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Article

Blockchain as the funding foundation for Indian MSME Sector

Pallav Kumar Singh

Abstract

The difficulties for small and medium enterprises (SMEs) accessing traditional trade finance products, specifically in emerging markets, is well known. Could Blockchain technology be a saviour in the SME funding space with respect to trade finance? It needs to be analysed through various evolving tools such as P2P lending and Initial Coin Offerings and the contemporary global outlook towards the same. The foundation of Block-chain funding also depends on the usage of this technology for upgradation of the existing systems and removing existing loopholes. For India to emerge as a Blockchain Technology leader, we need to move beyond skepticism and deploy tools that fuel the technology's transformative capabilities. We need to create nation specific Sandboxes for specific testing environments. Can it also impact national security at the vulnerable grass-root level? Blockchain could be the answer to curb terror financing and to create foundations for transparent funding options in India's vulnerable sector. It also fosters financial inclusion which play a pivotal role in job creation and access to credit thus providing scope of development in conflict and insurgency affected regions. Blockchain funding tools in MSME sector in Border areas or areas battling insurgency can help us create transparent incorruptible systems providing us with real time solutions and data access.

In January 2019, the Indian banking sector went into major reforms when eleven banks including ICICI , HDFC, Axis and Yes Bank came together to launch India's first Block-chain driven funding initiative for Small and Medium Enterprises.[1] This initiative which was set to tackle the problems of bad loans and defaulters puts India in the company of

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nations such as China which are reportedly already using the Blockchain technology to streamline the sale of their products through their central banks including Industrial and Commercial Bank of China (ICBC) and China Construction Bank (CCB). A consortium called the Blockchain Infrastructure Company (BIC) organized the meeting for the participating lenders.[2] This move is expected to allow Indian lenders and banks to make well informed decisions on the basis of transparent data accessing and having a prediction algorithm based on this transparent data access. Though hailed as a revolution, this isn't a first time India has taken such an initiative. In May 2018, Infosys, along with seven Indian banks, set up the India Trade Connect,[3] a Blockchain-based trade network with a similar aim - to increase transparency, and better manage risks in trade finance operations, while ensuring a time bound supply chain financing mechanism.[4]

...Industrial and Commercial Bank of China (ICBC) and China Construction Bank (CCB).

What is Blockchain?

Before we delve into the further applications and the various processes of technology-based funding alternatives, we must first understand the technology. The Blockchain is a shared distributed ledger that facilitates and enables the process of data recording, such as agreements, transactions or contracts and tracking assets for business related purposes.[5] These assets can be something tangible (car, property, cash, jewelry) or something intangible like intellectual property, copyrights, digital branding archives. One of the simplest ways to comprehend how Block-chain technology works is to think of it as a giant spreadsheet, being updated in real time and available to anyone with access.[6]

What makes the whole process inherently transparent and incorruptible is its ability to independently record any data that needs to be verified as having happened and to look at it in regard to its distributed nature. Anyone on the network can have access to the same data. Once updated, the ledger cannot be altered or tampered with, but can be added to, thus ensuring everyone in the network has the same information at the same time and creating a system with transparency as an indispensable virtue.[7] Virtually anything valuable can be tracked and traded on a Block-chain network, critically reducing risks and costs for all involved and increasing its value in terms of the additive capacity. The Block-chain system in principle works on the following three concepts: Identity, Digital Assets and Smart Contracts.

When we talk about Identity, Block-chain is likely to eradicate the risk of identity theft and other such digital fraud cases. Using the ledger to create digital IDs, where

identity is immutably and transparently recorded, could open the doors to dozens of different applications. . For instance, it could be used for various online memberships or to sign in to social media platforms without having to enter a password, or it can also be embedded in website and search platforms or even online business cards.

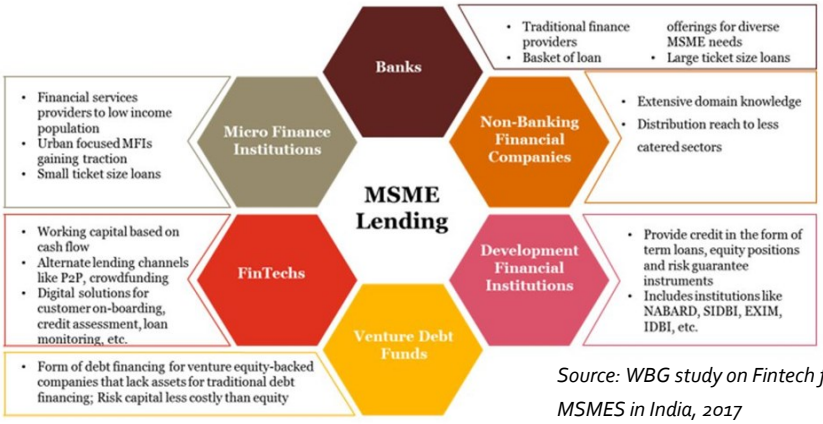
In other instances, lending and leasing companies could benefit greatly from the shared ledger which is explained later in this paper. Despite it appearing rather simple, in reality the management of all the different ledgers within the network is time-consuming, effort taking and complicated. By embracing the Block-chain technology, lending and leasing companies could significantly reduce their costs and increase efficiency as every network participant could access, monitor and analyze the state of the assets in real time. A smart contract is a set of rules or an agreement under which a business transaction is governed. Ownership can be proved and connected to the terms of a given contract through Smart contracts. They are stored on Block-chain and executed automatically as part of a transaction. Some of these contracts may have contractual clauses that could be partially or fully self-enforcing, self-executing, or both. Let's look at some pragmatic applications for Smart Contracts. For example, a smart contract could define the terms and conditions of a travel insurance, which would be executed automatically when a flight is delayed or cancelled, or a baggage is damaged. This means that one wouldn't need to contact the insurance company to make a claim, the smart contract would do it for the person.[8]

Global Outlook

There has also been a global acknowledgment of the Block-chain technology as an effective tool for bridging gaps in SME funding. According to the World Bank,[9] formal SMEs contribute up to 60% of total employment and up to 40% of national income (GDP) in emerging economies. These numbers are significantly higher when informal SMEs are also included. Based on the same report, 600 million jobs will be needed in the next 15 years to absorb the growing global workforce, mainly in Asia and Sub-Saharan Africa. In emerging markets and developing economies, SMEs generate most jobs and, in some countries, creating 4 out of 5 new positions.[10] However, access to finance is a key constraint to SME growth. Without access to capital, many SMEs languish. Formal Credit is limited to only half of regulated and recognized SMEs. The financing gap becomes even larger when micro and informal enterprises are also taken into account. Overall, approximately 65% of all micro, small and medium-sized enterprises (MSMEs) in emerging markets and developing economies lack access to regulated and formal credit.

While the gap varies from region to region, it's wider in Africa and Asia. The current credit gap for formal SMEs is estimated to be US$1.2 trillion; the total credit gap for both formal and informal SMEs is as high as US$2.6 trillion.[11]

Figure 1: Key players in the MSME lending space in India



Source: WBG study on Fintech for MSMES in India, 2017

A World Bank Group study suggests there are some 365 to 445 million MSMEs in the emerging markets. Of these, 25-30 million are formal SMEs, 55-70 million are formal micro enterprises, and 285-345 million are informal enterprises.[12] Moving informal SMEs into the formal sector can have considerable advantages for the SME (for example, better access to credit and government services, better transparency) and to the overall economy (for example, higher job creation, higher tax revenues, better regulation). Also, improving SME's access to finance and finding solutions to sources of capital is crucial to enable this potentially dynamic sector to grow and provide jobs.

The Debt Trap

The concept of Block-chain was born slightly more than a decade ago. However, there is still skepticism when we talk about its ability to solve financial irregularities due to its distributed transparent ledger. As per the bankers, the traditional banking system is global and efficient. However, if you're a non-bank lender who would like to diversify your global lending potential, you might find that it is punitively expensive, time-consuming and aimed almost exclusively at international banks and funds. One of the major causes of the global financial crises of 2008 were non-performing pools of debt artificially created by banks and cumulatively bought in trillions of dollars by funds around the globe. Allegedly subprime debt was mixed with prime debts to increase financial hegemony and it further caused several system crises. This led to an insatiable and

unending appetite for debt, bundled up and sold to funds and banks who didn't really understand what they were buying, at a huge profit for the originators. The result was the financial system was clogged due to opaqueness, mismanagement and its own chaotic systems for debt management. A Blockchain based system could have prevented that. Blockchain represents a solution for transparency and the trading of private debt internationally, by everyone. Using cryptocurrencies to invest in businesses across the globe and trading that debt can be done without experiencing delays or high fees, which means that it is more inclusive and available for everyone.

India on the brink of a Blockchain technology revolution

The Indian MSME funding sector already has a set of diverse underlying issues that the Block-chain technology should focus on. The sector is coming to terms with the understanding that the Credit Reporting Systems are pivotal and important as better credit information can lead to increased credit for SMEs due to transparency and can also attract investments. Secured Transaction Registries ensure that SMEs can provide moveable collateral as the basis for more lending and increasing the access of the funds that they have.[13] Modernized counter Insolvency initiatives can help restructure viable businesses while also promoting the efficient and effective "exit" of those firms that are not economically efficient. The current government has passed a set of legislations such as the Insolvency Code and have initiated several banking reforms that aimed at counter insolvency. Streamlining of Payments Systems supports the more efficient movement of money throughout the economy, including Business 2 Business, remittances, money transfer, vendor payments and other forms of payments.[14]

Technology should and has played a crucial position to increase in the banking area in India. The Block-chain as a pioneering and vital tool is functioning as an effort to facilitate in addition and integration of an increasingly more networked financial system and nurture transparent monitoring of credit scores. Like other technologies, Block-chain too has had a slow beginning, but has the capability to grow to be commonplace in the coming years. Business financing has usually been trouble for several MSMEs and is frequently stated as one of the reasons and motives for early stage failures of several projects and enterprises. One report observed that approximately 29 percent[15] of failed agencies recognized the shortage of operating capital as a prime cause for failure, seconded by lack of market demand for the service or products

The many boundaries within the traditional finance industry cause these financial shortfalls and hegemony such as consisting of previous credit score rating protocols. As

an end result, banks and other conventional lending institutions often have strict and slow lending tactics, consequently denying MSMEs well-timed access to operating capital and seriously affecting enterprise increase. This is where the Blockchain, the incorruptible, decentralized ledger, can help create new possibilities for investment at the same time as supporting current institutions make higher lending selections for MSMEs, therefore enhancing availability of much-wanted funding.

The Tools of Block-chain Funding

Peer to Peer or P2P lending

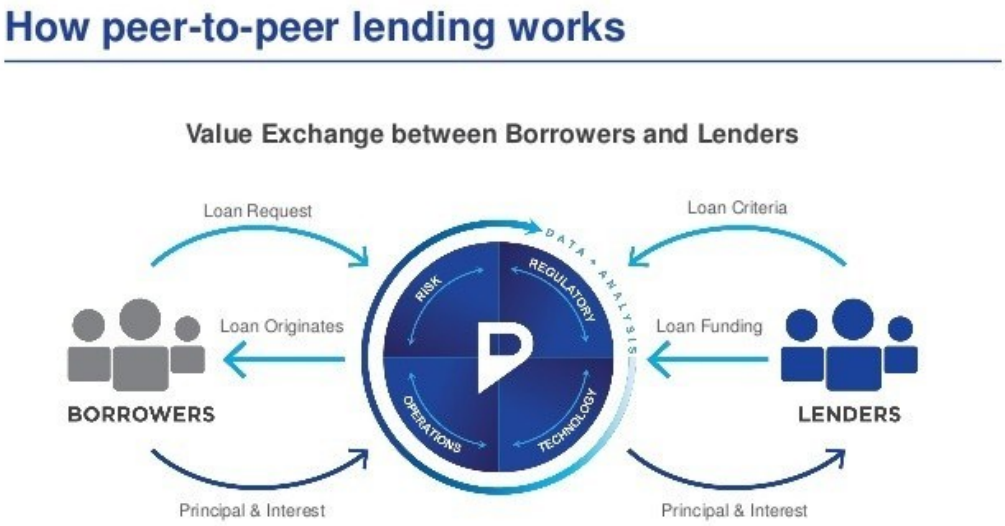
The basis of peer-to-peer lending is to remove middlemen such as traditional banks and to create a more crowdsourced pool of investments with multiple stakeholders. When the idea of peer-to-peer lending was first conceived, it was based unique ideation that helped offer a price range to people and agencies with decreased charges and increased speed of remittances. P2P lending cuts out connects lenders with individual borrowers or small business. Typical P2P loans are crowdsourced, which reduces risks for investors and enables a more distributed and transparent kind of investment pool.[16] Instead of putting all the money into one pot and exposing investors to a risk of loss, P2P providers spread the investment across a number of different loans, significantly reducing the risks thus creating the 'eggs in multiple baskets' approach. Even If one loan defaults (that's when a borrower cannot pay back or misses), the other investments will continue to make money.

As the technology matures, Blockchain-powered P2P lending platforms are promising to increase transactions and cut processing costs. By the usage of smart contracts, Blockchain-powered P2P systems are capable of verifying customers and validate transactions nearly instantly, therefore, accelerating the manner and cutting down on fees for debtors and other stakeholders. P2P crypto lending, also known as alternative lending, works in the same way as traditional peer-to-peer lending by eliminating banks and connecting investors and borrowers directly except the loans are issued in cryptocurrencies.[17]

Blockchain technology and P2P lending seem like natural co participants in the upcoming technology based financial revolution. Blockchain can have a truly transformative effect on the P2P industry as it offers greater visibility, transparency, distribution, efficiency, and scalability and potentially, lower costs. Blockchain-powered smart contracts[18] would enable P2P providers to validate transactions, through verification of legitimacy of stakeholders, and perform routine administration tasks in

real time, reducing costs and accelerating the processes. Often, Blockchain technology is all about solving a data problem. It not only has the potential to enable close to 2 billion people around the world who are currently unbanked to access digital currencies, but it also streamlines and smoothens the financial services, and eliminates the need for a third -party for multiple ranges of transactions that go way beyond finance. Trading private debt on a peer-to-peer basis has never occurred in any large volume and that will be the true proof of concept. So far, the global solution has been to create bundles of private debt into vast securitization based finance pockets.[19] Therefore, it seems a logical path to make debt originated by different platforms tradable on one market, enabled through Blockchain technology.

Figure 2- Functioning of a peer-to-peer lending system



Sourcehttps://www.linkedin.com/pulse/p2p-lending-banking-without-banks-gazi-yarmohammed/

An international platform with ultra-low fees, allowing smaller transactions, would transform the international private debt market and add an exciting layer to an already booming alternative lending sector and it a lot of Blockchain based technology enterprises are working to address this very aspect.

Another important concept aided and created by Blockchain is loan tokenization. Trading of debt forms is the backbone of the traditional lending industry but currently doesn't exist in the world of P2P loans.[20] Adopting Blockchain would allow tokenization of loan assets, enabling investors to easily trade their loans with other P2P network participants. In reality, a borrower creates a token and issues a smart contract, outlining

the repayment of his or her loan. The monthly repayments are made automatically, like the direct debit transactions we set up to pay our utilities or major bills (credit card, phone, electricity etc.). The investors get their money, and the debtor builds up their creditworthiness and improves their credit scores. Next time when she needs another loan, she doesn't have to go through the same vetting and analytical process that she went through last time, she simply issues another smart contract and watches the investors purchase her tokens in such way funding her loan.[21] This will open up the P2P lending platform to an international audience, hence enhancing credit access to enterprises all around the globe.

ICOs and MSME investment

ICOs (Initial Coin Offerings) had been many of the most popular implementations of the Blockchain, shot into fame via cryptocurrencies and their unending set of applications. And for the longest time, they've been associated with modern day startups within the tech industry, where they've helped boost billions in revenue generation. However, the ICO ecosystem is a very complex environment extending beyond MSMEs launching ICOs and individuals or institutions wishing to participate in the ICO (investors or other stakeholders).[22] It has a lot of branches such as digital venues for exchange; trading platform operators and managers; digital wallet providers; increasingly emerging financial and technical advisors; participants in regulated markets with underlying tokens and other assets; investment funds or other collective schemes investing in tokens (such as hedge funds); custodians and regulators.[23] The ICO ecosystem is tech-heavy, requires a substantial amount of technology infusion in early stages, and building a community plays an important role in their development given the open source nature of platforms. Computer engineers, programmers and developers build the network infrastructure and develop the platforms' protocol (software) and applications that run on it.

A lot of ICO related information is constantly being relayed through multiple social media platforms and specialized websites (telegram and Github) but also mainstream social media such as Twitter and Facebook participate in the promotion and marketing of ICOs.[24] Blockchain-based projects are important in such a manner that some ICO issuers have resorted to random allocation of coin-based tokens. Although such mechanisms enable the rapid creation of a network around the project, participants' incentives may result in a lot of speculation and creating market frenzy.

Structuring of ICO offerings varies across projects in regards to the number of tokens issued; the proportion maintained as compared to the one distributed to

investors; the allocation mechanisms; the future supply of tokens; and the sale model used. As this financing mechanism is new and innovative, the structuring of the offerings tends to evolve as the mechanism matures, in part as a response to failures experienced. Most ICO offerings are capped, placing a ceiling on the amount they wish to raise which is in turn translated into a cap in the number of tokens that will be issued. Uncapped ICOs run the risk of token "inflation", with the value of existing tokens being eroded with every new token issuance.[25] This effect is similar to the dilution to which equity-holders are subjected to.

The schedule of token issuance, if tokens are not issued in a single issuance, needs to be clarified by the issuer upfront. Given potential token "inflation" and the fact that the price of tokens is affected by the supply of tokens, initial token-holders are sometimes negatively surprised when the issuer decides to issue more tokens than initially announced. Having a full and accurate schedule of the medium-term financing needs of a start-up upfront can be a very difficult task, as their financing needs depend on the success of the business, the speed of its development and other unpredictable factors.[26] This can be a real challenge for SMEs who may realise after the ICO that their initial issuance did not sufficiently cover their financing needs; the issuers will have to deal with a trade-off between depriving themselves of further token-based funding rounds so as not to negatively surprise their existing token-holders or issue further unscheduled rounds of tokens and dilute them.

These crypto-tokens are basically digital assets. There are a method of payment for the service that the company proposes to offer. Examples of such services may include online music/movie- streaming services or cloud storage space. Reliance Jio announcing its own ICO called 'Jio Coin' created some buzz but that's where it ends.[27] The US Securities and Exchange Commission and the Canadian Securities Administrators, on the other hand, have released investor bulletins highlighting that some ICOs may need to be categorized as securities in accordance with the nature of the crypto-token offered.

However, in order to streamline and regulate ICOs in India, there are legal and regulatory challenges that need to be addressed. First, based on their nature, crypto-tokens/cryptocurrencies could be classified as securities or currency or a payment system or intangible property. Additionally, the hybrid nature of crypto-tokens might require coordination among the Securities and Exchange Board of India (SEBI), the Reserve Bank of India (RBI) and other sectoral regulators for effective regulatory oversight.[28]

Big data and Blockchain to improve current systems

Apart from P2P lending and Initial Coin Offerings the Blockchain has immense utilization scope by the opportunities and traditional lending establishments to improve huge statistical analytics, a creditworthiness accessing tool commonly being used worldwide. India's private and public banking system can benefit a great deal from Blockchain technology as it will not only help banks automate their internal operating processes but also substantially improve and overhaul existing administrative and financial processes. When these operating systems are powered by Blockchain technology, banking processes will require the minimum intervention of regulating bodies and third-party outsourced intermediaries, while for banks themselves, monitoring assets and performing compliance-related tasks will become much easier, faster, and efficient as compared to the current systems.

Blockchain may be a new technology, but its ability to counter fraudulent activities through distribution and transparency, especially with respect to financial transactions, has gained significant attention from the financial services and technology industry, considering how a strong majority of criminal activities affect financial intermediaries like stock exchanges and money transfer facilitators each year.

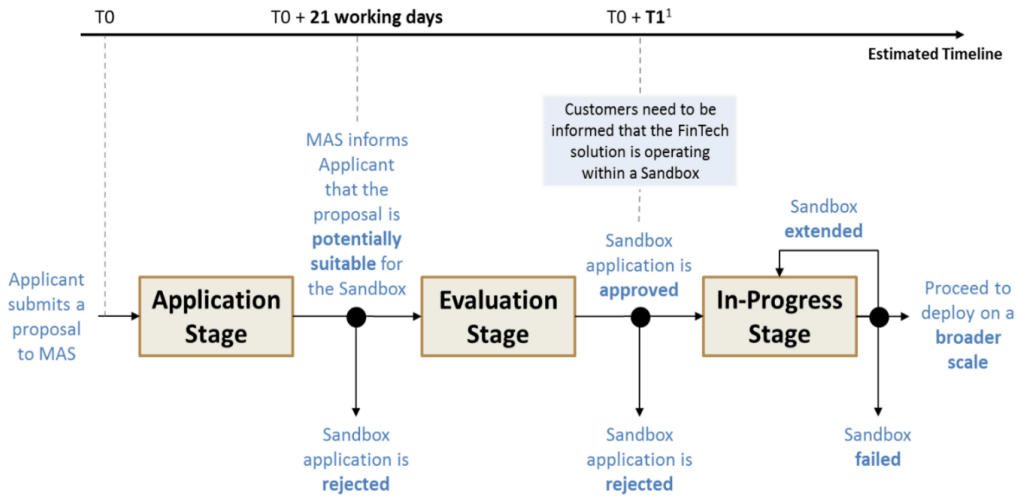
As a lot of banking systems across the globe are built and operated on a centralized data repository, they have a certain extent of vulnerability towards cyber-attacks. The threats are real because an attack directed at a single point can harm the entire system, thereby enabling hackers to access and tamper with it. However, the Blockchain being a distributed ledger where each block contains a timestamp and holds batches of individual transactions with a link to a previous block. Hence, this technology can eliminate some of the major cybercrimes being perpetrated online today against financial institutions and organizations. Blockchain-based lending platform for MSMEs is using the technology to assist and enhance the conventional structures for even providing an easy platform for repayments. Several Startups integrate an MSME's financial infrastructure with their Blockchain platform, allowing the lender to provide enterprise loans, tokens and coins advances primarily based on real coins drift in place of belongings.

Sand Box

Whenever a new technology makes its mark in the world, it must ideally go through a series of tests for better functioning. Sandbox is a commonly used term in the area of software and application development, which refers to an isolated but fully

controlled and functional testing environment where software, apps or programmes can be tested. Any developer after writing a new code or modifying a previous one may use the Sand Box for testing.

Figure 3: A sample Fintech Regulatory Sandbox sample as described by Monetary Authority of Singapore (MAS) outlined approval process.



Sourced from medium.com

For instance, say a programmer working on updating the Ola app or any vehicle service aggregator adds a new feature to more accurately locate the passenger using GPS or linking a digital mobile wallet to the use account, or a team of developers at a social networking platform enhances the site's functionality to restrict users from sharing posts that may have been flagged as fake news or has been reported for infringing upon another user's privacy. Before such updates and features are launched, they may be tested in an isolated and controlled environment, the sandbox. Beyond testing features and functionality, a sandbox also allows security aspects to be verified and the entire back end of operations can be streamlined through the organizations code of conduct.

The need for a Sandbox becomes paramount in the financial sector. The financial tech sector is exploding with new, innovative and useful services and products. Since this sector deals with monetary transactions belonging to the areas of lending, payments, insurance and trading mostly processed in Straight through Processing (STP Mode) mode,[29] regulatory compliances become a necessity for transparency and public sector purview. Developing innovations without the overheads of over-regulation and protection of consumer interests need a balanced and a highly nuanced approach, for

which financial regulators in a lot of countries have started a 'regulation sandbox' based approach. Use of a regulatory sandbox allows authorized businesses to test their innovative products, services, business models and delivery mechanisms in the real market, with real consumers, on a trial basis and it falls under the regulatory purview. It helps builds a more suited product as per the user demands and reduces delivery time to market at low cost, improves access to capital, and ensures adherence to compliance requirements. Such regulatory sandboxes allow room for direct communication between financial tech developers and businesses and regulatory officials while alleviating the risks of unpredictable and unintentional negative consequences such as security flaws and verification based issues.

As cryptocurrencies, P2P lending and other Blockchain based applications gain popularity, adherence to regulations and the security of digital assets is also gaining importance. Repeated incidents of cryptocurrency thefts, hacking attempts, and scams are also acting as a deterrent to mass adoption and in some cases, they have created certain hysterical incidents in the fintech world too. The concept of a regulatory sandbox is now also being extended to the virtual world of cryptocurrencies, where financial regulators are offering authorized businesses the possibility of testing Blockchain products before mass adoption and launch. For instance, in June 2018, Financial Conduct Authority (FCA)in the United States gave Eleven Blockchain and distributed ledger technology-related companies access to its regulatory sandbox service. In the U.S., Mick Mulvaney, acting director of the Consumer Financial Protection Bureau (CFPB), announced in July of 2018 the launch of a regulatory sandbox aimed to encourage cryptocurrencies and Blockchain technology.[30]

In India, incubators, investors, technology companies, developer community and government-led policy institutes have been studying the intricacies of Blockchain technology and its potential applications across various sectors. However, we now face an urgent need to move beyond the evaluation phase and operationalize a Blockchain sandbox under the current Indian regulatory framework, which has a stern and unhindered focus on agile review, outcome-based assessment and shared knowledge of the impact for different use case scenarios.[31]

The past couple of years have seen an unchecked and unstoppable run of crypto-currency driven by unverified and anonymous speculators who created an embedded regulatory skepticism towards Blockchain. This shadowed its transformative technology capabilities of assisting government delivery mechanisms, enhancing public distribution

systems and enabling efficient commercial and monetary transactions. Expectedly, Indian regulatory agencies have taken a cue from their counterparts across the world and conducted their own assessment of various prospects of Blockchain technology.

There needs to be a definitive, well thought and quick regulatory response from financial, security and government agencies to pave the future way. The development around the ban on the use of cryptocurrency in India, should not hamper the deployment of Blockchain technology for far more efficacious and specific purposes. There are many examples wherein the state governments are aggressively looking at adoption of Blockchain and regulatory authorities like Telecommunications Regulatory Authority of India (TRAI) urging the telecom sector to use Blockchain to control the flow of commercial communication on their networks.

There is an imminent need to institute a sandbox environment in India to encourage evaluation of Blockchain applications and quicken the delivery of applications. For example, the Financial Conduct Authority (FCA) in the United Kingdom, which initiated the idea of a regulatory 'sandbox' for testing Blockchain solutions. Subsequently to the announcement of this initiative by the FCA, regulators around the world have set up their own regulatory sandbox, in countries such as Singapore, UAE (Dubai), Canada, Malaysia and Australia. A technological Sandbox manifests an environment where software development undergoes testing and controlled iterations in a simulated environment codes until the solution meets its technical objectives, or meets failure as an unviable solution without an iota of considerable impact on the various stakeholders it aims to address in real time.

In India, an ideal regulatory sandbox would enable participants to deploy innovative Block-chain solutions and test them extensively in near–real-world scenarios, while taking away the pain and hindrances of various licensing issues. At the same time, regulators should ensure that the sandbox insulates consumers and beneficiaries from technology that is only at a pilot and proof of concept stage and avoid any consequential risk to the system or economy thus enabling an environment which aims at creating a Minimal Viable Product. For instance, deployment of a Blockchain solution for processing insurance claims by banks will necessarily and surely find itself at the crossroads of regulation by the banking and insurance sector, as well as the applicable legal ambit and purview that the insurance sector operates in. Each government agency would therefore need to contribute towards an integrated and coordinated view on whether such a Blockchain based solution is permissible in the real-world for real consumers.

India needs to avoid initiating a top-down approach to creating a regulatory sandbox, and not depend indefinitely on its vision, mission, organization set-up, and eligibility criteria, or draw up elaborate requirements for documentation submission and review.[32] Instead, the testing of Block-chain-based applications requires an enabling environment of sorts, which though not completely devoid but is free from the excessive interference of bureaucracy, excessive regulations and multiplicity of authorities. Additionally, the sandbox would bring forth an integrated view of various stakeholders, including government authorities, policy-makers, industry players across sectors, and the academia on Block-chain technology use-cases. This will enable solutions which speak to the concerns of the entire ecosystem that it seeks to operate in and the conditions it has to work under the umbrella of. In conclusion, a sandbox permits not only perfect solutions; rather it must admit imperfect ones and then provide a simulated environment for testing these solutions to assess their impact and suitability for the purpose it seeks to achieve

Financial Inclusion and MSME funding through Blockchain

Conflict zones in India are marred by financial opaqueness and discrepancies on the grassroot level that deprives the locals of opportunities of financial inclusion. India has an incredible opportunity to spread financial inclusion across the length and breadth of the nation. According to a joint study released by ASSOCHAM and EY, 19 percent of the population continues to remain unbanked, or financially excluded, despite the best efforts of banks and financial services providers.[33]

Globally, Financial Inclusion is considered as a critical indicator of development and well-being of a society. The renewed focus on an inclusive financial system is widely recognised in policy circles as an efficient, pivotal and proactive measure and has become a basic priority in the majority of countries across the globe including India. Financial Inclusion is considered as an effective means to sustainable economic growth, an indicator for development, as a toll to measure the state of the public distribution of financial services and is intended to ensure that each citizen of the country is able to use their earnings as a national financial resource for redeployment in productive sectors of the economy. Such collective and integrated financial resources can be streamlined to develop enterprises, building a growth centric economy and fueling the nation's progress. This underlying theme has brought Inclusive economy in foray has come to occupy centre -stage in financial intermediation.

One of the biggest policy initiatives came with the roll out of the '*Pradhan Mantri Jan Dhan Yojana* (PMJDY)' in August 2014. PMJDY has been designed to ensure accelerated access to various financial services like basic savings bank accounts, affordable, need-based credit, remittances facilities, and insurance and pension for excluded sections. These form a solid crux and a strong foundation for delivering basic financial services to the unbanked sector. Such deep penetration at affordable cost can only be possible with effective use of technology. Hence, the banking ecosystem operating on core banking mode needs a severe technology-based upgradation and needs to keep up with its global contemporaries. The ability of NPCI and other organizations have also been pivotal in scaling up the issue of debit cards and has been enabling effective implementation of PMJDY. As a result, the number of new savings accounts opened by the banking system has been phenomenal under the scheme.

Globally two billion working-age adults don't have access to financial services[34]. They are considered the unbanked of the world. Most of this population is in the emerging countries and developing economies. They don't have direct access to credits, deposit accounts, money transfers or insurance in the form of basic services and them being a part of investment pool is a farfetched area. Financial inclusion could create new opportunities for them. It can also help them improves their personal lives and their quality of life index through financial access.

For the unbanked, lack of capital limits their prospects for overcoming poverty. Traditional banks don't have the right technological and analytics infrastructure to support them. Block-chain-based solutions can play a major role as we have a proof of concept and the minimal viable product.[35] These solutions can create new ways of solving infrastructure and cost management problems. The result will be a more profitable way to serve the unbanked population and also helping them access financial services.

While the Government of India and the Reserve Bank of India have taken several steps to spread financial inclusion, the infrastructure at present is not sufficient to reach out to the varied and diverse sections of the society. The most significant barriers in this mammoth like vision are the lack of basic data repositories and sometimes that results in lack of basic documentation required for initiating the basic prospects for financial inclusion.

There exists a massive gap between the idea and implementation stage for mass adoption of financial services. The use of Blockchain technology helps resolve this mismatch by establishing digital idenities for individuals and enabling Smart contracts

and digital identity as specified earlier. . For immediate means, the Government can leverage the potential of cryptography technologies to create online profiles that are secure and exist on a distributed incorruptible network after taking account of an individual's identity and family associations. Another perspective is to create usernames with an open space for the name, and directly embedding the user data in the Blockchain. This way, individuals can self-identify and access the available financial services – from opening bank accounts to sending or receiving money, applying for loans and more.

Blockchain will also be able to facilitate a greater flow of remittances into the country from Indian workers overseas – again, the degree of access to financial services that Blockchain provides through its identity management will enable hitherto unbanked workers overseas to send funds directly back home, with a very clear positive knock-on effect for local economies. Citizens hitherto excluded from access to financial services will enjoy greater financial freedom and security through Blockchain technology. Digital identities created in the process offer greatly improved privacy by restricting them to specific devices or by granting privileged access to individuals, in line with their authority.

A financial institution can access the same digital identities to reissue documents or access data whose paper versions may have gone missing. By integrating these solutions into other external services, we stand to reduce instances of fraud or error in the delivery of financial services to the under-served or unbanked sections of society.

While financial inclusion is paramount for India to continue her growth trajectory, its nature tends to be complex and challenging. The shift in paradigm requires collaboration between the private and public sector, for not only trailblazing innovations but also creating a holistic, robust ecosystem. With the growing adoption of Block-chain technology, the two billion unbanked people spread across the globe stand a chance of financial inclusion. Lowered risks and costs, along with increasing innovation, means that Block-chain technology is going to be integral to financial services in times to come.[36]

Block Chain in India: The Road Ahead

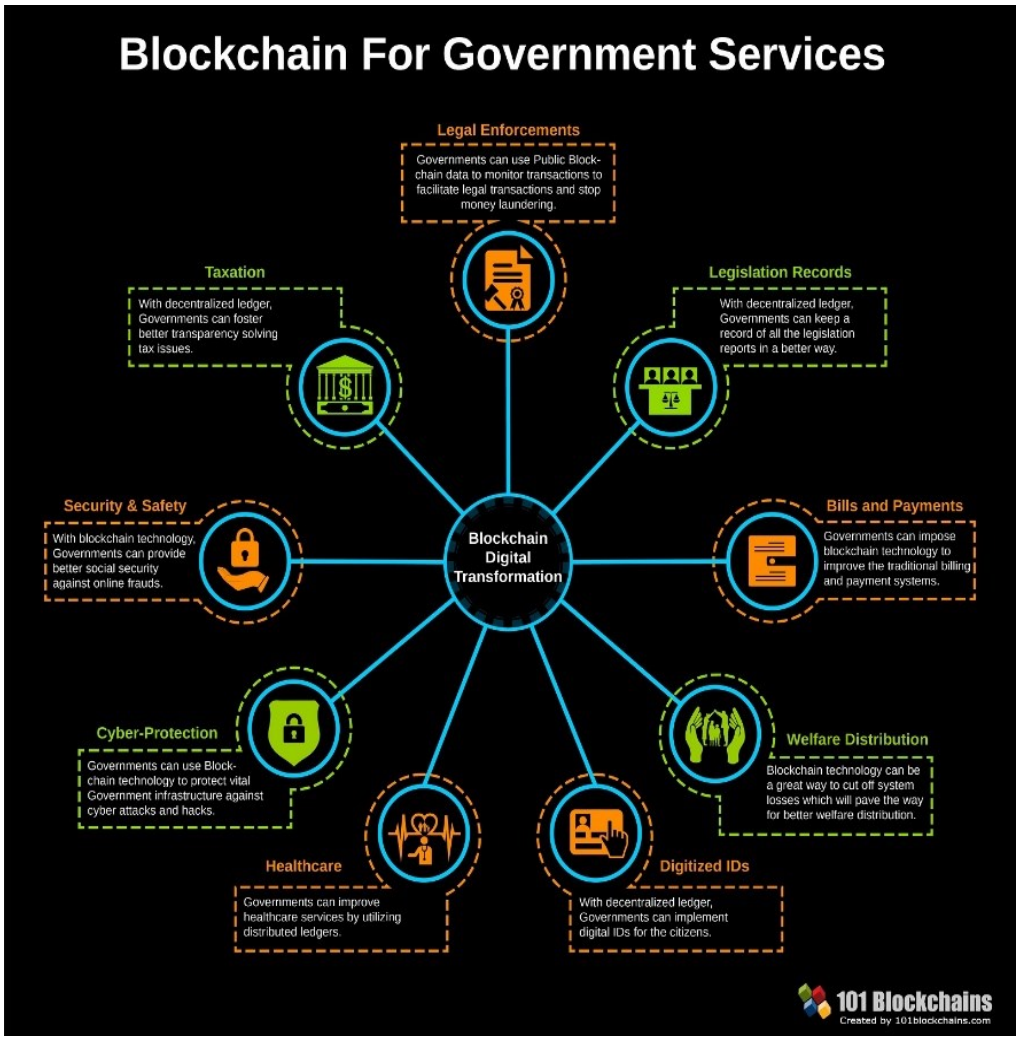
As stated earlier, India is on the brink of a technology revolution. Due to the high demographic dividend and India being the ideal candidate for technology adoption, there is a lot to look forward to. Blockchain has the ability to accelerate governmental capabilities and affect functions like public benefits, healthcare, public distribution system and education.[37] Thanks to the new forward-looking digital outlook of the country, India is one of the few nations who are quick to realize the potential of Blockchain in good governance and running of day to day affairs. India has witnessed

several proofs of concepts to demonstrate Blockchain applications across several sectors such as banking, insurance and managing land records. IDRBT, the technology arm of Reserve Bank of India (RBI), led two platform based aspects such as domestic trade finance letter of credit and enhanced information for payments with the involvement of banks and technology firms like Infosys and IBM.[38] General insurance companies and private players also worked on a pilot project to track health insurance policies using Blockchain and set up what could be a mass adoption of Smart Contracts in the near future. Andhra Pradesh is the first state in the country to introduce Blockchain in land records thus trying to find a solution to India's huge data repository issues, and is also setting up a Blockchain Centre of Excellence to set up the country's first Blockchain state operated such initiative. Other states like Maharashtra, Karnataka, Kerala and Rajasthan are following the lead.

As an emerging major economy, India needs true solutions to tackle major problems, including middlemen intervention, data breaches, fraud, identity theft corruption, and tampering of financial ledgers. And, block-chain seems to be the most viable solution. India, with more than 6 million engineers capable of delivering a solid throughput, holds approximately 55 % market share in the global IT services industry to become the digital capabilities hub of the world.[39] Indian leaders are also optimistic about a block-chain powered future. In one of his speeches, Prime Minister Narendra Modi mentioned, "India's youth can lead a revolutionary movement using Artificial Intelligence and blockchain technologies with value addition." In another instance, during a parliament budget session in 2018, Finance Minister Arun Jaitley acknowledged the value of block-chain and assured the government's commitment to exploring the use of block-chain technology for ushering in the digital economy.

India, as the biggest democracy, needs a revolutionary technology to reform major sectors including agriculture, healthcare, financial services, and real estate. The fresh developments in block-chain technology and the outlook of the leaders and bureaucrats on block-chain are in favour of India capitalising on the technology. The outlook of countries such as India towards block-chain will encourage more countries to tap into block-chain's potential this year.

Figure4: Various Sectors and applications of Blockchain in the government sector



Source: www.101blockchains.com

India, the second-largest online market in the world, has already embraced blockchain. NITI Aayog, a policy think-tank of the Government of India, co-hosted the biggest blockchain conference in Asia with International Blockchain Congress 2018, with the state governments of Telangana and Goa. Events such as these will definitely lay the groundwork for a blockchain revolution in the country.40 Decentralised applications on public blockchains can solve myriad Indian problems, such as eliminating middlemen, providing data security, reducing corruption and tampering of financial ledgers, and improving the speed of service delivery by governments and corporations.

We are and should be fully cognizant and sympathetic to government concerns of money laundering, tax evasion, investor protection and capital flight. However, the blockchain sector is especially sensitive to regulation. Any regulatory action on cryptocurrencies that misses the nuance of separating speculative activity from core software development inadvertently shuts down core development as well. There are sufficient global examples of countries that have taken nuanced and cautious steps in regulating the technology, and are focusing on stopping illegal activity without hurting innovation. In the current regulatory environment, Indian developers do not have to ability to develop open blockchain solutions at scale. Serious blockchain professionals are migrating rapidly to countries with more friendly regulations. As a result, India's ability to benefit from jobs, capital, local innovation and positioning is all curtailed without the talent ecosystem in place.[41] The government has legitimate concerns around money laundering, tax evasion and capital flight using cryptocurrencies. However, regulating the space is not too difficult with a light touch and intelligent policies.

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