility of adopting central bank digital currency (CBDC) for Indian currency and even many countries are exploring this method. The government has planned to introduce "The Cryptocurrency and Regulation of Official Digital Currency Bill, 2021" the provisions might affect the future of

the cryptocurrency market in India but are still not known. The future of cryptocurrency remains in balance [31].

**Table 3.** Basic difference between Cryptocurrency and mutual funds

<b>Cryptocurrency</b>	<b>Mutual Funds</b>
Investment platform in the form of virtual currency.	Investment platform in the form of mutual funds objectives chosen.
It is Decentralised.	Regulated by Securities and exchange board of India (SEBI), Reserve bank of India (RBI), stock exchange, minister of finance.
The individuals can invest directly without any third party.	Backed by professionals' investment management.
Powered with blockchain technology.	The technology usage depends on mutual funds provider management.
Profits are earned based on the trading of the cryptocurrency.	Profits are earned based on the mutual fund's scheme chosen.
As a long-term investment.	Have the option of short-term and long-term investment.
Returns depend on the cryptocurrency market price which keeps on fluctuating. But seen a high rise in a long-term strategy.	Since it is operated by the professional management team the individual can expect stable returns.
Higher risk.	The risk depends on the mutual fund's scheme.

Source: Cleartax. in edited by the author

#### (j) Cryptocurrency legal Platform for transactions:

The cryptocurrency platforms that are most used and safe, legal are Coinbase, Gemini, BlockFi, Kraken, Robinhood, eToro, Bitcoin IRA, Crypto.com, Binance, Ledn [32]. People are often using these platforms for cryptocurrency investment, and these are the top 10 crypto transactions platforms that people found to be safe and legal [32]. In India, the few cryptocurrency trading exchange platforms are WazirX, CoinDCX, Zebpay, CoinSwitch Kuber, UnoCoin [17].

#### (k) Information technology (IT) safety and regulations:

The cryptocurrency is powered by blockchain technology which records the history of transactions from person to person (P2P) which is difficult for hackers to attack the user's account. But Information technology safety concerns are to be followed i.e., anti-virus software installation, using trusted cryptocurrency interface service platforms, using a two-step authentication process, safeguarding the private key [33]. In India, the government lack regulations over cryptocurrency [34] only the authentication of bank process, tax, and criminal acts are applicable over cryptocurrency trading and its usage.

However, how safety the Information technology is regulated hackers are coming up with a new approach, but it takes time for them to proceed until the cryptocurrency service providers are well versed and updated with safety concerns. We have heard the news about hackers attacking the cryptocurrency exchange providers such as Bithumb in

2017, Coinrail in 2018, BitGrail in 2018, Coincheck in 2018, suffered an attack from hackers having stolen about \$30 million tokens, 38.2 million digital currency, \$195 million token nano, \$534 million coins respectively. These attackers mainly targeted hot wallets. [35]

(l) Cryptocurrency Benefits as a medium of transactions:

Benefits: Cryptocurrency as a medium of transactions deals with autonomy, (P2P) person to person transactions, eliminates banking fees, low transaction cost/fee: international payment, payments through mobile as easy access for an individual, can eliminate bank cards usage i.e., more accessibility [36].

(m) The human psychology about Cryptocurrency:

Human behaviour about the financial market connects to a person who knows and observes the market. The behavioural pattern of users plays an important role in the financial market. The study conducted by Aspembitova et.al described the common behavioural types seen in users of two cryptocurrency market bitcoin and Ethereum that is optimistic, pessimistic, traders in positive and negative ways. The study also described the behaviour of users during the fluctuation of price and events occurring in both cryptocurrency markets [40]. The study conducted by Abraham et.al described the psychological factors of the acceptance and penetration of bitcoin such as risk, benefits, trust, ease of use, security, socio-economic factors, technology. The study also described the predictability of penetration such as individual culture, long-term direction, variability avoidance, and predictability of acceptance such as tangle distance, social distance, assumed distance. The study also noted that the monetary policy considers the factors pretending to psychology and culture for the innovation happening in the country and globally [41]. The Indian philosophy is more about human psychology. Human psychology plays an important role in the cryptocurrency market. Every individual in India has their own financial culture. The individuals think about the financial needs and security for their social and personal life. The belief in the financial markets in terms of investment, savings, earnings, benefits, access to financial needs are the aspects that are seen in the Indian perspective. The financial needs of a person are seen from the perspective of savings and investment culture. As per the reserve bank of India's households, financial committee reports the households are seen more in investment in physical assets like gold, real estate, under-investment in insurances, pension schemes, more debts from money lenders (non-institutional) these activities are for financial needs, financial stability [42]. We have come across a piece of news about the cryptocurrency that has surpassed gold which the Indian investors have an eye on it. India has witnessed the largest Information Technology (IT) population, ease of internet access, and smartphone era where the online commercial e-commerce, payment platforms are seen rapid growth. The internet gave access to know more about cryptocurrency and investors have shown interest in it [43]. The human psychology about

the investment is seen a lot in the people and younger generation too, it can be mutual funds, stock market and now the trend of cryptocurrency. The human psychology 'behaviour, mind' about the cryptocurrency comes from the individual interest, rising prices, risk, cryptocurrency as an alternative payment platform, herd mentality, theory of mind [44] these aspects involve the person in the cryptocurrency investment as per the psychology perspective. India is the country having more of young people population, where digital technology is one area that the people have shown more interest in. The awareness among a few people through internet access about the cryptocurrency has made curious to the people to invest. The investors are seen in small and long-term periods to earn some profit out of it. The behaviour of humans on the security, regulation, safety are the aspects required by the domestic investors in India, because the Indian financial market has witnessed scams. Young people's minds think about cryptocurrency as one of the investments other than the stock market, mutual funds.

When compared with the global culture the approach towards innovations, competition among the countries, technologies, safety, economy are a few parts of the modern culture seen globally. The global culture is looking towards easy accessibility, quick progress of works, less time consumption, global currency, sustainability are the few people around the globe who are interested. The common human psychology remains the same across the globe on the investment. Young investors have shown a lot of interest in cryptocurrency. The only concern about the human psychology of the cryptocurrency market is the type of regulations that can come up by the government in the future it can be positive or negative but negative impacts more on the human psychology around the world on the cryptocurrency market.

(n) Cryptocurrency Implementation Status:

El Salvador is the first country to accept cryptocurrency bitcoin as legal tender in June 2021. Bitcoin is the most know cryptocurrency by the people in El Zonte of El Salvador. Bitcoin beach is the platform used for transactions. The level of bitcoin beach usage is payment in grocery shops, small vendors, electricity bill payment, water bill payments. The Bitcoin ATM service is also provided in a few places of El Salvador such as El Zonte, El Tunco. The challenges faced by the people for bitcoin cryptocurrency are the fluctuation in price, awareness, usage levels, acceptance [45].

The top 10 cryptocurrency usage countries are Nigeria 32%, Vietnam 21%, Philippines 20%, Turkey 16%, Peru 16%, Switzerland 11%, India 9%, China 7%, U.S 6%, Germany 5%, Japan 4% [46]. Across the world, the number of cryptocurrency users is estimated to be 300 million. Around 3.9% is the ownership rate by country and 18,000 businesses around the world are accepting cryptocurrency as an alternative payment. Nigeria is one of the top countries in cryptocurrency usage which accounts for 32% the strong reasons/influencer behind this trend is 87 million poverty people out of 200 million Nigeria people, the transaction is

feeless, more smartphone usage for payment, inflation. Nigeria is most fond of bitcoin cryptocurrency usage and it's an opportunity for the people of Nigeria [46]. But Nigeria people are facing concern about the future ban on cryptocurrency because the Nigerian government is working on central bank digital currency. There is no data or information stating the successful implementation of cryptocurrency at all levels in a country.

### 3.2. Cryptocurrency Case Study / Practices

(a) Contractor: Naples Luxury Builders, Inc. Naples, Florida, USA

The 'Naples luxury builders' contractor company is accepting all kinds of cryptocurrency namely Bitcoin as mentioned by Steven Sunquist founder and the owner of 'Naples luxury builders. The company is accepting all kinds of payments until there is approval from the team of 'Naples luxury builders. Being the contractor company their decision towards accepting cryptocurrency: Bitcoin is paying off. Steven sunquist said that accepting cryptocurrency can increase the net worth by seeing the trend of Bitcoin emerging in its value. The company thinks about providing more payment options like cryptocurrency will lead to more buyers and can make more money. The company believes that they have invested in the cryptocurrency payment option at the right time. The cryptocurrency is new to the real estate market and its outcomes are unfamiliar [37].

(b) Relator: COMPASS, Florida

Hans Haedelt, realtor COMPASS, Florida said that the home buyers/ people have approached him through phone calls asking about bitcoin as payment for buying a house. Hans also said about the demand for cryptocurrency is what makes people choose the options [37].

(c) Contractor: Fire & Ice, Columbus, Ohio

Fire & Ice is the most trusted residential HVAC contractor in Columbus. The company is accepting Bitcoin for all the services related to HVAC. The services related to HVAC such as installation, repair, or any other services can be paid fully through Bitcoins. The company accepts bitcoins through the BitPAY app by QR codes payment window. After receiving the bitcoins from the customers, the company converts the bitcoins into cash because there will be fluctuation of bitcoins price. Any related refunds to the customer will be processed through cash/bank currency only not in bitcoins. The company is way forward to adopting new things like in the payment process even they adopt the future way forward in the HVAC service category also [38].

(d) Professor: Tom Smythe, Economics professor at Florida Gulf Coast University

Professor Smythe said cryptocurrency has lots of things to do by the person entering the bitcoin world. Bitcoin can be a top player in the cryptocurrency market over the years. The value of bitcoin can remain higher by using them in day-to-day transactions at restaurants, stores, shops [37].

(e) Contractor: Cornerstone Construction, South Carolina

'Cornerstone construction' is a roofing contractor company in South Carolina it is a subsidiary company owned by 'SOLAR integrated roofing corporation'. The parent company partnered with 'coinbase' as cryptocurrency service providers for the payment process. The cornerstone construction will deal with the testing of accepting the cryptocurrency payment and they completed the financial and technical integration with 'coinbase'. The type of cryptocurrency accepted by the company is "Bitcoin, Bitcoin Cash, DAI, Ethereum, Litecoin, USD Coin" the payment can be made for all the roofing and solar services, other goods, and services. "The company is looking forward to providing better services to the customers even in the payment scheme also and to be part of cryptocurrency economy," said David Massey, CEO for solar integrated roofing corporation. The company has noticed more young homebuyers and alternative payment options are required. Massey said "The trial of cryptocurrency payment acceptances through 'coinbase' service platform where they can evaluate the cost savings such as processing fee/transaction fee, cost incurred during some fraud/mistakes when compared to the traditional method of payment. The alternative payment method cryptocurrency will add value to the company strategy to attract more customers and provide better service. If this method works out, the company can implement it in other subsidiary companies and even for the investors, shareholders" [39].

(f) Construction firm: Orocco, UK

Orocco is the first construction company in the UK to accept cryptocurrency payments for projects, client transactions. The company has set up the cryptocurrency payment gateway and digital wallet which accepts Bitcoin, Dogecoin, Ethereum, Stellar, and XRP for the completed projects. The company provides high-end buildings and renovation work. Mark Ivinson managing director of Orocco said, "Cryptocurrency is doing well nowadays, and he had some thought about it and wanted some payment options for the clients, customers", the company has recognition in the UK as one of the forwarding-thinking companies.

In India, there no such construction company has thought about/is in process of adoption/has some theory about the cryptocurrency payment for real estate transactions, construction projects, contractors/ client payment transactions. The reason might be the government's opinion that is heard on a timely basis as a piece of news regarding access to cryptocurrency, even after the lift of the ban on cryptocurrency usage in India there is less clarity among some people and the firms. RBI is also working on the possibility of adopting central bank digital currency (CBDC) as an Indian rupee. So apart from this, there are few restaurants, merchants are accepting cryptocurrency, but these are heard/seen in fewer numbers.

From the above real-time cases/practices/theory of adopting the cryptocurrency in their firms as part of the construction industry. The future of cryptocurrency sounds

to be well forecasted, but still, the circumstance of it is unknown which might arise based on the cryptocurrency market condition.

## 4. Methodology

The work is carried out successively to full fill the objectives stated. Firstly, the research gap was found out through the literature review method, secondly, the discussion section consists of information detailed about the cryptocurrency. Objective one is achieved through the information written in the discussion section, which is the reference from articles, news blogs, papers about cryptocurrency. Thirdly the questionnaires were framed out from the understanding went through the literature review and discussion on cryptocurrency. The question was made into six sections. The questionnaire form was prepared in a google form to survey the construction professionals through the LinkedIn platform, telecon, text messages. The mixed method of data analysis was done i.e., qualitative, and quantitative methods. The data collected was analysed and represented in which objectives, two and three are achieved. The research methodology was carried out to fulfil the objectives and the research gap stated.

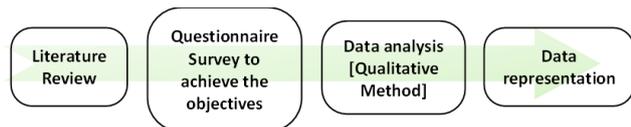


Figure 1. Research Methodology

## 5. Data Collection

The research data collection was done through a questionnaire survey among construction professionals across India. The questionnaires were prepared in six sections namely section one respondent's info, section two construction project payment info, section three awareness info, section four cryptocurrency challenges info, section five cryptocurrency opportunities info, section six general comments, and feedback. In the questionnaire sections two and three, the questions were objective type. In the questionnaire sections four and five the questions were asked to rate on a Likert scale of 1 to 5 for the elements stated in the challenges and opportunities section. The respondents were also asked to comment as feedback on the research topic. The questionnaires were prepared simple and systematically to make the respondent easier to understand and respond to. The questionnaires were recorded into a google form to conduct the survey. The survey form was circulated among construction professionals through the LinkedIn platform, text messages. A total number of 91 respondents were reached out of which only 54 responded (51 responses were considered as valid responses) with a response rate of 56% which is good to proceed for data analysis. The data was collected from the period 28<sup>th</sup> June 2021 to 18<sup>th</sup> Sep 2021.

The data collected through the google form is transferred to the excel sheet to analyse the data and represent it. The data analysed and its representation is reported in the results and discussion section.

### 5.1. The Respondent's Info

The respondent's demographic is represented in a clustered bar graph as shown in Figure 2. The responses were received among junior, mid, and senior-level management. The management professionals such as Human resources manager, project managers, quantity surveyors, Associates valuation, engineers, structural engineers, technical manager valuation, chartered accountant was part of the survey. The respondents were asked to select the options for the type of organisation working for, the size of the organisation, and years of working experience. From the figure we can observe that 49% of respondents work for consultant organisations, 63% of respondents belong to large enterprises, 61% of respondents have experience of 1-5 years. Further, the data represented is as follows.



Figure 2. Respondents Info

## 6. Results and Discussion

The details covered in this section are the data analysed and representation from the information collected through respondents to the questionnaire survey. The data was extracted through the excel sheet after validation.

### 6.1. Construction Project Payment Info

The invoices generated are the amount of work executed in a construction project by the stakeholders that are needed to be paid on a timely basis by the employer. The transactions must happen through a medium or directly. The banking system is the most found medium for transactions. The amount ranges from smaller to huge in number based on the work executed, type of project, project timeline. Below are the percentages talks about the construction project payment information in brief.

(a) Mode of payment used: Based on the survey responses the mode of payment used for the invoices submitted for a work executed in a project is represented in Figure 3. The mode of payment is arranged in descending order of most frequently used in which 80% prefer Net banking mode which includes NEFT, RTGS, IMPS, 67% prefer bank cheques. Demand draft, cash, unified payment interface, bank cards are less frequently used. Interesting to see the

cash mode of payment which accounts for 57% less frequently used which can be said that digitalisation is working in the payment program, but it can't be said that cash payment mode is not completely vanished but from the data, it says 10% to 33% prefer cash mode of payment in which it can be in the smaller projects.

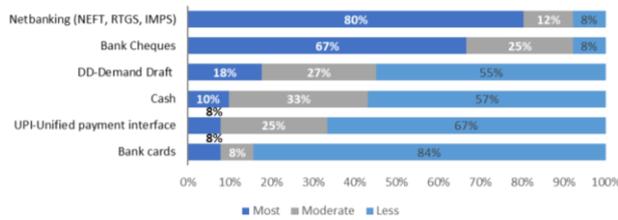


Figure 3. Mode of payment used

(b) Payment issue: As we discussed the mode of payment for the invoice in which the net banking, bank cheques are the most preferred. During the transactions, the payer and receiver face some issues with the bank so to understand this the respondents are asked to rate the issues. Based on the survey responses, bank verification issues are mostly faced. In general, the verification issue can be documented as missing, invalid documents, bank restrictions. Sometimes higher transaction fees are applied for international transfers. Bank processing time and transaction delay can be noticed commonly when there is an issue between the payer and receiver banks.

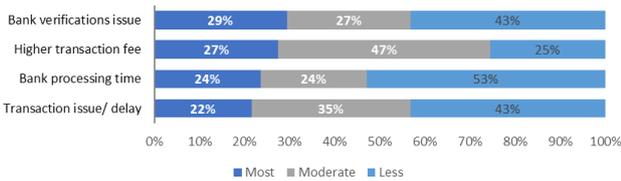


Figure 4. Payment issues

(c) Can cryptocurrency be considered as the alternative payment option in the construction industry: The construction industry has witnessed the medium of exchange from cash to net banking or online transactions. The world is also witnessing the emerging alternative payment called cryptocurrency so what do the respondents say i.e. The survey data states that 29% says no it can't be an alternative payment option, 65% say probably it can be and 6% says there is a chance for cryptocurrency as an alternative payment option in the construction industry. From the trend of cryptocurrency emerging around the world, it can be said that it's just a beginning.

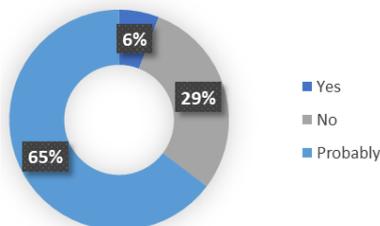


Figure 5. Cryptocurrency as an alternative payment option

## 6.2. Awareness Info

Any new concepts that are interesting and found to be popular in the field that a person is in should make themselves aware which can add value to the profession in the coming future. Similarly, the respondents were asked about cryptocurrency awareness which will add an advantage for data validation.

(a) Aware of cryptocurrency or virtual currency: Based on the survey responses, 71% of respondents are aware of the cryptocurrency, 29% of respondents are probably having little information about the cryptocurrency. So, from this, we can say that the data collected are valid for data analysis. Apart from this, few respondents turned down to fill out the survey form circulated because they are not much aware of or heard about the cryptocurrency.

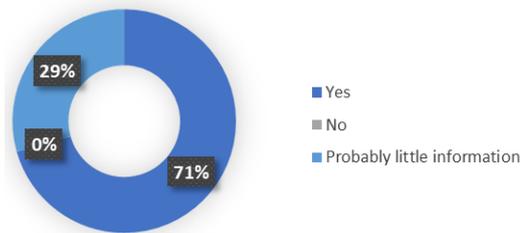


Figure 6. Awareness Info

(B) Your organization thought about cryptocurrency: Based on the survey responses, the respondents working for their organisation were asked about the cryptocurrency adoption status in their firm like in the process or thought about it. The data states that 63% of the respondent's organisation has never thought of cryptocurrency payment implementation, 37% of the respondents say that no such information is heard from their organisation team. The level of adoption of cryptocurrency in the organisation is not clear as per the survey data.

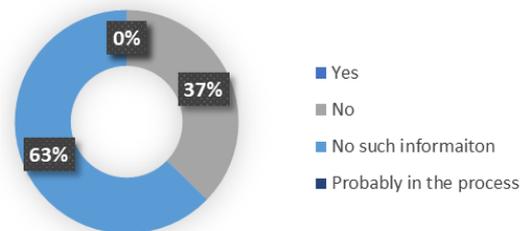


Figure 7. Cryptocurrency adoption

(c) Option to invest your money: People in India have their way to invest their money in the market as per their choice of risk, returns, and security. Having noticed the emergence of the cryptocurrency market the respondents were asked if they have the option to invest their money, in which market it would be to understand the individual perspective of chances of choosing cryptocurrency. The data states that 45% prefer mutual funds, 43% prefer the stock market and only 12% would prefer cryptocurrency which is interesting to see the choices based on various reasons the respondents might have thought.

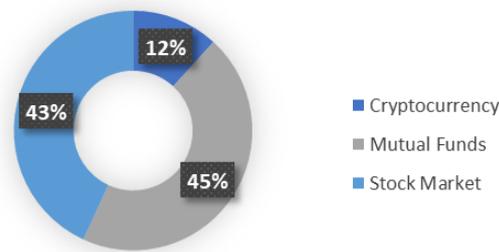


Figure 8. Investment Choice

### 6.3. Cryptocurrency Challenges Info

The challenges are always part of human life, business, market, organisation, and other domains in some way, it must be faced to stand up in the competing market. Drafting and understanding the challenges in the first place can make the work go well initially and later to be handled on a pro-rata basis and regularly updated. For the research work, the general challenges and construction-related challenges associated with cryptocurrency were drafted based on the study carried out on literature review, articles, blogs, vlogs, news, knowledge, construction competencies, awareness.

#### 6.3.1. General Challenges

Some of the general challenges that are associated with cryptocurrency adoption as an alternative payment are discussed in this section. Based on the survey responses the general challenges are arranged in descending order of priority of challenges that are faced.

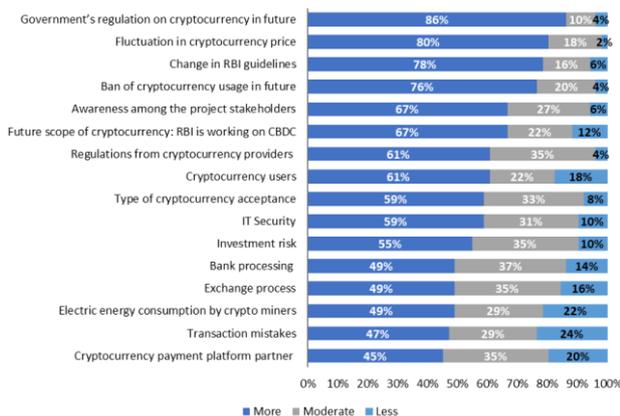


Figure 9. General Challenges

The top five general cryptocurrency challenges that are faced most as an alternative payment option based on the survey responses the more challenging aspects are government's regulation on cryptocurrency which accounts for 86%, fluctuation in cryptocurrency price which accounts for 80%, Change in RBI guidelines which accounts for 78%, Ban of cryptocurrency usage in future which accounts for 76%, Awareness among the project stakeholder and future scope of cryptocurrency which accounts for 67%.

#### 6.3.2. Construction Industry-Related Challenges

Some of the construction industry-related challenges that

are associated with cryptocurrency adoption as an alternative payment are shown in Figure 10. Based on the survey responses the construction industry-related challenges are arranged in descending order of priority of challenges that are faced.

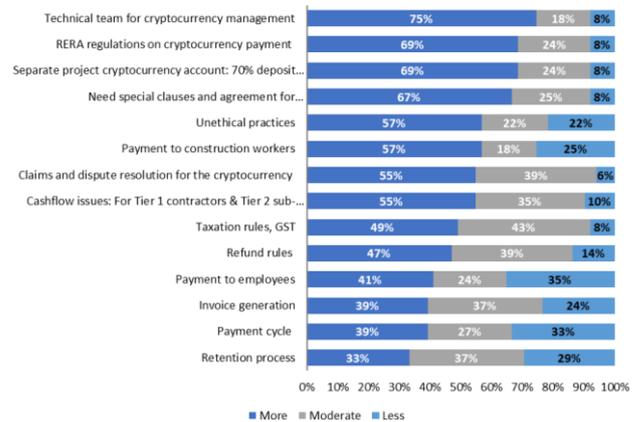


Figure 10. Construction Industry related challenges

The top five construction industry-related cryptocurrency challenges that are faced most as an alternative payment option based on the survey responses the more challenging aspects are; Technical team for cryptocurrency management which accounts for 75%, RERA regulation on cryptocurrency payment which accounts for 69%, separate project cryptocurrency account which accounts for 69%, need special clauses and agreement for cryptocurrency usage which accounts for 67%, unethical practices which accounts for 57%. The other interesting challenge that needs to be noted is cashflow issues are faced which accounts for 55%.

### 6.4. Cryptocurrency Opportunities Info

Opportunities are the chance of getting a new way to the market, work. Every person thinks of opportunities that can be gained from the options available. Opportunities can help to have stability and handle things carefully to gain something out of it. For the research work, the general opportunities and construction-related opportunities associated with cryptocurrency were drafted based on the study carried out on literature review, articles, blogs, vlogs, news, knowledge, construction competencies, awareness.

#### 6.4.1. General Opportunities

Some of the general opportunities that are associated with cryptocurrency adoption as an alternative payment are discussed in this section. Based on the survey responses the general opportunities are arranged in descending order of priority of opportunities.

The top five general cryptocurrency opportunities that are faced most as an alternative payment option based on the survey responses the more opportunities aspects are alternative payment option which accounts for 73%, backed by blockchain technology which accounts for 69%, encouragement of digital India which accounts for 67%, fast payment process which accounts for 55%, No third-party

interference which accounts for 45%.

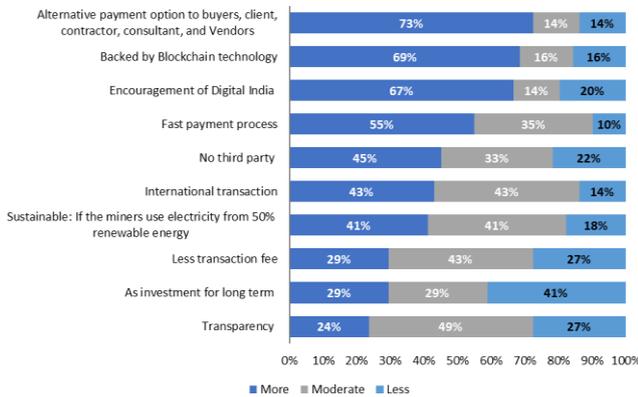


Figure 11. General Opportunities

### 6.4.2. Construction Industry-Related Opportunities

Some of the construction industry-related opportunities that are associated with cryptocurrency adoption as an alternative payment are discussed in this section. Based on the survey responses the construction industry-related opportunities are arranged in descending order of priority of opportunities.

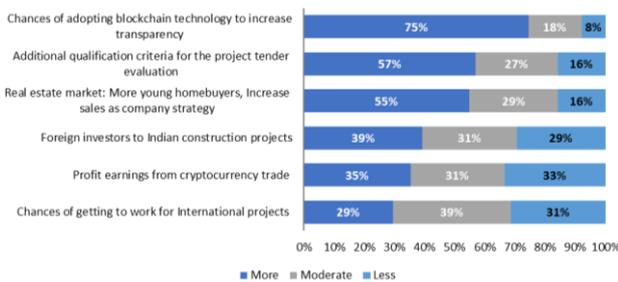


Figure 12. Construction Industry related opportunities

The top four construction industry-related cryptocurrency opportunities that are faced most as an alternative payment option based on the survey responses the more opportunities aspects are chances of adopting blockchain technology which accounts for 75%, additional qualification criteria for the project tender evaluation which accounts for 57%, real estate market: more young homebuyers which accounts for 55%, foreign investors to Indian construction projects which accounts for 39%.

## 7. Conclusions

The Indian construction industry has witnessed changes in the work culture from their past practices to best practices. Considering the stakeholder's requirement, the approach towards work pathways has seen a drastic change. Each organisation looks forward to future possibilities plan, concepts that can help them reach the standards that they have set as per stakeholders' requirements, industry conditions, long term goal preceptive to outstand as a unique organisation. The research and development team in an organisation is one of the important departments that can

make the organization unique in the industry and support's future aspects/concepts possible in real-time or create a bridge to reach future trends and to handle them in a better way. Keeping this in mind the research is carried out, from the data collection and analysis we have noticed the key points that are faced for cryptocurrency as an alternative payment option. Based on the analysis of respondent's data the key points discussed are often payment modes used are Net banking, cheques with the common issue related to bank verification, higher transaction fees. There is a chance for cryptocurrency as an alternative payment option but takes time which can't be predicted due to its market condition and awareness among people.

The general challenges that are mostly faced are the government's regulation on cryptocurrency, fluctuation in cryptocurrency price, Change in RBI guidelines, ban of cryptocurrency usage in the future, Awareness among the project stakeholder and future scope of cryptocurrency apart from this mining of cryptocurrency activities in a sustainable way is a challenging task.

The construction industry-related challenges that are mostly faced are the technical team for cryptocurrency management, RERA regulation on cryptocurrency payment, separate project cryptocurrency account, need special clauses and agreement for cryptocurrency usage, unethical practices, cashflow issues. So, from these key challenges noted are to be aware when dealing with the cryptocurrency as an alternative payment option in the construction industry which can help in forecasting the probable factors that can impact the decision made in the payment terms.

When the world is choosing the alternative option from its earlier one's like payment mode, work culture, the trend has some opportunities out of it. Similarly choosing cryptocurrency has some opportunities i.e., in general, based on the data analysis there is an opportunity for cryptocurrency as an alternative payment, backed by blockchain technology, encouragement of digital India, fast payment process, and no third-party interference.

The construction industry-related opportunities that are mostly faced are chances of adopting blockchain technology, additional qualification criteria for the project tender evaluation, real estate market: more young homebuyers, foreign investors to Indian construction projects.

From this, we can say that overcoming the challenges the opportunities out of it can be benefited. Based on the research data represented the challenges are to be managed and solved with the aim of having cryptocurrency as an alternative payment option in the perspective of the Indian construction industry. This research work can help graduates, construction professionals out there in the construction industry looking for blockchain technology, alternative payment options, cryptocurrency challenges and opportunities. This research work can be further carried out in, the demand for cryptocurrency mining data centres in India: A Commercial manager standpoint, to draft the cryptocurrency payment process for stakeholders in a construction project: Blockchain technology in the

construction industry perspective.

The chances of cryptocurrency emerging in the Indian real estate, construction industry is improbable in the imminent future. The future possibilities of digital currency/Virtual Currency/Cryptocurrency can be with the hand of central bank digital currency (CBDC) of respective countries, like India on its research ground and trails, the chance of 'Digital Rupee' can emerge.

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