BLOCKCHAIN FOR PROPERTY

A ROLL OUT ROAD MAP FOR INDIA

INDIA INSTITUTE

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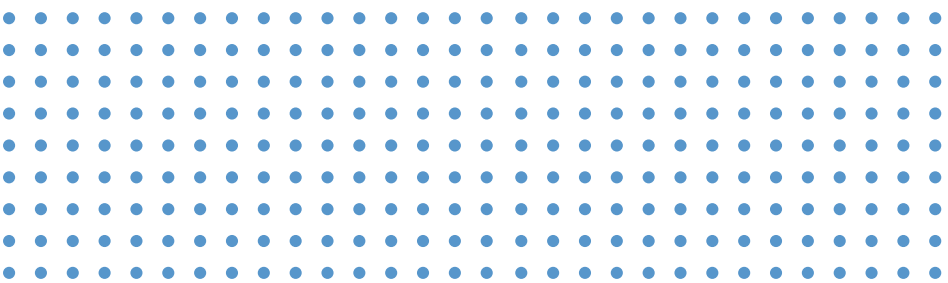

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Foreword

The history of the concept of the blockchain goes back to the early 90's. The first implementable version emerged in 2008, when Satoshi Nakamoto published the white paper that conceptualised Bitcoin and the blockchain. Little did we know how disruptive that document would be just a few years later. The blockchain has emerged as a key innovation that allows us to reimagine our interactions with business, politics and society-at-large.

To the uninitiated as I was at one time, the best way to understand the blockchain is like minutes of a meeting maintained accurately by all the participants of the gathering and secured with cryptologic protocols – or using encryption. That way, every person has a copy (read: public ledger) of the minutes (read: transactions) and is in the position to validate past transactions and process future transactions upon satisfactory validation. Data is owned, run and monitored by everybody without a single party controlling it. This solves the key challenge that has plagued decentralised record keeping for digital transactions: that of "double-spending", a fraud easily perpetrated when the digital token is copied and used multiple times.

The blockchain and its most well-known implementation, the cryptocurrency Bitcoin faced much negative press recently due to high-profile reports of theft, use for illegal activities and the like. Despite setbacks over the recent past, a new Blockchain Protocol 2.0 and its offspring Ethereum, emerged in 2014-15. It shows even greater promise for moving towards a decentralised governance mechanism in all avenues by allowing smart contracts to be executed over the blockchain. Blockchain technology represents a paradigm shift in the social contract that exists between citizens and the State and centralised institutions. It allows for a shift from traditional hierarchies, punitive mechanisms and centralisation to processes for distributed consensus. It stresses the importance of citizens who record and maintain the public record. In this way, the blockchain upholds the ideals of liberalism; albeit with an algorithmic twist. The technology futurist Melanie Swan lists a set of potential governance ideals that the blockchain can empower like direct democracy, societal maturity, and borderless government services, amongst others.

And Swan highlights another key impact: "The endpoint is not lawlessness and anarchy, but that legal frameworks become more granular and personalized to the situation". The blockchain does not seek to invalidate the need and the legitimacy of the state. Instead, it instils a deep sense of personalisation, security and transparency in the citizen's transaction with the state. The state has an inherent interest in increasing the security and checks in transactions involving high-value assets such as real-estate and property. Centralisation of land and property records (which are often in the form of physical ledgers and maps) within the state machinery opens the information to risks

such as theft, loss, unauthorised modification and corruption. Additionally, centralised control offers little by way of transparency and accountability. Unavailability of important information can lead to poor decision making, delays, tedious transaction processes and in some cases even loss of the property itself. So the technology, in essence, provides a classical win-win-solution.

In most countries, I am told including India, these risks are uniquely magnified when one considers the counter-intuitive definition of and challenges in protection for property rights. Poor, rural and marginalised communities fall at the extreme end of the risk spectrum due to challenges to demonstrate a clear title and to seek reparation in case of any issue. When property transfers are secured by the blockchain, we no longer need to rely on a central authority to verify them. Validation of transactions is secured by the code and cryptologic mathematics that secure the chain itself.

I believe this book is being published at just the perfect time. Multiple pilot projects are underway in India and across the world, Sweden, Honduras and Georgia being the prominent ones. With chapters by experts on various aspects of instituting property records on Blockchain, this book can form the basis for a policy framework for distributed ledger systems for property governance to the benefit of many, many individuals and also to society and the economy as a whole.

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Regional Director South Asia
Friedrich-Naumann-Stiftung für die Freiheit (FNF)

Preface

I first heard of blockchain at a conference in New York where Guillermo Pena of Fundación Eléutera presented their pilot, using this technology to plug loopholes in Honduras' land records management system. Blockchain appealed to me as a technology that would be most suited for improving governance anywhere- it combined the ease and efficiency of the Internet with the trust and authenticity of a physical contract. The significance of the advent of blockchain is evident from the fact that the Internet came before cyber security and cyber laws. A Pew Research Centre report quotes Vinton Cerf, one of the creators of internet protocols: "We didn't focus on how you could wreck this system intentionally." Marking a big leap in cyber security, blockchain allows people who may not trust each other to transact digitally by creating records that are immutable and irreproducible. And thereby enhancing the systemic ease of doing business.

One of the immediate applications for such a technological innovation is in the realm of public sector, which, as Transparency International's Global Corruption Index shows every year, inspires little trust in most parts of the world. This year's index also highlights the connection between untrustworthiness of governments, and unequal distribution of wealth and power in the society. The Honduras pilot was exploring the possibility of using blockchain-based registers to restore trust among parties transacting in properties. Soon Sweden and Georgia too started deploying the technology for property transactions.

These developments piqued my interest. Property governance - creating a trustworthy eco-system for transactions in physical property and maintaining their records - has been a challenge for both the central and state governments of India. The scale of the problem is evident from the fact that two-thirds of all civil cases in the country are property-related. Property registration takes months, records have to be verified by transacting parties by procuring documents from multiple agencies, and capitalisation is arduous. Without going into the causes, at the centre of the problem are two issues. One, most of the property related records are incomplete, damaged or not updated. Two, transactions involve unwieldy processes and multiple agencies who also rely on incomplete records. The biggest reform in this sector, the Digital India National Land Records Modernisation Programme (DNLRMP), started a decade ago. This is a project to digitise all land records in the country and fix mapping errors through a resurvey of all lands. Digitisation of records, like digitisation of any other type of record, will improve efficiency of transaction by reducing time taken to update or access records. However, it does not address trust deficiency arising out of cumbersome processes and corrupt practices. Extending DNLRMP to adopt blockchain-based registries for the records will address this issue squarely.

As a broad outline, moving to a blockchain-based land registry would involve the following: creating land records where none exist; correcting discrepancies in existing land records; developing blockchain-based applications for property transactions; formulating protocols for authentication of data and approval of changes to records; putting in place legal and policy frameworks for protection of data; and designing a phased transition from the existing system to the new blockchain-based system.

There are developments by several private and government actors that can be galvanised to make it possible. Under its Digital India campaign, the government of India has introduced several mobile apps for government services. This has already prepared the public for more digital state-citizen interfaces. Most banking institutions too are focused on online transactions. Some of them are already using blockchain-based applications for financial transactions. An application for property transactions will find an existing digital eco-system and acquainted users.

Haryana Space Applications Centre (HARSAC) has designed an intervention that used GIS technology and community involvement to fix discrepancies in land records in a village called Kamal. Similarly, Action Research in Community Health and Development (ARCH) Gujarat, an organisation an organisation working for land rights of farmers in Gujarat, has developed another intervention which also used GIS technology and community involvement to create new land records for thousands of tribal farmers with traditional land holdings. Scaling up these models to address the twin problems of discrepancies in, and absence of, records is key for the success of any reform in land records management. They could even be incorporated into the resurvey mandate under DNLRMP.

Some state governments have already taken the initiative to explore blockchain based registries. Andhra Pradesh, which is in fact establishing a blockchain Institute, has run four pilot projects to test blockchain based applications including two related to land records management. The state has set for itself an ambitious target to be blockchain-enabled by 2019. Telangana has announced that it is preparing to move all its land records to a blockchain-based registry. Other states can take advantage of the experience of these two states, especially with respect to user interface, integrating legacy systems and mechanisms to address problems during the transition period.

Partners of the India Property Rights Alliance have been actively working across many states of India to improve property governance. They, as well as other organisations working for good governance and rule of law, can contribute valuable insights to policy framing and outreach.

In an effort to foster a dialogue between these actors, India Institute, supported by ARCH Gujarat, organised a successful conference on 9 August 2017 where senior government officials interacted with national and international experts involved in property governance and blockchain-based applications.

This book is a continuation of our efforts to steer India's dialogue on blockchain for property governance towards a purposeful collaboration between experts, practitioners and policy makers. In three focused chapters, the book discusses the processes involved in transitioning to a blockchain-based land registry, and legal and policy reforms that will be required. The fourth chapter documents Andhra Pradesh's measures and strategy to adopt a blockchain based land registry. The fifth and final chapter highlights two interventions that are shaping property governance in India.

It is our hope that this publication will act as a ready reckoner to any policy maker or activist interested in implementing a blockchain-based land registry for India. I should hasten to add that the technology being nascent and its extensive use in governance still untested, the book is by no means expected to be comprehensive. More research and studies will be needed in the coming months and years to adapt and customize application of the technology for Indian context. This volume is an attempt to imagine key design and policy questions that would be relevant if India were to move to a blockchain based land records system and answer those questions within the larger legal and policy framework governing the country.

This book would not have been possible without the help of so many people. On behalf of me and my co-editor Vishnu Chandra, I would like to express gratitude to all the authors who wrote several drafts without any commercial considerations and our wonderful designer Sonal Singh.

We also thank the many officers passionate about land records modernisation in various government agencies at the Centre, and in the states of Delhi, Andhra Pradesh, Haryana, Kerala and Gujarat, and the Central Information Commission from whom we received tremendous support in terms of knowledge and information.

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Three people without whose efforts this would not have been feasible need to be thanked here specially. Ananth Padmanabhan who has been involved right from the conception stage of this book, and my colleagues Manoj Mathew and Divya Joshi who have anchored our blockchain initiative so far.

Baladevan Rangaraju
Editor

1

Distributed Land Ledgers: Law, Policy, and Application

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- The current land records management system is outdated, and handicapped by lack of coordination between agencies, delayed updates of records and aspersions on accuracy of documents.
- Blockchain technology proffers a robust solution through real time update of records and transparent transactions, thereby increasing public trust in the system.
- Quintessential for transition: Development of Uniform Economic Transfer Protocol and Public Key Infrastructure, and a comprehensive Titling Law for conclusive titles.
- Transition of digital transactions should be in a phased manner: pilot, develop robust processes and give necessary time for adaptation by all stakeholders.

Introduction

Technology has always disrupted the way hierarchies operate and legacy functions are carried on. It challenges the set order to usher a new paradigm. However, when it comes to certain areas of human activity, technology's gains and offerings cannot be scaled up without policy intervention and proactive regulations. Governance is an apt example of such an area. While the force of technology may nudge people to request for more information and create a polity with a different set of demand expectations, the supply side of the equation cannot change unless there is direct political will and an opening up of the hitherto closed-door style of functioning. Only when the latter occurs can one truly remark that structural change is under way.

For instance, the central government's Digital India initiative is laudable to the extent that it attempts to improve upon the government delivery of service by taking it online using digital technology. The online interface does have significant advantages, including efficiency and time-saving, some potential to reduce corruption thanks to the doing away of a human point of contact, and reducing current levels of information asymmetry. The push towards digital literacy could also go a long way in the large-scale adoption, and even creation over time, of technological solutions by Indians. But does it fundamentally alter the way government employees and departments discharge their functions? The response to this probe is perhaps less effusive and more muted.

In this chapter, we look at one such aspect of governance that requires a drastic revamp in the way it is currently being carried out: *property governance*. As we witnessed recently, in a bid to provide renewed fillip to the economy and deal with the long standing problem of non-performing assets (NPA) found in the books of Indian banks, the Modi government proposed the bank recapitalization scheme to infuse 2.14 trillion rupees into the banking system.[1] While banks have been constantly grappling with NPAs and this measure therefore offers them a *new lease of life*, it only treats the symptom and conveniently skirts around the cause.

The extreme uncertainty and disorganization when it comes to maintaining land records is a definitive contributing factor towards fraudulent games played by borrowers on banks. The present system allows such borrowers to create multiple encumbrances, thereby grossly devaluing the property even while raising money from different lending agencies who miss out on the full picture. It also makes us lose faith in a market where simultaneously executed double and triple transfers are the name of the game. Even though there have been initiatives undertaken by the central government to push for complete digitization, it has met with scarce success and is yet to see fruition.

Financial institutions rely heavily on property for collateral security. Securing property rights is extremely critical as a strong correlation exists between this step and the growth of a nation through increased investments per square metre of land due to certainty and ease of transactions.

It is in this context that the upcoming blockchain technology becomes very important to tackle the ills of the current inefficient system of land records management. It is our understanding that the distributed ledger created on the bedrock of blockchain technology is the answer to travails of India's current property registration system.

The blockchain technology is in its nascent stage of development. It would be pertinent for the

[1] Krishnan Sitaraman, A Lease of Life Called Bank Recapitalization, http://www.livemint.com/Opinion/Bvs4qz9YIJ6FjtJeklw8PI/A-lease-of-life-called-bank-recapitalization.html

regulators to find the fine balance between innovation and regulation in order to ensure that the burden of compliance doesn't hinder the development of the technology itself. This chapter will *first* explore the technology and understand what is blockchain and distributed ledger technology. *Second*, it will explore the problems of the current land records management system of the country and how blockchain is a comprehensive solution in sight at the moment. *Finally,* it will address the legal and policy hurdles in its adoption followed by policy recommendations for its implementation.

Understanding the Blockchain and Distributed Ledger Technology

Blockchain is the technology underpinning the bitcoin, the first cryptocurrency that was developed through it. It came to prominence in 2008 after Satoshi Nakamato, an anonymous developer, published a paper establishing the root of blockchain-based cryptocurrency innovation. It was the first time that the problem of double spending of digital currency was definitively resolved.

The paper defined bitcoin as peer-to-peer version of electronic cash which allows online payments to be sent directly from one party to another without going through a financial institution.[2] It eliminates the requirement of a trusted intermediary to ensure the security of the transaction by introducing trust in the system through decentralization of the data storage and verification process of the transaction. Each computer, called as node, which is part of the network verifies the authenticity of every transaction by solving a complex mathematical equation. Nodes can join and leave the network at their will, with the longest proof-of-work chain accepted as proof of what happened while they were gone.

The transactions are timestamped by the network as they are hashed into a continuous chain of hash based proof of work forming a record that is unalterable unless the proof of work is re-done. The data is encrypted through cryptography and stored publicly. Cryptography is the science which provides security to the blockchain. We need to understand three concepts to appreciate it completely: hashing, keys, and digital signatures.

A hash is a unique fingerprint that helps to verify that a certain information has not been altered without the necessity to actually see it. Keys are both public and private. Public key is used by the sender of the information to encrypt it which can then only be decrypted by the owner of a private key. It is like a locker of the bank which requires both keys for it to open. A digital signature proves the authenticity of a message or document through mathematical computation.[3] Cryptography gives public visibility but only private inspection. It ensures that the privacy is protected and at the same time authenticity is guaranteed without jeopardizing the security of original documents.

Because the information available on the blockchain is accessible by every participant, it contributes to trust-building. Blockchain is an approach that binds multiple computers together that follow the same "consensus" process for recording the information held by them. Every time a consensus is reached by the majority of nodes, which run algorithms to evaluate the

[2] Satoshi Nakamato,"Bitcoin: A Peer-to-Peer Electronic Cash System", https://bitcoin.org/en/bitcoin-paper.

[3] William Mougayar, THE BUSINESS BLOCKCHAIN.

validity of the transaction, it gets recorded on a "block" as it is a storage space. It creates a chain of blocks which run back to block number one which makes it almost impossible to alter the data. This is then distributed on the ledger across the network. Therefore, even though data may be lost on one node, it does not impact the system.

A blockchain can be public or private and each comes with its own advantages and suitability for application. A completely public blockchain, such as Bitcoin's, is based on global consensus. In other words, every single node that participates in the system agrees on the state of the blockchain. This structure has many benefits. However, it restricts the number of transactions per second and utilizes enormous computing power. Considerable time is taken to reach the consensus with regards recording of transactions. It may not be ideal for say financial transactions as funds and shares etc. change hands in millions of transactions per minute. Volume of transactions on a public blockchain is indeed a challenge that needs solution.

A private blockchain is more suited for transactions which require a high level of security but does not depend on high speed and low latency, unlike stock market. In a private blockchain, there exists a few pre-determined approvers who validate the authenticity of transactions while the records are publicly accessible by all participants. It works well for real estate transactions where government has to authenticate the transactions and real time transaction is not of the essence. Various financial institutions, governments and central banks across the world are looking into blockchain to evaluate its usage for increased efficiency and transparency of the existing systems.

Distributed Ledgers

A distributed ledger is essentially a database that keeps track of who owns a financial, physical or electronic asset. Blockchain is the technology and distributed ledger is the application of the same. A copy of the blockchain created through consensus is kept by everyone on the network on this ledger. Every new transaction is automatically updated. Bitcoin is often pejoratively associated with the nefarious silk route and the funding of terrorist activities. Because of this, certain misconceptions exist about blockchain technology itself. The distributed ledger offers umpteen benefits to the government and financial institutions due to certain of its properties:

Reconciliation through cryptography:

A number of businesses, organizations, and governmental actors share messages and pass on details. However, once sent, the data is then updated in the institution's personal ledger. It is difficult to ensure that these are identical and there exists no discrepancy, due to the possibility of active tampering or plain human error. The ledger solves this problem as different users have to come to a consensus with regards underlying data for it to be recorded by way of consensus algorithms.

Replication avoids failure:

Since all the parties are in possession of a copy of the ledger, it wards off the situation of single point failure. The parties can also perform reconciliation calculation themselves.

Granular access control:

Distributed ledgers deploy keys to control who will perform what function inside the ledger. Specific capabilities can be awarded under specific situations. For instance, a regulator may have a "view all" key to monitor every transaction of the institution but it can only do so when it is given permission by a key owned by the courts.

Granular transparency and privacy:

Due to access to the ledger and collective verification (as explained above), it provides high degree of transparency. The regulators and courts can verify with certainty that a fraudulent entry hasn't been made to the database. It makes it extremely important for regulatory compliances and declaration along with fraud detection. Unique cryptographic signature ensures privacy, as well as identifies whether each participant has uploaded the appropriate records as per relevant rules.

Smart Contracts

Smart contracts bear varied meanings depending on who seeks to define them. It is understood very differently by a computer scientist and a lawyer. For a legal professional, contract has specific connotations; it comes with certain legal obligations, rights and duties based on performance of pre-agreed terms. The computer scientists look at it in terms of code. Therefore, there exist two different schools of smart contract.[4] Smart legal contracts where it refers to legal contracts being represented and executed by software. Smart contract code is more of a piece of code which is designed to execute certain tasks on fulfillment of certain pre-defined conditions. These tasks are embedded and performed in a distributed ledger.

However, for our understanding, the definition of Clack, Bakshi and Braine can be used.

"A smart contract is an automatable and enforceable agreement. Automatable by computer, although some parts may require human input and control. Enforceable either by legal enforcement of rights and obligations or via tamper-proof execution of computer code." [5]

Smart contracts are the enabling technology, but the resultant effect can be converted into a legal agreement. For instance, share ownerships can be transferred by a smart contract between two parties. As of 2016, the full legal ramifications around smart contracts were a work in progress.

Smart contracts make the breach of an agreement come with actual and real time cost as by "digital means", they exercise control over a real-world valuable. Therefore, a functional implementation of a condition can be enforced via a smart contract. Proof of certain conditions being met or not met exists on the distributed ledger. The implementation can be very strict, say, non-payment of installment on-time can get the asset digitally locked until the receipt of payment.

The Labyrinth of Land Records Administration

Even in 2017, the accurate, up to date and reliable record of land acquisition, land transfer, and land allotment remains absent across India. Forceful acquisition and illegal transfer of lands threaten the livelihood of lakhs of people living in urban, semi-urban and rural areas across the country.

It is a gargantuan task to bring any sort of uniformity in keeping the land records and having one single system primarily for two

[4] Stark, J. (2016). Making sense of blockchain smart contracts. http://www.coindesk/com/making-sense-smart-contracts/

[5] Clack, C., Bakshi, V. & Braine, L. (2016, revised March 2017). Smart Contract Templates: foundations, design landscape and research directions.

reasons. One, landholdings are majorly small or marginal and the percentage of such landholding is only increasing, standing over 78% at the moment. This means that the frequency of transfer of ownership is immense and so is the work of recording each one of them. Second, every state has its own particular format and mode of recording which makes it difficult to vie for uniform records of the land.

An ambitious digitization programme was undertaken by the Central Government in 2008 under Land Records Modernisation Programme. The scheme was supposed to computerize land records in all districts by 2017. The scheme did not make much headway due to operational challenges and huge gaps between the scheme and its implementation. Lack of computer training for field staff, lack of private contractors to update records and absence of will of the administration resulted in the non completion of the modernization drive. In 2016, Digital India Land Records Modernisation Programme (DILRMP) re-launched the scheme with the aim to streamline the conclusive titling of the immovable assets through *"computerization of all land records including mutations, digitization of maps and integration of textual and spatial data, survey/ re-survey and updation of all survey and settlement records including creation of original cadastral records wherever necessary, computerization of registration and its integration with the land records maintenance system, development of core Geospatial Information System (GIS) and capacity building."* [6]

The conclusive titling, which is the object of the DILRMP scheme, faces an uphill challenge in India. The maintenance of land records has been clubbed with record of rights and cadastral surveys which feature in the Constitution in entry 18 and 45 of list II of Schedule VII. We follow a dual system of keeping both land records and land registrations. The practice of keeping land records began during the colonial era as the British used it for ensuring revenue collection in the form of taxes. Land records were kept in the rural areas except for forests while urban areas resort to land registrations. Land records are managed by Department of Revenue while registrations are the domain of Department of Stamps and Registration.

The land records exist purely for the purpose of collecting revenue and titles are only presumptive in such a situation. Registration on the other hand is only recognized as an agreement between two parties for transfer of property. It is not a testament to its underlying legal validity and is subject to challenge before the Indian courts. A registrar will register a transaction in the absence of countervailing claims as the Registration Act, 1908 does not mandate the vetting of validity of documents. [7]

CAG report of 2015 recorded pendency of about 1.5 lakh registrations.[8] Lack of coordination between the agency and delayed updates of records casts aspersions on the true and accurate ownership of the land. Because of this uncertainty, the lower level officers such as patwari have to be paid bribes to process a transaction. It also leads to formal channels of credit becoming inaccessible to small farmers as their property cannot be used as a collateral. It also drives the increase in the interest rate for lending due to fear of NPAs making the credit expensive.

A lot of times, the farmers pay off patwaris to receive falsified records of crop failure to receive crop insurance. It drives up the premium for receiving such an insurance which has been made compulsory to receive loans, hence affecting the small farmers yet again. There

[6] National Land Records Management Programme Website. http://nlrmp.nic.in/

[7] Meghna Bal, Securing Property Rights in India through Distributed Ledger Technology, available at http://www.orfonline.org/research/securing-property-rights-india-through-distributed-ledger-technology/

[8] Hari Charan Behra, "Constraints in Land Records Computerisation", Economic and Political Weekly.

exists no integration of digitized land records and land registration data in various states which makes verification of submitted documents for registration difficult. Hard copy of survey maps become torn, brittle and faded over time. For instance, only 49% of such records are in good condition in Andhra Pradesh out of 5 million land parcels.[9] It also leads to delay in access of these records and requires multiple visits to the relevant government offices. Last but not the least, a centralized database is subject to cyber attacks resulting in data theft, loss and manipulation of records.

In a nutshell, the current problem can be crystallised thus. Firstly, Government in a transaction is only involved in a few steps right at the end of the real estate transactions i.e. for registration of sale deed. Consequently, the process is not transparent for the public and other stakeholders. Second, the land records system takes ages at registering real estate transactions that often take months from the point of signing a legally binding contract to its final registration and updation in the records of the registry. Third, all of this has led to creation of their own complex processes for agreements by sellers, buyers, banks and real estate agents, to ensure the safety of the transaction, often large in value, thereby creating inefficiency.

Blockchain as a Solution

It is here that the blockchain technology can offer a solution to India's ailing problems of land administration. Blockchain technology, by creating verification records for the digital files, in this case the verification documents of land or transactions, will make them uniquely identifiable 'fingerprints' of the original files. Each verification record will be converted into a "block", creating a chain of all such records. It will be made available for public viewing without compromising the security. The private blockchain can be used with the registrar's office, revenue department and other government nodal agencies, banks, insurance companies etc. being the verification actors with their unique keys and roles. The role and functions of all the actors will be governed by the regulations which can be embedded in the blockchain through the smart contract code reflecting such regulations.[10]

The platform that will connect all the stakeholders is known as Uniform Economic Transfer Protocol and the rules, regulations etc. which will be embedded are known as the Public Key Infrastructure. Both of these are extremely necessary for successful implementation of blockchain in India.[11]

Adoption of blockchain technology brings in unique solutions to the table along with it. First and foremost, the public records and accessibility creates a new trust regime amongst the population and investors as they can verify the veracity of the ownership themselves. It eases decision making with regards a transaction at the very beginning and not post facto. Most importantly, it has the potential of transferring the conclusive titles of the property on the same day itself. At present, once the transaction is finalized, the tehsildar has to submit a demarcation of land to the registry before the registrar can register the deed. This document helps the registry verify that the transaction is indeed of the same property as has been claimed in the documents. It takes anywhere between one month to three months for the tehsildar

[9] Id

[10] "The Land Registry in the Blockchain", Swedish Land Registry Report by Lantmäteriet, Landshypotek Bank, SBAB, Telia company, ChromaWay and Kairos Future

[11] Id

to create the document. The documents are only prepared on payment of the bribe.[12] The existence of open, accurate public records will reduce not just the time taken for creation of these documents but also the instances of bribes through reduction in reliability on the tehsildars. Transfer of assets will become cost effective and efficient.

Further, the authentic data will help the banks also be certain of the ownership and will make it easier for them to grant credit to the farmers and SMEs. It will increase the credit coverage and will bring down the high interest rates as per the studies. It will also aid insurance companies to reduce insurance premium for immovable properties due to surety of titles hence enabling more people to avail of the insurance at lower cost. Lastly, increased economic activity due to the ease of business emanating from improved transparency and other above-mentioned advantages will push the growth rate up in a developing country like ours.

Identifying Implementation Hurdles and Policy Pathways

It is an ambitious project to move the entire land records administration system on the blockchain. It will require a steady and committed approach from the government given the costs that would be involved and the gains, both being high, thus calling for a systematic and planned approach.

To begin with, it is important to acknowledge that the blockchain technology is still in its nascent stage. It is still resolving internal problems at present. While taking regulatory decisions for the technology, it is indispensable to first take time out to understand it. The regulation needs to be supportive of the technology and shouldn't lead to stunting the technology itself through over regulation. A fine balance between regulation of underlying technology and innovation has to be struck to unveil its real potential.

First, the biggest obstacle in the way of implementation is the absence of digital records of the land and conclusive titles. The blockchain technology is dependant on existence of an already verified and digitized land records. It will allow for real time updation and verification but as its base, it will need the digitized records to be converted into a hash and put into the block. Digitisation of land has to be completed which has been pending for atrociously long with the exception of the State of Karnataka. Post the digitization of land records, titling will also need to be finalized. A cue can be taken from Rajasthan Urban Land (Certification of Titles) Act, 2016 through which the provisional certificate for titles are provided which need to be challenged within a timeline post the issue. If a third party then successfully challenges the title in the court, the government ensures the compensation to the buyer.

To remedy the lacunae, legislation by the relevant government will need to be passed along the lines of the Rajasthan law. The act can provide for completion of all proceedings before the courts under the act within two years. The timeline can approximately be the same for completion of digitization of rest of the land records along with these titling certificates. The Department of Land Resources in the Union Ministry of Rural Development has to play an instrumental and collaborative role in addressing these land policy issues.

[12] Supra Id 8. The duration has been arrived at based on authors' interview of land brokers and the upper time limit prescribed for delivery of service under specified rules. The brokers suggested that upon non-payment of requisite bribe, the service is delayed and because of non-existence of records, often times, extreme discretion at the hands of tehsildar leads to land being shown to be disputed.

Further, the technology is yet to be tested for scalability for pan India implementation. Even though it will be on a private blockchain where high level security exists without requiring high number of transactions at low latency since property transactions aren't as ubiquitous as say digital payments, it still needs to undergo a pilot to find out the technical challenges that may crop up for its implementation on a national scale. Therefore, a suitable district with cent percent digitization needs to be identified; appropriate service providers need to be approached by involving experts in the technology. Learning from the pilot needs to be extensively mapped and possible problems need to be predicted to perfect their solutions.

The government personnel will be inept at the moment to adopt this technology as desired. There needs to exist a continual training for the upgradation to this new system. The officers need to be normalized to the idea of technology and be made comfortable with its usage. It will require a sustained effort and a top down leadership to enable them to embrace this change. Dubai passed a law[13] to make almost every government service to be taken on blockchain to save paper and millions of man-hours by 2020. The Act sets a deadline that has to be abided. India also needs to set realistic timelines and work towards achieving them. It will depend on the synergy between drives for digitization, titling, political will and embracement of technology by the officers on the ground ultimately implementing the technology.

Finally, a policy cannot be made while being divorced from the socio-economic reality of the demography. In the absence of cent percent literacy amongst the population let alone digital literacy, broadband penetration, access to smart phones and computers by a majority of the population of the country, the entire process cannot only be performed on a blockchain platform. There needs to exist a dual system, that is, an option to use the online services but the age old process of going through the paper documents submission at the government office to avail of any service should be done away with in a phased manner. Those who wish to avail the benefits of a quicker, more efficient system can do so directly through blockchain. The land agents and brokers, who exist in the current system as well, can take up the role of service providers of registry using blockchain to those who find it difficult to adapt to the new technology. These agents can be regulated via guidelines and mandatory registrations to protect the interests of the poor. Literacy and more so digital literacy will catch up with time, and until then these makeshift measures need to be adopted. However, a cost to benefit analysis seems to suggest that its overall benefit will accrue to the country in plethora of ways as highlighted throughout the paper. A final decision on the mode of implementation of the transition on a national scale can be taken based on the report of findings of the pilot project.

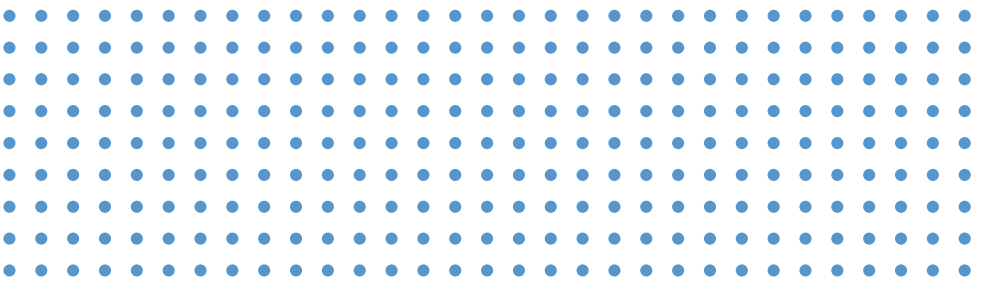
[13] http://dubaidata.ae/dubai-data-law.html#highlights

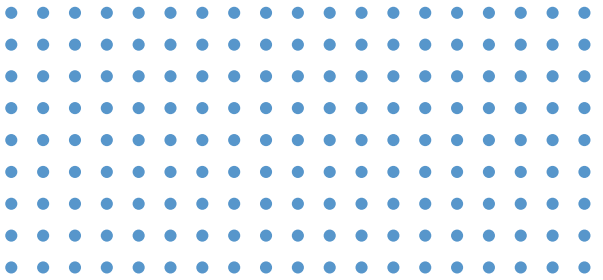
Conclusion

Blockchain is a disruptive technology, which is taking the world by storm in a plethora of areas where there was a centralized entity hitherto. Governments must work with the technology to reap the benefits that it has to offer, which weren't possible a decade ago.

The governments across the world: Sweden, Honduras, United Kingdom etc are experimenting with the technology, with Sweden even conducting a pilot for land registry through blockchain. India should also join this league to adopt blockchain to secure the property rights of its citizens. As discussed here, the current state is one of extreme jeopardy due to lack of trusted, transparent and up-to-date database.

The technology offers security along with transparency. The solution is not easy and will require the administration to engage with its functionaries with a never-before velocity to break the inertia that is blocking land records modernization in India. If successfully executed though, blockchain, with all its promised benefits, could be that silver bullet solution to cure India's land records administration woes.



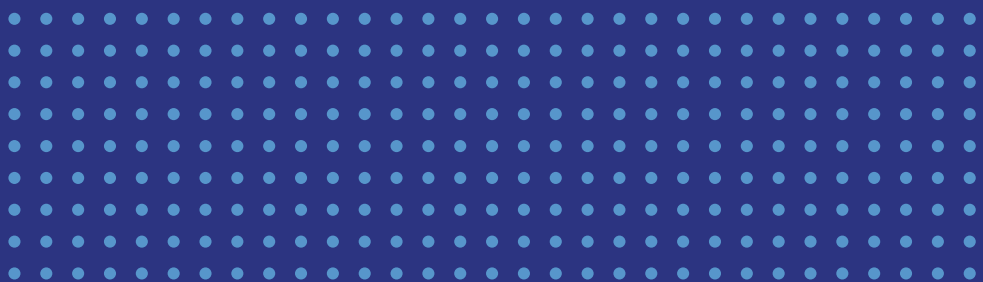


2

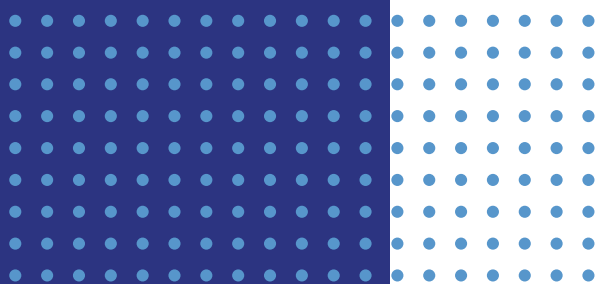
Designing a Blockchain Solution for Property Governance in India

Or Perelman
COO & Co-founder, ChromaWay, Sweden

Baladevan Rangaraju
Founder-Director, India Institute



- A dispassionate assessment shows blockchain is best suited for trade finance and property governance.
- Blockchain based property transactions will be secure and real time through mobile and web apps.
- Trust, transparency and efficiency in property transactions will strengthen good governance, and reduce the volume of property related litigation in the country.
- A solution with a centralised database is likely to be less costly, but would offer vastly reduced security and minimal improvements over current processes. We know no other technology that has enabled a trustworthy solution for creating, enacting, verifying, storing and securing digital contracts.



Blockchain is a technology that allows building of applications for storing data in the form of distributed ledgers. Distributed ledgers are digital record books copies of which are with multiple people and get updated simultaneously, making alteration to the data without the knowledge of all who have copies of the ledgers virtually impossible. For the same reason, it is well-nigh impossible to create new copies of the ledgers on the sly. This security feature of blockchain differentiates it from all other decentralized technologies. It is also the reason for blockchain being considered by experts as the most suitable architecture for dealings involving multiple stages and actors such as trade finance and property transactions. No other technology has been shown to combine such a high level of security with flexibility for universal application.

Still, only three countries have taken serious steps to employ blockchain for property governance. Honduras, Sweden and Georgia. That is understandable since policy makers have to make a dispassionate assessment of the long-term benefits of adopting a new technology for a critical public service like property gorveranance. In this chapter, we discuss three fundamental questions that we believe will help make that assessment for India.

1. How will a blockchain based property registry work?
2. How will a blockchain based property registry promote good governance?
3. How efficient will a blockchain based system be compared with the present system of property transactions?

How will a blockchain based property registry work?

1. All the actors involved in a transaction will have a digital file representing the agreement of ownership of the real estate, mortgage deeds and the transaction processes. These files can be stored in the cloud, locally, or at some other location of the actor's choosing.
2. The authenticity of the process, the signatures, the file confirming ownership, mortgage deeds etc. will be secured with a blockchain by the land department[1], but the blockchain will also be stored and validated by other actors. It will therefore be easy for authorised third parties to verify information. These third parties would usually be actors who are part of the process: banks, buyers, sellers, real estate agents etc.
3. Keeping privacy laws in mind, the land department can choose what information related to the property/ transaction will be public and keep the rest confidential.
4. The only way to steal a property will be by entering a new real estate transaction process with stolen or forged identification. To counter this, the security of the ID-solution can be improved to include more stringent identification procedures such as photos of physical ID-cards, biometric identification where available, multi signatures etc.

[1] Throughout this chapter, considering that the exact sequence of processes and names of agencies involved in a property transaction may differ from state to state, we use the generic term "land department" to refer to the appropriate government agency responsible for a particular process. Similarly, "land records" would mean any and all relevant land related documents such as title records, tenancy records, mortgage records, cadastral maps etc.

How will a blockchain based property registry promote good governance?

Three security features synonymous with blockchain are irreplicability, immutability and verifiability of records. These three properties of digital solutions were very difficult, or even impossible, before the blockchain. Their significance is evident when we consider what their absence has engendered: corruption, fraud and usurpation that have come to plague the real estate sector. Secure transactions on blockchain can form the bedrock for strengthening the good governance principles of ethical conduct, fairness and efficiency.

1. Irreplicability

If we look at a central bank that is about to issue fiat money to the market, we can easily identify some of the concerns that they would have. The quite obvious concern of outmost importance will be that the notes must be very difficult to copy. If everyone could take a home printer and make thousands of copies of their currency notes, the notes will soon be worthless. The same would be true for digital currency. If a central bank wanted to issue money in digital form, it would still be crucial that the money cannot be copied. However, such a property of the digital world did not exist until recently. Bitcoin was the first to solve this 'doublespending' (using one set of digital coins to make multiple payments leading to a consequence similar to that of counterfeiting currency notes) problem. Perhaps the main reason for this is the possibility to create transferrable digital units, which are more or less impossible to copy. If one wanted to create a digital IOU, and be sure that there are no copies of that IOU, and that its properties are securely preserved, then blockchain is the only known solution today.

2. Immutability of records and processes

While digitization has come far in many respects, one handicap it has been suffering from is the ease with which a digital file or photo can be manipulated. It is well known that the Internet is full of fake documents and pictures that have possibly led to decrease in public trust of anything digital. In the present system of land records, if a corrupt but tech-savvy person makes changes in some documents, it is very difficult to detect who made the changes and when they were made, or to notice at all that any change has been made.

With the blockchain it is now possible to make sure that a digital file, register, patent, video etc. is still the same as it was when it was first registered on the blockchain. If we want to digitally represent binding contracts, it is of paramount importance that they be impossible, or at least very hard, to manipulate.

Blockchain also offers immutability of processes. The most discussed example of such a process is trade finance, where a series of actors have to confirm what they are doing at various stages in the agreement. They have to take responsibility for the goods being shipped and confirm the process for actors throughout the chain of transportation. Securing a process is also valuable in a contract such as a purchasing contract of real estate. It is important for all parties involved to be confident that all other parties are signing the contract in an acceptable order. This also makes it possible to proceed even if some of the actors are not physically present. This may also be of help in securing processes related to objects connected to 'the Internet of Things'. It is very important to prevent or detect

any manipulation of the processes these products are involved in before they do any damage.

3. Verifiability

A central part of blockchain technology is the ability to create unique verification records of digital files. For example, photos, transaction lists, registers, agreements, video films, patents, etc. Essentially, this includes everything that can be stored as a digital file. Using an advanced "fingerprint algorithm", any digital file can receive a unique code. This is technically called a cryptographic hash.

An example of an algorithm that creates cryptographic hashes is SHA256. This algorithm takes all of the ones and zeros that describe a digital document and recalculates them in a repeatable but irreversible way. An illustration of how an algorithm like SHA256 works is: take every third digit in the file, multiply the number by 7, and divide the total by every fourth number in the file. Combine every number not used in the previous calculation to the number you have. In the end, a series of digits and/or letters is created, in other words, a hash.

If the same digital documents and the same encryption algorithms are used, the result will be the same hash. However, it is not possible to reverse engineer, that is, to understand what the file that created the hash looked like. The hash includes just a few characters, for example, 32 numbers and letters. In the same way that a fingerprint is unique for a person, the hash is unique for a digital file. So, in the same way one cannot imagine what a person looked like based on their fingerprint, one cannot know what a digital file looked like based on its hash.

Here's an illustration from property governance: Let us say an agreement to sell for a land parcel is scanned and becomes digital. The hash that is created from the document is unique. If a bank receives that agreement to sell via email, the bank can see that the document is correct. The bank will take the document and run the algorithm SHA256 on the file. The bank can then compare the hash generated with the hash for this document as mentioned in the list of verification records, assuming that it is already available with the bank. The bank can then trust that the document is the original sale deed. If someone sends an incorrect contract, the hash will not match. Thus, despite the fact that email has a low level of security, the bank can feel confident about the authenticity of the document. It is the verification records — the hashes — that are saved on the blockchain. We can imagine the advantage of the land department creating its own database of verification records. Different agencies involved in property governance can then check the authenticity of documents and files from cross-referencing the list of verification records.

The owners of the agreements, documents, images, patents, etc. also benefit from having the list of verification records distributed to more stakeholders. A high level of redundancy reduces the danger of a single list of verification records disappearing. When multiple people have access to the verification file, the trust in that file grows. Everyone can therefore be confident that their document is considered authentic because multiple people have access to the verification records. Here, the blockchain is a way of saving the list of verification records. When the number of hashes grows very big, a format called a Merkle tree can be used to convert multiple hashes into one to save space in the block.

The blockchain is called so because each block is linked back to the previous block. Each subsequent block gets a hash, i.e. verification, of the previous block, which makes it difficult to cheat by creating another version of what happened. For example, it is not possible to enter

a new verification into an old block without changing the subsequent blocks. If a lot of people have saved the blockchain, they can see that changes have been made and that the manipulated blockchain is not authentic.

The blockchain and its verification records can be accessible to a large group of actors. The persons who approve which verification records will be accessible can be a mix of private and public actors, and in these cases several actors can approve transactions but not just anybody. In the future, we can imagine that private organizations and groups of IT companies, banks, central banks and other agencies would have blockchains that they monitor and regulate. While approval of the blocks is limited, access to the verification lists can be open to a group or to all to expand the scope of its utility.

How efficient will a blockchain based system be compared with the present system of property transactions?

This can be best assessed by taking an example transaction. Let us compare the processes involved in a property transaction in India at present with the processes that will be involved in an imagined blockchain based system for the same transaction in order to showcase the benefits that the latter would accrue.

The most common real estate transaction is the purchase of a private residence. Let us first review the process involved in this transaction as it stands today. Real estate transactions by private persons via real estate agent today involve the following seventeen steps, which often take 3-4 months to complete.

1. A property owner wants to sell her property.
2. The property owner, i.e. the Seller, contacts a real estate agent and draws up an agreement for managing the sale of the property.
3. The agent collects records of the property from the land department in order to check the information about the property, i.e. that the seller is in fact the owner and is eligible to sell the property.
4. The agent puts the property up for sale and markets the property to potential buyers.
5. The Buyer goes to a bank, the Buyer's bank, and asks for a loan commitment. The bank checks the Buyer's credit rating and approves the loan commitment up to a specified limit.
6. The Buyer (assuming he is the highest bidder) makes an initial inquiry about credit options for the specific residence with the Buyer's bank.
7. The Buyer's bank evaluates the property, does due diligence of the property accessing the same records from the same department as the agent to satisfy itself of the legitimacy and legality of the property.
8. The bank approves the purchase price and loan.
9. The agent checks that the Buyer actually has a loan commitment from the bank.
10. The agent arranges for signing of the Agreement to Sell between the buyer and the seller. Often four copies of the contract are created, one for the seller, one for the Buyer, one for the agent and one for the Buyer's bank.
11. The contract is sent by the Buyer to the Buyer's bank.
12. The bank sends credit documents to the Buyer.
13. The Buyer sends the signed loan agreement to the Buyer's bank.

14. The Buyer's bank receives the loan documents.

15. Buyer's bank makes the payment to the seller.

16. After this step, the main process remaining is to actually sign the sale deed, transfer the possession of the property and register the sale deed with the land department.

17. Seller and/or Buyer pay their commission to the agent.

Summary of the current situation

What we see above is that the land department is involved relatively late in the process. Not until stage seventeen does land department make any active decisions or receive any of the submitted documents. Prior to that, it is primarily the agent who provides records to check the ownership of the property. Land department is the actor with the highest credibility, and if land department is involved earlier, the confidence and transparency in the process would increase. Second, the processes are cumbersome and take a long time. There are likely advantages with the process because the buyer and seller of a residence will often want to have time to sell the previous residence and find a new one. It also takes significant time to prepare all the information. All the actors have to separately check and validate the documents. Information that is already listed in the Agreement to Sell is written again into the sale deed.

Third, there is a lot of paper work. Checking the documents and the identity of the people who signed them must be done manually. Agents, buyers and sellers can be sitting for two hours signing several hundred pages of documents when signing the agreement to sell, and applying for the loan since all of the documents and often all of the pages in several documents need a signature or initials written by hand. This takes time and the amount of documentation and information that must be saved also leads to mistakes.

Property transactions on the blockchain

Now let us compare the current processes with the processes for the same transaction on an imagined/ future blockchain application.

Current Process:

1. A property owner wants to sell the property.

2. The property owner, the Seller, contacts a real estate agent and draws up an agreement for a real estate sale.

Future Process:

The property owner can check their ownership and whether there are any obstacles to the sale by themselves using an app from the land department and by verifying their identity via their mobile phone. The property owner, the Seller, contacts a real estate agent and commissions the agent to sell the property via the app. The agent accepts the offer to manage the sale of the property. In practice, the agent can also guide an individual through these steps in the app.

Current Process:

3. The agent collects records ofthe property from the land department in order to check the information about the property, i.e. that the seller is in fact the owner and is eligible to sell the property.

4. The agent puts the property up for sale and markets the property to potential buyers.

5. The Buyer goes to a bank, the Buyer's bank, and asks for a loan commitment. The bank checks the Buyer's credit rating and approves the loan commitment up to a specified limit.

6. The Buyer (assuming he is the highest bidder) makes an initial inquiry about credit options for the specific residence with the Buyer's bank.

Future Process:

In the future, this step will be superfluous because the agent can see the information directly in the app and any applications for changes in the property registry are communicated immediately.

Current Process:

7. The Buyer's bank evaluates the property, does due diligence of the property accessing the same records from the same department as the agent to satisfy itself of the legitimacy and legality of the property.

8. The bank approves the purchase price and loan.

9. The agent checks that the Buyer actually has a loan commitment from the bank.

Future Process:

In the future, the property does not need to be questioned again because the latest information is always available and can otherwise be checked directly in the app. The Buyer's bank can provide preliminary approval of the loan so that the agent and the Seller can be confident that the Buyer has the ability to pay. The Buyer's bank is given access to the property records via the app and the bank can check the same there. Information about the condition of the property, inspection report etc. can be included in the app or linked to the app.

Current Process:

10. The agent arranges for signing of the Agreement to Sell between the buyer and the seller. Often four copies of the contract are created, one for the seller, one for the Buyer, one for the agent and one for the Buyer's bank.

Future Process:

The necessary information is registered in the app, e.g. date of possession and purchase price in digital fields, which reduces the risk of the contract being incorrectly formulated. Signatures are provided in the app using ID solution. Everyone involved can retain a copy of the agreement and the verification record in the blockchain in their mobile phone or computer for extra security. The contract cannot be lost or falsified. If anyone wants to print out a paper copy, it is easy, but it is then just a copy that is only valid for the time when it is taken out. The contract is also shared with the land department, which registers the pending property title at no cost until the final verification record for the transfer (sale deed) is executed. The information about the purchase price and the property can be made public if need be, which provides security for the Buyer and Seller and is important information for entities like the Ministry of Statistics and Programme Implementation and Reserve Bank of India.

Current Process:

11. The contract is sent by the Buyer to the Buyer's bank.

12. The bank sends credit documents to the Buyer

13. The Buyer sends the signed loan agreement to the Buyer's bank.

14. The Buyer's bank receives the loan documents.

Future Process:

The Buyer's bank can see the signed contract in the app and does not need duplicate paper work for confirmation. The credit documents can be attached to the app and signed directly when the agreement to sell is drawn up. It is possible to make the credit documents accessible only to the Buyer and the Buyer's bank. If the Buyer does not want to display to other parties how much money is being borrowed , access to the credit documents can be encrypted or sent outside of the app. The Buyer can sign the loan documents as well as the payment order directly with signatures in the app.

Current Process:

15. The buyer's bank makes the payment to the seller.

Future Process:

The bank can make payment to the seller directly because the Buyer signs the payment order digitally.

Current Process:

16. After this step, the main process remaining is to actually sign the sale deed, transfer the possession of the property and register the sale deed with the land department.

Future Process:

The pending property title is already granted and the process of verifying the agreement can proceed more quickly through automated decisions because the risk of incorrect formulations in the sale deed is reduced when this is done using digital fields.

Summary of advantages in the blockchain based system

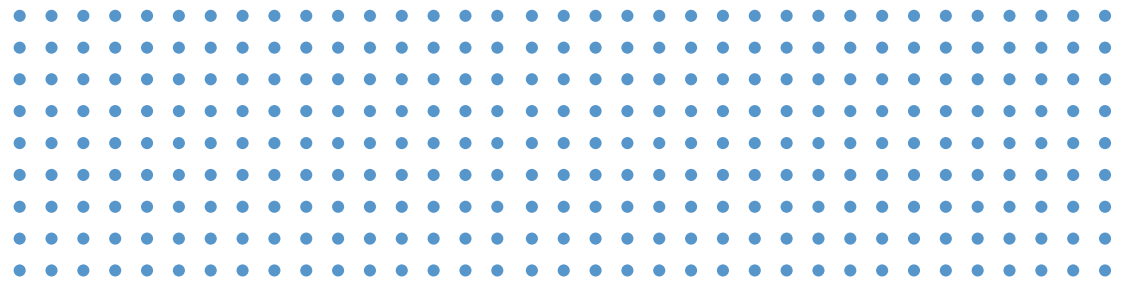
As can be seen, the future process example indicates a number of improvements over the current process. The time between when the agreement to sell is drawn upand when the pending property title is registered with the land department can be reduced from 3-4 months to a just few days. Eventually, this could take place more or less in real time. This also adds security against corrupt practices as the Buyer is granted the pending property title, and the property cannot be sold a second time by the seller. The information that is needed for the sale deed is already registered in the system for the most part. Therefore, in practice, the buyer and seller sign the same information upon taking occupancy. The risk that the property title will not be granted is sharply reduced since the system can ensure that the information that is required by law is included in the system and is required by the system before the parties are able to provide their signatures.

Will transitioning to a blockchain based registry involve major investment on hardware?

Overall the technology has a small footprint and is expected to run on existing hardware. This does not mean that it will be easy or fast to implement but it is also not likely to involve more investment than other large technological implementations entail in general. A solution with a centralised database is likely to be less costly, but would offer vastly reduced security and minimal improvements over current processes. In the absence of other technologies with similar security guarantees, it is hard to make a comparative assessment of cost.

If it is possible to achieve the security and

transparency accorded by blockchain on the technology currently used for storing digitized land records, then making the transition to blockchain will be a wasteful exercise. But no one has demonstrated a trustworthy solution for creating, enacting, verifying, storing and securing digital contracts on the current technology framework. Until such a solution presents itself, the blockchain and the technologies described in this appear to be a solution with great benefits and worth the investment.



3

Policy Framework for Protection of Big Data in State Possession

Nikhil Narendran[1]
Partner, Trilegal [2]

[1] Opinions are personal and does not represent the Firm's views
[2] Prepared with assistance from Saahil Dama, Associate, Trilegal

- Big data cannot exist in silos. Interdisciplinary data often reveals interesting patterns and can help solve governance issues.
- One of the biggest challenges with respect to big data is the fear of discrimination and profiling. The government should engage in responsible and ethical big data processing.
- The government should come out with a big data policy detailing its commitments and vision with respect to use of big data for governance.
- Big data should not lead to privacy concerns and if it does, the proposed privacy legislation should take care of such concerns.
- Big data processing as such need not be regulated.

The term 'big data' denotes exponential growth both in the availability and in the automated use of information – a gigantic digital dataset held by corporations, governments, and other large organisations, which is then extensively analysed using computer algorithms.[3] The Department of Science and Technology defines big data as data whose scale, diversity, and complexity require new architecture, techniques, algorithms, and analytics to manage it and extract value and hidden knowledge from it.[4]

Big data is not an independent phenomenon, but is linked to technological advancements and social evolution. The advent of automation and internet of things (IoT) has led to machines collecting and processing large amounts of information and transmitting such information inter se. Specifically in the public sector, the government's renewed focus on e-governance, Digital India and Aadhaar-enabled public distribution system would result in it collecting and processing vast amounts of data about citizens. Big data analysis will also form a significant part of the government's Smart City Mission whereby the government and other private service providers in smart cities will possess real-time information about the residents and their activities. This data could be processed to arrive at the best possible ways of delivering services and improving infrastructure.

The benefits of big data in governance are countless. It can lead to a better understanding of the problems faced by public, help in improving delivery of services, and enable tailoring of measures as per public requirements. For instance, the government can analyse data about the traffic patterns in a city using location information of mobile phones in transit and use it to ease congestion.

Big data could also be used to make intelligent governance systems which take away discretionary powers and could reduce red-tapism and corruption. For instance, if property registration is automated, an automated decision could be made with respect to: (i) validity of title based on digitised records; (ii) adequacy of consideration based on existing valuation guidelines; (iii) stamp duty and registration charges payable by way of formulae; (iv) eligibility of parties to purchase property by way of checking databases and e-KYC; and, (v) checking if any other government clearances are required. This will replace administrative discretion at the local level with centralised algorithmic decision-making thereby eliminating delays, preventing revenue loss, and reducing corruption. If all the requirements for registration of land are met, the system could immediately take on record the property transaction without any human intervention.

For collecting and processing vast amounts of data, the government will need to have machine learning neural networks that will autonomously learn and execute. This will need significant capital investment from the government in computation power, big data IT infrastructure, and data scientists. A substantial part of data that is currently in paper form will need to be digitised. Even electronically collected data is residing in unconnected data repositories which reduces the utility of the data. Big data is less useful in silos,[5] and there should be an effort to break these barriers. Interdisciplinary data often reveals interesting patterns and can help in solving governance issues.

In light of the growing importance of big data in governance and society today, this chapter will discuss the issues that may arise from big

[3] Opinions are personal and do not represent the Firm's views

[4] Prepared with assistance from Saahil Dama, Associate, Trilegal

[5] EDPS Working Party http://ec.europa.eu/justice/data-protection/article-29/documentation/opinion-recommendation/files/2013/wp203_en.pdf

data processing by the government. It will also outline recommendations with respect to use of big data in governance. These recommendations will be based on the premise that big data cannot exist in silos, and must be given a free reign of usage for maximising public welfare.

1. Issues Relating to Big Data in Governance

1.1 Protection of government's information assets

Government data must be protected for a variety of reasons such as national security, sensitivity, privacy, intellectual property rights, economic interests, etc. While decisions and inferences relating to big data may happen only at the level of the highest authorities in India, the actual collection happens at the lowest level of the government. There is a lack of awareness amongst the lowest government institutions, as is evident from the series of incidents which lead to public disclosure of Aadhaar numbers of several people.[6]

Confidentiality of government data must be promoted within the government with a view to protect not just personal information but also critical government information. For this, the government should have strong information asset protection policies and internal mechanisms, along with policies on who can access data and how such data must be used.

Current information asset policies

The government has issued several policies to deal with government information assets. The National Cyber Security Policy 2013 [7] was issued to create a cyber security framework to enhance the security posture of the country's cyberspace. The Indian Computer Emergency Response Team (CERT-IN) has issued a Reference on roles and responsibilities of Chief Information Security Officers (CISOs) in ministries, departments and organisations managing ICT operations [8] which requires the CISOs to establish an information security program and draft various security policies, such as information security policy, data governance and classification policy, access control policy, acceptable use of assets and asset management, etc. to protect citizens' personal data.

The effective implementation of such policies must be ensured with a view to protect the confidentiality of data on the grounds of national security, sensitivity, privacy, intellectual property rights, etc., and prescribe good practices for use of the data.

The National Data Sharing and Accessibility Policy (NDSAP)[9] deals with open data initiatives. It aims to improve public use of non-sensitive, shareable data and information that is available with the government. The NDSAP prescribes for a senior officer at the level of Joint Secretary or above to be nominated as the data controller for each department, organisation or state. The data controller performs various functions such as preparing the negative list for the

[6] http://dst.gov.in/big-data-initiative-1 as accessed on 23/07/2017

[7] https://hbr.org/2016/12/breaking-down-data-silos

[8] Ananthakrishnan G, In Supreme Court, Centre admits Aadhaar Data Leak, Critics cite 'Civil Liberties,' The Indian Express, available at http://indianexpress.com/article/india/govt-admits-aadhaar-data-leak-critics-cite-civil-liberties-4639819/

[9] http://meity.gov.in/sites/upload_files/dit/files/National%2 Cyber%20Security%20Policy%20%281%29.pdf

department, leading the open data initiative for the department, heading the NDSAP cell, etc. The policy allows for three types of access: (i) open for everyone (open); (ii) open only for registered departments/organisations (registered); (iii) through authorisation by the government (restricted).

The government has also established guidelines for implementation of the NDSAP in the form of Dos and Don'ts.[10] Some of the Dos for data contribution and approval are –

- Quality standards must be met, i.e. the data must be accurate, free from legal encumbrances, and should not infringe upon privacy, confidentiality or national security;
- Time-sensitive data must be given priority so that the utility for the public can be maximized;
- Metadata should have formulas that explain how the data was calculated.

The Don'ts prevent contribution of datasets that are against national security, prohibit imposition of costs or fees that would create an imbalance in who can access the information, and prevent imposition of terms or restrictions that prevent public use.

The government has also issued an open data license, which guarantees all users an equal and permanent right to use the data.[11] It gives all users a worldwide, royalty-free, non-exclusive license to use, adapt, publish, translate, display, add value, and create derivative works for all lawful commercial and non-commercial purposes.

National security considerations

Unbridled processing of big data can be misused in many ways. It will not only affect individuals but also pose challenges to internal and external national security. Data is malleable and can be twisted to reach different conclusions depending on the processor's interests. For instance, statistics on religious conversions can be pitched as evidence of growing freedom of choice and simultaneously of forced conversions. If portrayed as the latter, it could affect national integrity. Similarly, from the national security perspective, mobile tower data from the borders could be used to map territories or to track troop mobilisation. It is important for the government to retain control over such data and strategically prevent big data from being publicly displayed/disclosed.

For national security purposes, it is important for the government to retain monopoly over the big data processed by it. Only shareable, non-critical and non-sensitive data (along the lines of the NDSAP) should be released by the government into the public domain. Under the NDSAP, Ministries are required to create negative lists of data that cannot be shared along the lines of the Right to Information Act, 2005 (RTI Act). The RTI Act prevents disclosure of:

- Information affecting the sovereignty and integrity of India, the security, strategic, scientific or economic interests of the State, relations with foreign states or leading to incitement of an offence;
- Information forbidden by a court from being published;
- Information causing a breach of privilege of Parliament/State Legislature;
- Trade secrets or intellectual property;
- Information that would endanger the life or

[10] http://meity.gov.in/writereaddata/files/CISO_Roles_Responsibilities.pdf

[11] https://data.gov.in/sites/default/files/NDSAP.pdf

physical safety of any person;

- Personal information that would cause an unwarranted invasion of privacy.[12]

While a similar classification may work, such classification after creation of data may not be practical in a big data infrastructure as the information sharing will often be real-time. Therefore, data origin based classification may be more appropriate especially where such data has the potential to impact national security.

The government should engage in responsible and ethical big data processing. It is also important to have a need-to-know basis sharing of sensitive information within the government. It is likely that governance-related big data will be collected and processed by non-State actors such as consortiums supporting infrastructure projects. The government must have adequate mechanisms to retain ownership and confidentiality of data. Similarly, a level playing field must be maintained to ensure that one party is not favoured over the other at the time of data dissemination.

1.2 Privacy

The Supreme Court in Justice K S Puttaswamy v. Union of India[13] recognized the fundamental right to privacy as a part of the right to life and personal liberty under Article 21 of the Constitution. The court held that an invasion of privacy must be (i) postulated by the law, i.e. it must be lawful; (ii) in the pursuance of a legitimate State aim; and (iii) proportional, ensuring a rational nexus between the objectives and the means used to achieve them.

The court also observed that informational privacy is a part of the right to privacy. It held that a robust regime needs to be created for data protection which would balance individuals' interests with legitimate State concerns such as national security, preventing crime, and disseminating social welfare benefits. Such a data protection regime must protect individuals not only from dangers to privacy arising from State actions but also from actions of non-State entities.

The Supreme Court recognized that privacy remains a major concern when it comes to big data processing. It noted - "…data sets are capable of being searched; they have linkages with other data sets; and are marked by their exhaustive scope and the permanency of collection. The challenges which big data poses to privacy interests emanate from State and non-State entities. Users of wearable devices and social media networks may not conceive of themselves as having volunteered data but their activities of use and engagement result in the generation of vast amounts of data about individual lifestyles, choices and preferences."

The Supreme Court summed up the state of an average citizen unaware of the data trails he creates while using technology and pointed out to the need for a law to regulate it. The possibilities created by big analysis are being revealed on a daily basis. Big data analysis can be used to obtain intimate, sensitive information about individuals. Platforms such as data viva[14] and Detecta[15] are used in Brazil to monitor crimes and aid investigation. Similarly, there are news reports about China using Cloud Walk's AI systems to predict crimes before they take

[12] Section 8, Right to Information Act, 2005

[13] 2017 (10) SCALE 1

[14] http://dataviva.info/en/

[15] https://blogs.microsoft.com/blog/2014/04/16/microsoft-and-so-paulo-government-partner-to-release-crime-monitoring-system/

place.[16] Such uses give rise to serious privacy concerns. Since right to privacy is a fundamental right, which cannot be waived,[17] any such use would have to be specifically examined as per the triple test laid down under the Puttaswamy judgement.

Should we regulate big bata?

The argument for regulating big data comes from the principle that a person has an inalienable right over any data collected from him which forms a part of an individual's right to privacy. However, in an IoT-enabled world, it is difficult and even practically impossible to monitor or regulate collection of data by machines and sensors. A consent model will be inadequate and lead to consent fatigue[18] especially in the context of an IoT-enabled world. In fact, consent fatigue exists even today and most people do not read privacy policies and terms and conditions with respect to data collection and processing. Even larger number of people are unable to comprehend the verbose legal text of these documents. This is making the process of taking consent redundant in most situations as there is no 'meeting of minds' for a legal contract formation, limiting the value of such documents to that of standard form contracts.

Considering the exponential rate at which data collection is increasing, a consent requirement is difficult to enforce and is impractical for most transactions. Consent should only be material when processing of information may breach the privacy of an individual, i.e. when processing of information could be used to arrive at personal or sensitive personal information. Traditionally, privacy laws have relied on the principle of consent for collection. Consent for collection is not only impractical but it is also irrelevant if such data remains at an aggregate and anonymous level. Instead, the focus should be on a "consent for processing" model, where consent should be obtained if processing is used to arrive at a data point which is sensitive. So long as big data remains anonymous without it being used to identify individuals or target them, privacy concerns are minimal. If such data is used to identify an individual, the rules applicable for protection of personal information must apply to big data processing.

For example, if big data about land ownership is analysed to derive personal information, then the person must be made aware of it. Similarly, if the data in possession of an organisation is used to predict or derive sensitive personal information, it must be governed by the privacy laws and consent should be taken. Any anonymised data can be processed freely, provided it does not result in a 'mosaic effect' - where data elements that appear anonymous in isolation can breach privacy when combined.[19]

Currently, there are no compelling reasons to regulate big data analysis as long as such analysis is conducted for a lawful purpose and such data is stored in a secure manner. This approach will not only promote use of big data but, at the same time, will address consequent privacy concerns. The pre-requisite to this is a strong privacy law that protects data with a strict enforcement regime.

[16] http://mashable.com/2017/07/24/china-ai-crime-minority-report/#ZCJGpZNIEqqk

[17] 1959 AIR 149

[18] Beyond Consent: A New Paradigm for Data Protection by Rahul Matthan discussed the issues with respect to consent fatigue, http://takshashila.org.in/wp-content/uploads/2017/07/TDD-Beyond-Consent-Data-Protection-RM-2017-03.pdf. In most cases, consent is not informed because of the complexity of the contract through which the consent is obtained which causes people to sign terms and conditions without reading them

[19] The Australian Public Service Big Data Strategy- Improved Understanding through Enhanced Data - Analytics Capability, available at https://www.finance.gov.au/sites/default/files/Big-Data-Strategy.pdf

Function creep

Insufficient data protection also opens the risk of "function creep" which is the practice of using data collected for one purpose for other purposes to which the user has not consented. The European Union (EU) has issued an opinion on the measures that should be adopted for protecting big data.[20] It suggests using strong 'functional separation' through technical and organisational measures to prevent the use of data that has been collected for research purposes from being used to take measures concerning individuals.

For this, technological measures should be built in as privacy by default and privacy by design standards.

New framework for privacy law

The Information Technology Act, 2000 (IT Act),[21] and the Information Technology (Reasonable Security Practices and Procedures and Sensitive Personal Data or Information) Rules, 2011 (IT Rules), offer limited data protection. They prescribe practices relating to collection, transfer, and storage of sensitive personal information. Personal information is not heavily regulated and most regulations apply only with respect to sensitive personal information, which requires consent for collection, transfer, disclosure, etc. The IT Rules propose a light framework with respect to data protection and do not entail detailed obligations with respect to processing, unlike their international counterparts. Another serious flaw is the lack of a data breach notification mechanism.[23]

The IT Rules are not a deterrent against illegal data processing due to the absence of a data regulator and lack of stringent penalties. The Aadhaar Act, 2016, also provides for some data protection for Aadhaar numbers and biometric information, but the Unique Identification Authority of India is the sole data controller, processor and regulator under the Act, which raises questions about transparency and fairness.

In any event, the government appointed committee on the data protection framework in India is working on a draft data protection Bill.[24] Though the Supreme Court-recognised fundamental right to privacy of an individual is only against the State, the data protection regime dealing with private entities collecting data will also have to be tailored according to the principle of proportionality. Though the purpose of the paper is not to discuss the proposed privacy law, it would be incomplete to recommend a regulatory approach for privacy implications of big data without discussing protection of personal information. Some of the key aspects that must be considered with respect to the privacy law are as follows:

- The proposed law need not regulate collection or processing of big data if it is for a lawful and transparent purpose. The entity, however, should be responsible for safekeeping of the data and should be liable for any data breach.
- The current consent framework must be

[20] Available at https://edps.europa.eu/sites/edp/files/publication/15-11-19_big_data_en.pdf

[21] Section 43A of the IT Act requires body corporates to maintain reasonable security practices which would protect sensitive personal information from unauthorised use, access, modification, etc. Section 72A punishes mala fide disclosure of personal information in breach of a contract with the data subject

[22] Issued under section 43A of the Information Technology Act, 2000

[23] A light reporting mechanism exists under the CERT-IN Rules, which does not prescribe strict timelines compared to its international counterparts

[24] http://pib.nic.in/newsite/PrintRelease.aspx?relid=169420

re-evaluated and consent for processing, as opposed to a consent for collection approach, may be considered for the proposed law.

- The proposed law must introduce a robust mechanism for protecting personal information and sensitive personal information, including instances where big data processing gets linked to personal information or sensitive personal information. If such a link is created, including instances of mosaic effect, processing must be subjected to the regulations applicable to these classes of data, respectively.
- Since there is a push to link Aadhaar to most services, there is no relevance to a consent mechanism for obtaining personal information. In a world driven by the IoT, it will be practically difficult to obtain consent or inform a data subject before collection of information. A purpose-related opt-out for personal information is recommended where any service provider has the right to collect personal information from the service recipient. This is similar to the existing framework under the IT Rules wherein there is a requirement to inform the recipient of any collection of personal information. Any harm caused to a person due to misuse of personal information must be punishable.
- The scope of sensitive personal information under the IT Rules is limited and does not reflect international best practices. It is recommended to expand the scope of the term to include intrinsic sensitive personal information such as political opinions, sexuality, criminal history, food habits, etc. in line with socio-economic realities in the country.
- The processing of sensitive personal information must be purpose-based and proportional. It must require prior consent. Any deviation from the stated purpose must be regulated and misuse of sensitive personal information must be punishable.
- Privacy by design and privacy by default as principles must be adopted in the privacy law to ensure that collection and processing are two distinct aspects. As a rule, processing must be on a need-to basis.
- Current enforcement mechanisms for breach of privacy are weak. Hence, there should be a designated data regulator and a specialised dispute resolution mechanism. The concept of data breach reporting and specific timelines for reporting must be introduced. Since most data transactions are online, a forward-looking data protection regulation should also consider online redressal mechanism for data breach complaints to reduce legal and compliance costs.

1.3 Issues relating to discrimination by use of big data

One of the biggest challenges with respect to big data is the fear of discrimination and profiling. The concerns about the discriminatory nature of big data have been well-studied and documented.[25] However, these problems are not unique to big data and exist even today. A commonly cited example is that of redlining. Redlining is the practice of denying loans and mortgages to people from certain backgrounds.[26] Commercially, it is best to deal with these problems at market level and, if necessary, by way of regulatory intervention. India already

[25] Big Data's Disparate Impact, Solon Barocas & Andrew D. Selbst, California Law Review, Inc. https://pdfs.semanticscholar.org/1d17/4f0e3c391368d0f3384a144a6c7487f2a143.pdf accessed on 23 July 2017

[26] http://dictionary.cambridge.org/dictionary/english/redlining; Rachel L. Swarns, Biased Lending Evolves, and Blacks Face Trouble Getting Mortgages, The New York Times, available at https://www.nytimes.com/2015/10/31/nyregion/hudson-city-bank-settlement.html (Oct. 30, 2015)

has adequate safeguards in various sectors such as in lending.[27]

Discrimination at an individual level is related to privacy and should be governed by the proposed privacy law which has been discussed in section 1.2 above. Internationally, however, the principle of group privacy is under discussion and it has been argued that a group of people that share a certain trait, such as race, religion or ethnicity, have certain privacy rights.[28] There are also concerns that big data processing will impact such group privacy. India does not recognise the principle of group privacy and, therefore, this paper does not venture in to that discussion.

The problem of discrimination by the State is already addressed by the constitutional protection under Article 14. Therefore, unless there is evidence to the contrary, there is no need for regulating use of big data to prevent discrimination. The State is already under an obligation not to discriminate on the grounds of religion, race, caste, sex, place of birth or any of them. However, in this context, algorithm regulations assume significance, which have been discussed below.

1.4 Algorithm regulations

A direct consequence of big data processing and machine learning is the impact of algorithmic decision-making. Algorithmic decision-making is the future of governance where governance systems will be programmed to detect illegalities or irregularities at the time of administrative action. Algorithm regulations seek to regulate algorithms which process big data to arrive at these decisions. There is an inherent fear that algorithms may themselves be discriminatory. The EU's General Data Protection Regulation seeks to regulate automated decision-making, including profiling, and allows it only in circumstances where there is explicit consent, or is specifically allowed by member states with adequate safeguards for protecting privacy and for the purposes of contract.[29] It also gives the data subject the right to opt-out.

The two main problems that exist with algorithmic decisions are that they:

- generalise the biases present in the data; and,
- lack transparency.

For instance, if there is technology to detect potholes using a smartphone App, it would be possible for the government to understand the areas in which the roads require the most repair. Yet it can also lead to false outcomes, because the largest amount of data would come from areas that have the most number of Apps or smartphones. The government would likely conclude that a particular area has the most potholes simply because the App usage or smartphone penetration is the highest in that area. Another area, which has more potholes but fewer Apps or smartphones, could go undetected. Thus, a bias in the data collected would result in the government implementing an under-effective or misinformed measure.

The second problem is the lack of transparency with respect to the decision-making. States in

[27] RBI Guidelines on Fair Practice Code for Lenders, https://www.rbi.org.in/scripts/NotificationUser.aspx-?Id=1172&Mode=0

[28] Group privacy refers to the privacy rights of a collective that shares common characteristics, such as race, religion or caste. Group privacy is not just a sum of every member's individual privacy - it is the privacy of the group as an independent entity

[29] Article 22 (Automated Individual Decision-Making, Including Profiling), General Data Protection Regulation, 2016

India have land ownership restrictions such as relating to ownership of land by outsiders, ceiling limits, etc. Big data from property registers could be used to not only determine excess landholding of a person, but also prescribe legislative formulae at the national level. If such formulae exist, a government registry can be automated to reject land registration automatically if the person coming to register the land holds more property than he is legally entitled to. This opens up a question as to how the algorithm came to the decision of rejecting a registration application.

While there have been discussions about regulating algorithms which process big data,[30] it may not be practical to do so as it involves opening black-boxes. Decisions made through algorithms are often impossible to be explained through logic or reason. This is because the algorithm essentially works like a 'black box' and its inside workings are often unclear to even the people who created it.[31] The likelihood of this happening is higher for more sophisticated or complex machines. Neural networks, such as the one used by AlphaGo, have often been labelled as 'black boxes' because what goes inside them is incomprehensible to the human mind.[32]

Algorithmic decisions can be impugned on due process grounds for this very reason. Due process guarantees fairness and transparency. But if policies or judicial decisions are made by relying on algorithms, the reasoning will remain oblivious to those affected by the decision. This assumes relevance especially for predictive analysis in the field of criminal justice system. Due process has been held to be a part of the right to personal liberty guaranteed by Article 21 of the Constitution.[33] The standard of due process is the threshold for examining the validity of government actions that infringe upon personal liberty.

It is not uncommon that when using technological tools to implement governance systems, the socio-political aspects of governance changes are ignored. While technology acts as a tool to prevent leaks and implement the law, it should in no way hinder fundamental rights such as freedom of speech, freedom of movement, right against self-incrimination, etc. So, any decision-making algorithm must be designed keeping in line the fundamental rights guaranteed under the Constitution and it should not, by default, make decisions which violate a person's right to life, freedom of speech, right against self-incrimination, etc.

So, algorithms cannot be programmed to process past information about an accused to predict the likelihood of an accused having committed a crime and decide a case or restrict a person's rights. Instead, any decision which leads to violation of fundamental rights will have to be implemented or confirmed by human intervention. For example, an algorithm should not be used to deny a school child mid-day meals, but just to point out the lack of information with respect to that school child which should then be examined by officials on the ground. This will ensure that the government and its citizens

[30] See, for example, Ian Sample, AI Watchdog needed to Regulate Automated Decision-Making, say Experts, The Guardian, available at https://www.theguardian.com/technology/2017/jan/27/ai-artificial-intelligence-watchdog-needed-to-prevent-discriminatory-automated-decisions

[31] Will Knight, The Dark Secret at the Heart of AI, MIT Technology Review, https://www.technologyreview.com/s/604087/the-dark-secret-at-the-heart-of-ai/

[32] Davide Castelvecchi, Can we open the Black Box of AI?, Nature, available at http://www.nature.com/news/can-we-open-the-black-box-of-ai-1.20731; Marina Krakovsky, Finally, a Peek inside the 'Black Box' of Machine Learning Systems, Stanford Engineering, available at https://engineering.stanford.edu/news/finally-peek-inside-black-box-machine-learning-systems

[33] Selvi v. State of Karnataka, AIR 2010 SC 1974

do not have a master-servant relationship, but instead that of a service provider-recipient.

A pragmatic option could be to regulate the outcomes of algorithms rather than algorithms themselves.

To do this, the authority in charge of algorithmic decision-making should explain how the decision was likely to have been obtained. This could be done by disclosing parameters that affected the decision, such as the input factors, the structure of the algorithm, the outcome that had been expected, etc. Some have argued for a '*right to explanation*' which would allow individuals to ask for an explanation for an algorithmic decision made about them.[34] If this is not possible for complicated machines, then the decision should be looked at objectively to determine whether it seems fair and reasonable. In case the decision seems questionable upon an objective analysis, it should be held to be inoperable against the affected party. Such a scrutiny will introduce a necessary level of accountability in algorithmic decision-making.

2. Big Data Policy

Big data analysis can only be efficient and serve its purpose when it works with appropriate datasets.[35] Therefore, the best way to improve benefits of big data is to open-up as much data as possible. Disparity in data distribution and information asymmetry will seriously impact the economy and the society. It must be ensured that any dissemination of data is open and transparent. It should also take into account the real-time sharing of vast amounts of data for the government's big data infrastructure. Therefore, a big data policy will be needed to tailor the framework of the NDSAP with big data realities.

To implement a practical way of dealing with increasing big data processing, it is recommended to have a road map for big data by way of a National Policy on Use of Big Data (Big Data Policy) which would outline the norms of the government with respect to collecting, using, processing, and decision-making on the basis of such data. The Big Data Policy should aim at fostering big data processing for efficient governance solutions and practical policy directions.

The policy should aim to foster:

- *Investment in big data infrastructure*
  The government must increase investment in machine learning neural networks to process large databases available with it, aid large-scale data collection, data management, and analysis to create new services and capabilities. A coordinated strategy is required to ensure that everyone from local self-governments to state governments can bank on the big data infrastructure. Data sharing must be enabled across various stakeholders including government departments, state governments, government corporations, etc.
- *Investment in R&D*
  The ggovernment must invest in R&D in data science with a view to improve existing machine learning capabilities. Traditional statistical approaches to handling datasets will not work in the case of unstructured, undersigned data for big data analysis.
- *Investment in algorithmic decision-making tools*
  The government must increase investment in algorithmic decision-making tools which

[34] Bryce Goodman & Seth Flaxman, European Union Regulations on Algorithmic Decision-Making and a "Right to Explanation," available at https://arxiv.org/abs/1606.08813

[35] https://hbr.org/2016/12/breaking-down-data-silos

will aid humans in interpreting big data analysis accurately and make appropriate decisions.

- *Investment in human capital*
  The role of data scientists who can understand and explain algorithmic decision-making is going to be crucial in the future. There is a serious shortage of data scientists in India.[36] There is an urgent need for the government to train and hire data scientists to be able to deal with all the challenges that this paper highlights. For this, we need a futuristic plan to overhaul the education system and introduce data science concepts at appropriate levels with a view to create an efficient task force and a data confident generation. A data confident generation is important to understand, appreciate, and enjoy the fruits of big data backed algorithmic regulation.

The National Big Data Policy should be tailored around certain overarching governance principles:

- *Sharing and openness*
  Big data is less useful if it is in silos. Therefore, the Big Data Policy should encourage active sharing both inside and outside the government.
- *Non-discrimination*
  Use of big data must not lead to discrimination. The Big Data Policy should ensure that algorithmic decision-making does not cause discrimination. The technology design of algorithms must be based on principles designed not to infringe on fundamental rights. If a decision has an impact on a fundamental right, the same must be made by way of human intervention backed by proper explanation. Right to explanation must be granted to the subjects.
- *Transparency*
  Processing of big data must be transparent to the extent that the proposed use of data must be made available to the public except in the instances of threat to national security or other identified reasons. The transparency principle must cover data sources, datasets involved, and the basis of the decision or action taken, if any, pursuant to such processing with a view to promote just and fair algorithmic decisions.
- *Data quality*
  Data used must be accurate and up to date to avoid issues with respect to irrelevant data. This is to ensure that there are no inherent data bias issues.
- *Accountability*
  The data controller should be held accountable for complying with all the principles. The Accountability Principle, for example, helps establish responsibility upon the data collecting and processing officer to keep the data safe and confidential. The data should be protected by reasonable security safeguards against destruction, disclosure, and modification.
- *Data criticality*
  Shareable data must be classified and tagged at the origin to avoid sensitive data from going public. Adequate technology measures must be put in place to regulate inter-ministerial/ inter-departmental data sharing as well.

[36] Shortage of Data Scientists in India: National Statistics Panel Chief, Economic Times, available at http://economictimes.indiatimes.com/news/science/shortage-of-data-scientists-in-india-national-statistical-panel-chief/articleshow/58914493.cms (May 30, 2017).

3. Recommendations

India is uniquely poised to be a global leader in the use of e-governance systems such as the Aadhaar. The size and scale of the Aadhaar platform is unparalleled and by adopting unique technologies such as digital distributed ledgers, e-governance systems are bound to be efficient and future proof.

The world itself is yet to come to terms with the possibilities opened-up by big data complemented by IoT and machine learning neural networks. With almost no regulations governing use of data, India is better poised than most other countries. Therefore, this paper recommends a light regulatory approach for regulating big data. The regulation of data should only focus on personal information, sensitive personal information, and national security.

On this basis, this paper makes the following recommendations:

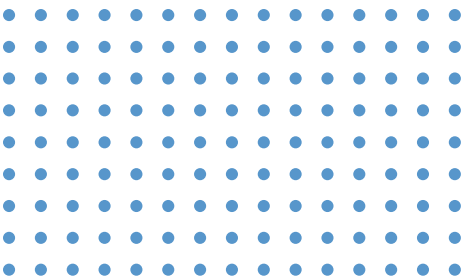
1. There should not be any regulations on big data processing provided that the processing is for a legal purpose and that the purpose is transparent. The entity, however, should be responsible for safe keeping of the data and should be liable for any data breach.
2. A new privacy law must be enacted based on international data protection standards and best practices.
3. Current consent framework must be revisited with the perspective of shifting to a consent for processing framework as opposed to consent for collection framework specifically to enable big data processing.
4. A light regulatory approach of opt-out, similar to the existing regime, must be introduced for processing of personal information for providing services to a person. Any harm caused to a person from misuse of personal information must be punishable.
5. Scope of sensitive personal information must be broadened by drawing from international practices and must be regulated through an opt-in mechanism. The processing of sensitive personal information must be purpose-based and proportional. Any deviation from the stated purpose should be regulated and misuse of sensitive personal information should attract stringent penalties.
6. Privacy by design and privacy by default as principles must be adopted in the privacy law to ensure that collection and processing are two distinct aspects.
7. If any big data processing gets linked to personal information or sensitive personal information, such processing should be subjected to the regulations applicable to these classes of data, respectively.
8. The government should formulate a Big Data Policy dealing with big data processing as a part of governance with the aim of improving transparency. The Big Data Policy should aim to establish both internal and external real time sharing of data.
9. The Big Data Policy should also deal with the challenges of big data in governance with a view to enhance coordination amongst various departments to enable data sharing and big data analysis.
10. The government should retain monopoly over big data generated as part of governance and only data that does not have national security/integrity ramifications should be made public. Such access should ensure a level playing field for all external parties.

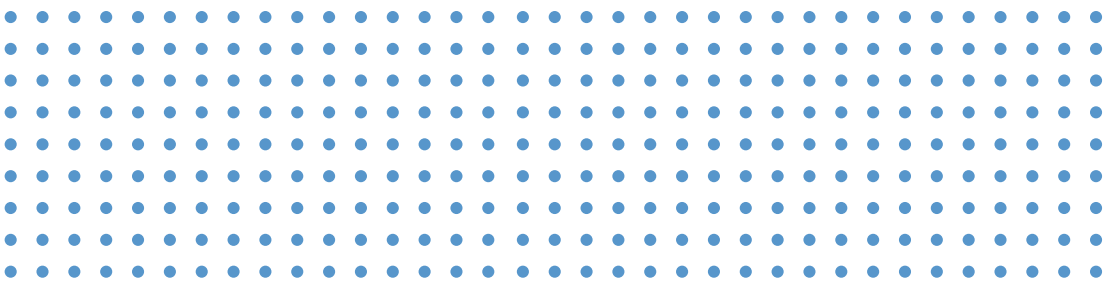
11. Algorithmic decision-making must be transparent and capable of being explained. Algorithms can remain as a black-box and need not be audited unless there is a compelling reason to do so.

12. Algorithms must be designed keeping in mind the fundamental rights and requirement for due process. Algorithms must not make final decisions affecting the fundamental rights of the citizens and such decisions must be confirmed by officials along with detailed explanations.

13. Citizens must be entitled to right to explanation in case of algorithmic decisions.

14. The technological design of big data infrastructure should be in-line with principles of privacy by default and privacy by design.



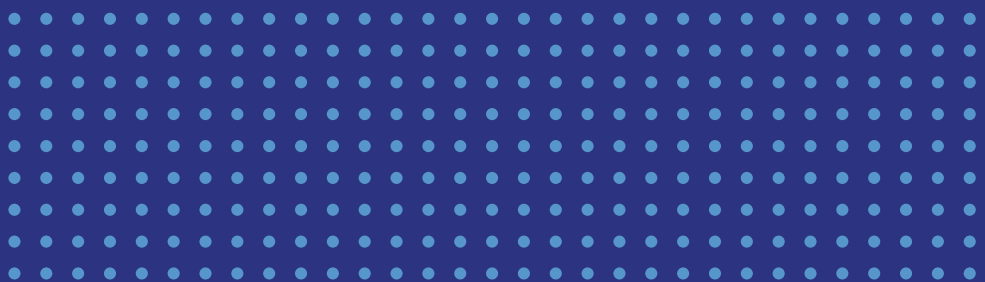


4

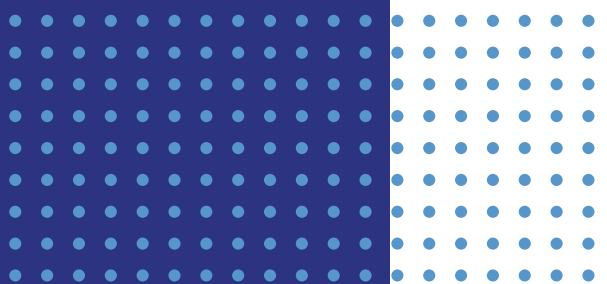
Blockchain for Governance

Andhra Pradesh pioneers how to put land records on blockchain

J A Chowdary
Special Chief Secretary & IT Advisor to
Chief Minister of Andhra Pradesh
Government of Andhra Pradesh



- India is transitioning into a dynamic ecosystem offering fintech startups a platform to grow.
- Fintech Valley Vizag is Government of Andhra Pradesh's flagship initiative.
- Two pilots in the state have established Proof of Concept for a corruption free property registry based on blockchain.
- Andhra Pradesh will be blockchain enabled by 2019. Target sectors are health services, food supplies, land records and fintech.



Fintech Valley Vizag is Government of Andhra Pradesh's flagship initiative that brings together industry, academia and investors to innovate, co-create and build the Fintech ecosystem.

The traditionally cash-driven Indian economy has responded well to the fintech opportunity, primarily triggered by a surge in e-commerce, and smartphone penetration. India is transitioning into a dynamic ecosystem offering fintech start-ups a platform to potentially grow into billion dollar unicorns.

The government is naturally the prima facie catalyst for the success or failure of fintech in a heavily regulated financial industry. The Government of Andhra Pradesh has taken a lead in the country by incorporating Fintech including Cybersecurity, Artificial Intelligence, Analytics and especially blockchain as its key strategy verticals in FY17.

Property fraud is rampant in India and takes many forms. It is one of the biggest avenues for investing black money. One way is to hold property in other people's names, and this practice is called benami, which means 'false name.'

In this murky scenario, the government does not only lose revenue, but buyers can also be duped when the same property is sold to multiple entities. What exacerbates the problem is rampant corruption. The Indian government introduced a new law and have seized benami properties worth US$282 million since November last year.

Sprawled across 160,000 square kilometres on the east coast with a population of over 50 million, the state of Andhra Pradesh wants to use blockchain technology to tackle the problem of corruption and crime in property deals. It is going to do it by adopting a blockchain based property registry. Blockchain's immutability can make land records tamper-proof. This feature will make land grabbing by forging records with the help of corrupt officials extremely difficult, if not impossible. Since Blockchain based registries are also distributed ledgers, the other property that would strengthen transparency is the visibility of records and any changes to them to all the stake holders.

The Government of Andhra Pradesh recently piloted four use cases on blockchain to have a hands-on understanding of what the technology entails for good governance. Two of these use cases as listed below were in the area of Land records and registration.

1. Registration of Land Records

Land has long been the subject of conflicting claims and disputes in the state of Andhra Pradesh. The government is taking constant efforts to create a transparent system that is also secure. There are inherent vulnerabilities in the current system where land and property records are centralized in government databases, making them prone to manipulation. Such a scenario makes it difficult to establish the ownership rights to a property. The government is exploring next-gen technologies such as blockchain that can help mitigate such risks by building a distributed ledger ecosystem that makes the data immutable, thus increasing the public confidence in the system.

In the pilot, a sample data of land registration (in Telugu language) was shared with participating startups. The teams put the data chain and historical records on the prototype application, successfully testing for proof of concept (PoC).

All the startups were able to create and demonstrate blockchain applications for maintaining land records. More significantly for the state, their applications had open architecture with the provision for integration with the government's existing systems through application programming interface (APIs).

2. Transfer of Ownership Transaction

Real estate transactions especially pertaining to transfer of ownership have always been complex and cumbersome. With each stakeholder involved in the process and no way of auditing the data, chances of fraud and error increase. Such activities undermine the confidence of the common man in the process. To present a clear picture of the sequence of events related to a land transaction, trusted and auditable data trails are needed. Blockchain as a distributed ledger can help conduct transactions in a transparent manner, which can also be validated. This will allow the citizens to ensure that their documents are legitimate, inspiring confidence of the citizens of the state as well as businesses in the state's accountable governance.

One of the participating fintech companies demonstrated how we could integrate historical land records with the new Blockchain based registry. A customized GUI (graphical user interface) would be a front-end to the legacy systems, allowing data such as land titles, ownership and transfer history etc to be viewed at an individual level.

Overall, all the standalone PoCs on static data helped us visualize the future shape of our departments with respect to information capturing, storage and utilization. We hope to see even more success when we launch a pilot on real data for real locations.

The Andhra Pradesh Blockchain Strategy

Having pioneered popular projects like CARD, eSeva, Mee Seva, e-Procurement, Andhra Pradesh has always been at the forefront of implementing e-Governance. To take the evolution of e-Governance to the next level, it is felt essential to have an AP State Enterprise Architecture (APSEA) for providing better services to citizens and businesses. e-Pragati is a framework to provide integrated services to citizens through a free flow of information, and to usher in an era of good governance, characterized by efficiency, effectiveness, transparency, and foresight. e-Pragati is a large program, with a long term vision for creating a sustainable eco-system of e-Governance, attempted on a scale like this by very few Governments in the world like Korea, Estonia and Singapore.

e-Pragati covers 33 departments and 315 agencies, from which nearly 745 services have been identified for inclusion in the program. The services have been grouped into 72 projects (45 greenfield and 27 brownfield) and bundled into 14 packages for ease of procurement and implementation. This is the largest e-Governance program approved by any state in India.

The next move for e-governance is blockchain, starting with land records but with potential applications in several other areas like health services, food supplies, and finance. PoC's from our pilots show that blockchain is a highly relevant technology for the times to come and will play a big role in e-Governance.

Vision of the Chief Minister, Sri Chandrababu Naidu, is for Andhra Pradesh to become blockchain enabled via e-Pragati by 2019. The three strategic pillars for realising this vision will be Ecosystem Creation, Secure Governance and Global Leadership and Advocacy.

5

Successful Technology Interventions in Land Records Modernisation

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- Land records modernization will be complete only when we have moved from presumptive titles to conclusive titles.
- Intelligent use of GIS technology and community involvement are indispensable to achieving 100 percent digitisation.
- Discrepancies in and absence of property records need to be resolved at the individual level across the country before full benefits of digitisation of records can be reaped.
- Intervention by HARSAC in Haryana and ARCH in Gujarat are models that need to be scaled up.

Introduction

Land includes benefits arising out of land and things attached to the earth, or permanently fastened to anything attached to the earth.[1] The subject land falls under entry 18 of the state list in schedule VII of the Constitution of India. Ownership of land in India lies in the name of the individual rather than the state. As a consequence, varied land records management systems were adopted by each state in accordance with their historical underpinnings. Notwithstanding the fact that these systems are diverse in form, they are frequented by the same array of problems such as outdated and incomplete land records, presumptive titles,[2] irregularity in updating land records, deed registration system, involvement of multiple agencies and many more. According to Landesa India,[3] there are 75 potential problems related to land ownership in rural India and most households have at least four of these problems.[4]

The issues pertaining to land records management once plagued even the most advanced countries like the United States of America, the United Kingdom, Australia and Canada. In order to tackle them, a system of conclusive title, also known as Torrens System, was developed by Sir Robert Richard Torrens, who was the third Premier of South Australia in 1858.[5]

The term conclusive title means an unassailable and conclusive proof of ownership of property.[6] The system of conclusive title is based on three tenets [7] -

1. The "mirror" principle- according to which, at any point of time, the land records must reflect the ground reality.
2. The "curtain" principle- which states that entries in the land record must reveal conclusive ownership and inquiry into past transaction or record should be unnecessary.
3. The title insurance principle- which states that the title is guaranteed for its correctness and if any loss is suffered by the party due to inaccurate records, the state is then bound to compensate for the loss.

With an ultimate objective of virtual management of land records in the country, the Government of India launched the scheme of computerization of land records in 1988-89.[8] However, there was a highly skewed progress and the lack of system of conclusive title because-

1. Old, incomplete and tattered land records

[1] Section 3(p) of the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013

[2] Presumptive title is a right over a property arising merely due to possession without any apparent right.

[3] Landesa is an international organisation that partners with the government to help poor, women and men for securing rights to land

[4] Sunil Kumar, Director Land laws and Policies, Landesa India, available at, http://cic.gov.in/sites/default/files/2017/P13-Shri%20Sunil%20Kumar%20MeekaCIC%20Seminar_Sunil_Landesa%20(1).pdf. For problems refer to Annexure 1

[5] Rita Sinha, Moving towards clear lan titles in India, Secretary, Department of Land Resources, Ministry of Rural Development, available at, https://www.fig.net/resources/proceedings/2009/fig_wb_2009/papers/country/country_sinha.pdf

[6] Id

[7] Lynden Griggs, The Doctrinal Coherence of the Torrens System of Land Registration in Australia: Evolution or Revolution?, available at, http://epublications.bond.edu.au/cgi/viewcontent.cgi?article=1207&context=theses

[8] Department of Land Revenue, available at, http://dolr.nic.in/comp_land_records.htm

did not reflect ground reality

2. Indian Registration Act, 1908, provided for the registration of deeds and documents and conferred only presumptive titles and
3. The system of title guarantee or indemnification was not applicable in a presumptive title set-up.

The Government of India then decided to pivot to a new, centrally-sponsored scheme known as National Land Records Modernization Programme (NLRMP) in August 2008, by merging existing schemes of Computerization of Land Records and Strengthening of Revenue Administration and Updating of Land Records.

Objectives of Digital India Land Records Modernization Program (DILRMP)[9]

The primary objective of the scheme is to develop a modern, transparent, and comprehensive system of the land records management which could confer conclusive land titles based on the three principles of Torrens System. The scheme also aims at establishing a single window for handling land records.[10]

The secondary objective of the scheme is to carry out activities which strengthen the land revenue administration.[11]

Progress under DILRMP[12]

For the purpose of estimating the progress made by different states and union territories in India under DILRMP till November, 2017,figures 1, 2 and 3 below show percentage of computerisation of land records, map digitisation and survey/ resurvey in the following manner:

All the states/ UTs have been categorised into six categories:

Category A: States/ UTs with zero or less than one percent progress.

Category B: States/ UTs with progress between 1-24 percent progress.

Category C: States/ UTs with progress between 25-49 percent progress.

Category D: States/ UTs with progress between 50-74 percent progress.

Category E: States/ UTs with progress between 75-99 percent progress.

Category F: States/ UTs with progress between 99.5-100 percent progress.

[9] Formerly known as National Land Records Modernisation Programme (NLRMP)

[10] Supra 8

[11] Id

[12] Digital India Land Records Modernization Programme, Department of Land Resources, Ministry of Rural Development, Last accessed on Nov 24, 2017, available at, http://nlrmp.nic.in/faces/rptPhysicalHome/rpt-StateGenericDetail.xhtml?id=./../master/physical.xhtmll.

Computerisation of Land Records

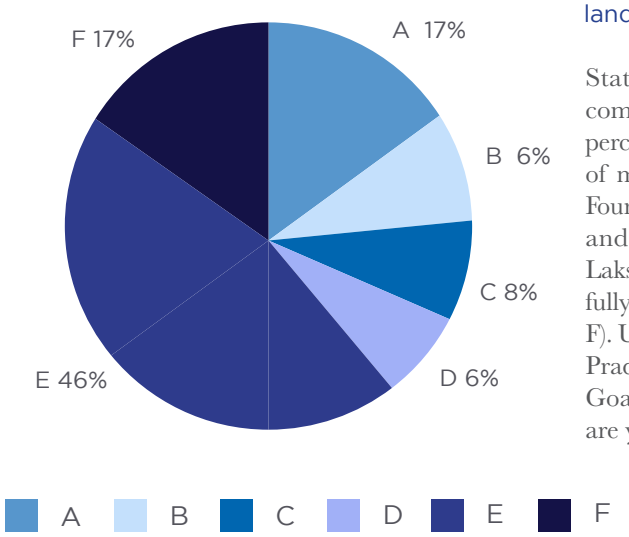


Figure 1: Progress of computerisation of land records in the states[13]

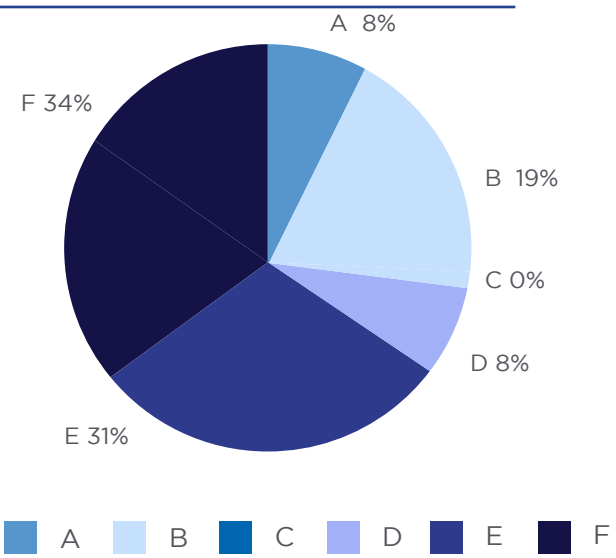
States have shown remarkable progress in computerisation of land records. Sixty-three percent states in India have registered a progress of more than seventy-five percent completion. Four states, Tripura, Odisha, Himachal Pradesh and Karnataka and two union territories, Lakshadweep and Dadra & Nagar Haveli, have fully completed the computerisation (category F). Unfortunately, five states, namely Arunachal Pradesh, Nagaland, Meghalaya, Mizoram and Goa and one union territory, NCT of Delhi, are yet to start the process.

Map Digitisation

Figure 2: Progress of digitisation of maps in India[15]

Cadastral maps include details such as boundaries of land, area, land use and topology sketched on a map. These maps are required to be updated in accordance with the changes in entries of record of rights.

According to the Committee on State Agrarian Relations and the Unfinished Task of Land Reforms (2009), the average age of cadastral maps in India is more than 50 years.[14] Therefore, the scheme aims at digitisation of cadastral maps and its integration with ROR so that they reflect true and factual details of the property.



[13] Data of 29 states and 7 union territories

[14] Ministry of Rural Development, http://southasia.oneworld.net/Files/MRD%20Commitee%20Report.pdf

[15] Data of 26 states/union territories

A majority, i.e. thirty-four percent of the states fall under category F. Out of these, four states namely, Odisha, Tripura, Sikkim and Goa and two union territories, Puducherry and Dadra & Nagar Haveli, have completed 100 percent digitisation of maps while three other states have registered a progress of more than 99.50 percent. But there are laggards here too. Uttarakhand and Daman & Diu are yet to initiate the process of map digitisation.

Survey/ Resurvey

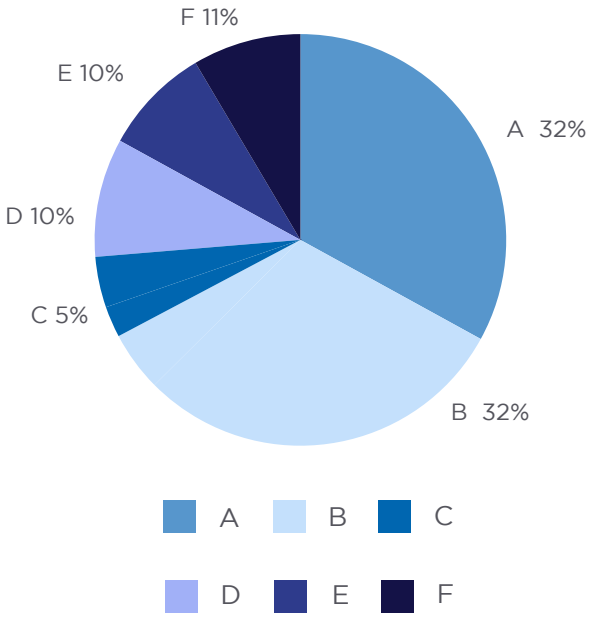


Figure 3: Percentage of states in which survey has been conducted[16]

According to Ministry of Rural Development,[17] survey/ resurvey will be carried out from the funds allocated under DILRMP only when the record of rights or field books or maps are not available or are destroyed/ damaged/ outdated. Survey or resurvey is not to be conducted unnecessarily when the land records are available.

Until November 2017, thirty-two percent of the states/ UTs has registered progress of less than one percent. Out of these, Madhya Pradesh and Uttarakhand are yet to begin the process. Only eleven percent of the states/ UTs have achieved the progress of more than 99 percent. Tripura and Dadra & Nagar Haveli are the only states with 100 percent progress.

Challenges to Digitisation under DILRMP

The major challenges which girdle the digitization of land records under DILRMP include-

1. Land without title: Indigenous people who have customary land holdings do not have their lands recorded in the government land records management system. In such a scenario, these people are deprived of their lawful claim over the land.
2. Discrepancies in records: The digitized land records have discrepancies in the ownership of the land, survey numbers, sub-division numbers and classification of crops/ land.[18] According to government statistics, in Kakinada (Andhra Pradesh), after the computerisation of land records,

[16] Data of 19 states/UTs

[17] Circular of Ministry of Rural Development, Department of Land Resources, dated 8thDecember 2016, http://dolr.nic.in/dolr/downloads/PDFs/DILRMP%20Policy%20Circular%201%20of%202016%20regarding%20Survey%20Resurvey%202017-03-08.pdf

[18] A massive 42 lakh errors have been detected in telangana's land records. These errors were identified through verification of computerised records with manual records. The errors were detected in five categories such as typographical, survey numbers, extent of land, registered in great grand parents' name and wrong land mutations.

the revenue officials received 12,71,455 petitions for rectification of online records, of which 12,41,636 had been attended to and 1,29,799 were rejected due to lack of proper documents.[19]

3. Wrongful alterations of land records/ corruption: Some reports point out that government servants, who are responsible for making alterations, often tamper with the records to feather their own nest.

4. Non integration with registration database: In the presence of different agencies responsible for maintaining record of rights and registration of property transactions, the digitised ROR database in many states has not been integrated with the digital land registration database resulting in confusion in seamless verification of property documents.

5. Delay in updating land records: Revenue officials often show apathy and carelessness in updating the land records which results in undue delay and uncertainty.

Way Forward

The primary objective of DILRMP is to transit from the system of presumptive title to conclusive title. In the conclusive title system, the ownership is proved by way of existing entries in the registers maintained by the government. If this system has to succeed, it is vital to include accurate information about every single property transaction with zero tampering of land records. However, the above-mentioned challenges are a bottleneck in the successful implementation of the ambitious Digital India Land Records Modernisation Programme.

The pillars of conclusive title system will fall apart unless we make our land records tamper- proof. In this regard, blockchain is the most promising technology which ensures secure accessibility of the data with improved transparency. It has the following two key advantages-

1. Immutable:

Since it is a distributed ledger and every user has the entire copy of the ledger, information once fed cannot be changed by a single person without the knowledge of others.

2. History of changes:

Every alteration in the information stored leaves a trail- details of the author, date and time of the alteration are stored. This allows for tracking the history of all changes made in any record.

But to be able to take advantage of distributed ledgers, digitisation of land records has to be completed first. That in turn means resolving the issues related to discrepancies in land records and creating records for lands without title. Among the several approaches that various agencies have tried to deal with these hurdles, community-centric innovative approaches combined with easy to use mapping techniques have been seen to offer the best results.

We highlight two such successful initiatives:

1. Digitization of cadastral maps in Haryana:

In a joint initiative, the Haryana Space Applications Centre (HARSAC) and Sirsa District Administration developed the methodology of eliminating discrepancies in land records with the help of digitised cadastral maps and public verification.

2. ARCH-Vahini:

ARCH helped tribal farmers of Gujarat acquire land titles by using satellite imagery and GIS technology. It trained the tribal villagers to conduct the surveys of their lands using hand held devices given to them by ARCH.

Scaling up of these initiatives is a pre-requisite to achieving the objects of DILRMP.

[19] Vadrevu Shrinivas, Kakinada: Errors in online records put landowners in a fix, Deccan Chronicle, Oct 24, 2016, available at, http://www.deccanchronicle.com/nation/current-affairs/241016/kakinada-errors-in-online-records-put-landowners-in-a-fix.html

CASE 1 : Haryana Space Applications Centre (HARSAC) - Village Kamal Project

Haryana is one of the very few states in India that has shown remarkable progress in the field of digitization since the beginning. It started the scheme of Computerisation of Land Records (CLR) in 1990-91 with an objective of making available computerized copies of land records instead of manual copies. The scheme was launched as a pilot project in Rewari district with technical support from National Informatics Centre (NIC)[20] . Under this project, record of rights 'jamabandi', 'khasra girdwari', 'mutations' and 'sajra nasb' were all digitised.

In order to achieve the objectives of the CLR scheme, the state government, in consultation with NIC, started another project called Haryana Registration Information System (HARIS) in 2000. The aim of the project was to computerize the property registration system at the level of Sub-Registrar's Office (SRO) in the whole state.[21] Initially, the project was implemented in six SROs. Later, by 2002- 03, it was executed across the entire state.

Encouraged by the success of the above project, in 2003, the Haryana government launched Haryana Land Records Information System (HALRIS) to reform the solutions under CLR scheme and to integrate it with the online registration system. The purpose of this project was to link the registration process with the mutations in order to generate mutation notice for public convenience. It took considerable time to update and port the data, and finally in 2007, the services were made available on www.jamabandi.nic.in. With this, Haryana became the first state in the country to integrate land records with property registration system.[22]

The technical progress under the digitization scheme was considerable. However, certain issues such as presumptive title, discrepancies in the land records, manipulation of manual data and delay in updation remained intact. Moreover, HALRIS only dealt with the textual records and did not provide information pertaining to maps. To overcome all the above shortcomings, in 2007, a pilot project in village Kamal, Sirsa district, was initiated to digitize cadastral maps using satellite imagery.

Kamal Village Project

Kamal village project was a joint venture between the Haryana Space Application Centre (HARSAC), Sirsa district administration and Infotech Enterprises Limited, Hyderabad. HARSAC strategized the methodology of digitization of cadastral maps in Kamal village with the help of satellite images (GIS). GIS is a framework, which analyzes and displays wide range of geographical data. Coupled with spatial information i.e. information regarding geographic location of features on Earth, GIS also provides non- spatial information. It is the partnership of these two data types that enables GIS to be such an effective problem solving tool.

The total land area of the village, which comprised of 1,626 acres, was linked to the internet through satellite using GIS. In

[20] Revenue & Disaster Management Department, Haryana, available at, http://revenueharyana.gov.in/html/landrecords/computerization_of_land_records.htm

[21] HARIS was implemented in all the 129 tehsil and sub-tehsils of State. Centre for innovations in public systems, available at, http://www.cips.org.in/documents/DownloadPDF/downloadpdf.php?id=454&category=E-Governance

[22] Success stories on NLRMP, Department of Land Revenue, Ministry of Rural Development, available at, http://dolr.nic.in/dolr/downloads/pdfs/revenue_ministers_document.pdf

order to associate a physical map with spatial location,[23] mussavies[24] that were generated during consolidation of joint punjab in 1957 were used as a basis for generation of digitized cadastral maps. During consolidation, 65,000 mussavies[25] were created for the entire state of Haryana, divided into uniform grids of 400 acres, in the following manner. [26]

1 Acre = 1 Killa

1 Killa = 40 Karam x 36 Karam

1 Karam = 5.5 Feet

Killa grid of 25 Acre = 1 Muraba

16 Murabas = 1 Mussavi

1 Mussavi = 400 Acre

Methodology

All the mussavies were collected from the 'patwaris' (village officers) for the purpose of digitisation. If any mussavi was missing, lost or damaged, a new mussavi was generated with the help of field book or other revenue documents. These mussavies were cleaned and corrected for scanning. After scanning, mussavies in the form of grids (raster map) were converted into a vector map. Vectorisation refers to the representation of map using polygons, lines and point.[27] In a vector map, polygons represent areas such as the boundary of a city, forest, etc. These features are two dimensional and therefore, can be used to measure area. Line data is used to represent linear features for example rivers and streets. Line features only have one dimension and therefore, can be used to measure length. Point data is most commonly used to represent non- adjacent features and discrete data points. Points have zero dimensions, therefore, length or area cannot be measured by datasheet, for example schools, bridges, offices.[28]

After this, printouts of vectorised maps were taken and verified by the Revenue Department with the record of rights. Following this, the digitised cadastral maps were superimposed on satellite images provided by the National Remote Sensing Centre, Hyderabad, with an objective to comprehend the inaccuracies in land record.

The report of the project was submitted to the Financial Commissioner, Revenue Department, Haryana, who proposed the model to the Department of Land Revenue, Government of India. In 2008, acting on the proposal, the central government launched a new scheme of National Land Records Modernisation Programme (NLRMP) by merging the existing schemes of Computerization of Land Records (CLR) and Strengthening of Revenue Administration and Updating of Land Records.

[23] Spatial location describes the location of a thing using geographical co-ordinates such as latitude and longitude.

[24] Geographical data on special kind of paper maps for each village

[25] T.L.Satyaprakash, Land Record Modernisation, Gurgaon, https://macrofinance.nipfp.org.in/PDF/SEMINARS/Satyaprakash16092016.pdf

[26] Satyaprakash Lakshmanappa & Dr. Sultan Singh, "A viable approach to establish conclusive land title in India", District Administration, Gurugram, file:///C:/Users/Geeta%20Rathore/Downloads/01-12-Timmiah_Lakshmanappa-715_paper.pdf

[27] Database concepts, University of Colorado, http://www.colorado.edu/geography/gcraft/notes/datacon/datacon.html

[28] Vector Data, https://docs.qgis.org/2.6/en/docs/gentle_gis_introduction/vector_data.html

In the end, a Jalsa-e-Aam (public verification of digitised land records) was organized at Kamal village by the Sirsa district administration and HARSAC in 2012 for public verification. The purpose was to encourage public participation in the verification of land records. All the digitised maps were displayed in the exhibition and the villagers were given an opportunity to identify discrepancy or inaccuracies in the updated land records. Majority of the villagers emphasised that the non-availability of proper records of their land caused several difficulties for which easy accessibility of the updated land records would resolve several issues.

Kamal village became the first village in the country where the cadastral maps were digitised. The initiative to digitize the cadastral maps with the help of GIS technology was successful in eliminating errors and discrepancies in land records. Integration of land records with cadastral maps followed by a public verification ensured that there is coherency between entries in the land record and actual status of the land.

It has been more than eight years since the Government of India launched the scheme of Digital India Land Records Modernisation Programme (DILRMP).[29] Though the majority of the states have digitized their land records, the possibility of accessing correct information is very less owing to the inaccurate data. As a result, errors in computerized land records are creating more difficulties for landowners.[30] The Kamal Village project shows that the real challenge does not lie in digitising the land records, but in ensuring that existing land records are correct. For this purpose, surveys and public verification is pre-requisite. Thus, the key answers to the problems lie in the community based initiatives, because the participation of public guarantees more accuracy in land records.

[29] Earlier known as National Land Records Modernisation Programme (NLRMP)

[30] According to the government statistics, in Kakinada, Andhra Pradesh, after the computerisation of land records, the revenue officials received 12,71,455 petitions for rectification of online records out of which 12,41,636 had been attended to and 1,29,799 were rejected due to lack of proper documents.

CASE 2 : Action Research in Community Health and Development (ARCH), Gujarat - Technical Intervention in Dediapada

Established in 1982 in the Eastern tribal belt of Gujarat, ARCH's work began in one small village, Mangrol in taluka Rajpipla in the district of Narmada (then district Bharuch). ARCH has worked in the fields of health, education and land rights of tribal farmers/ villagers displaced by Sardar Sarovar (Narmada) dam Project and as well as on land and forest rights of tribal farmers who have been living in forests for centuries, but whose rights over these resources were not recognized. It has been working on this for more than three decades now and has also developed a strong link with the tribal community there.

Here, we are showcasing a technical intervention by ARCH which enabled tribal farmers of Narmada district of Gujarat and tribal farmers who held land traditionally to get titles over their lands under the Forest Rights Act (FRA) of 2006.

The Forest Rights Act, 2006 was passed by the Parliament in December, 2006 and became operational in all states of India from 1st January, 2008 after the Rules under the Act were adopted. This is a revolutionary law, which recognizes traditional rights of tribal farmers and other traditional forest dwellers over forest lands and resources that they have been traditionally cultivating/ using. It recognizes two types of rights – the first are the individual titles (jointly in the names of the husband and the wife) over forest lands that the tribal families have been cultivating from 2005 or before and the second are the community rights of the village Gramsabhas over forest resources, which have the full ownership of all minor forest produce (including bamboo) and the right to protect, conserve, regenerate and manage the forest resources of their villages for sustainable use.

The implementation of this Act is, however, far from satisfactory. From 40,35,107 claims for individual forest rights filed by tribal and Other Traditional Forest Developer (OTFD) families in different states, only 17,37,467 (fourty-three percent) were approved till July 2017. 18,00,126 (fourty five percent) were rejected and 4,97,514 (twelve percent) were still pending (Monthly Progress Report, July 2017, Ministry of Tribal Affairs, GOI). The most important reason for this high rate of rejection is that it is very difficult for the tribal farmers to provide credible evidence that they have been cultivating the lands from before December, 2005, as is required by the Act.

Technical Intervention of ARCH in District Dediapada

The first technical intervention started from district Dediapada of Gujarat. To address the above issue, they came out with an innovative tool of using GPS survey and Satellite images (of 2005) with active participation of the Forest Rights Committees (FRC). In addition, it also used the tools of community mobilization and legal awareness.


Figure 4: Community mobilisation and Legal awareness camps conducted by ARCH

Proving that the Land belonged to the Farmers:

ARCH started conducting awareness camps to make tribal farmers aware of the provisions of the Act. When faced with the issue of lack of documentary evidence, it trained members of the village FRCs to carry out GPS surveys of all claimed plots of lands in their villages. It then super-imposed the GIS data of these surveyed plots on the geo-referenced satellite images of 2005 and 2009, obtained from National Remote Sensing Agency, Hyderabad and downloaded from Google Earth, and generated maps of surveyed plots with satellite images in the background. These maps clearly showed, beyond any doubt, that almost all plots of lands were being cultivated from 2005 or before, which proved that villagers' claims were genuine. Villagers then submitted these maps as supplementary evidence in support of their claims.

The tribal farmers immediately grasped the significance of this method and took up this work in a big way. They learnt how to carry out GPS surveys and carried out the surveys for all claimed plots of land in their villages themselves, with the help of GPS devices provided by ARCH. The farmers then shared the data with ARCH for processing and map generation. After processing the data and preparing the maps, ARCH then gave paper copies of the lists and maps to the


Figure 5: Tribal farmers identifying their plots on Google maps


Figure 6: Tribal farmers carrying out GPS surveys of their own plots

claimants. Cost of carrying out the surveys was fully borne by the tribal farmers themselves.

ARCH has so far helped more than 20,000 tribal families from 250 villages of 6 districts of Gujarat in carrying out GPS surveys of more than 30,000 land parcels (plots) and generating maps. They had submitted these maps to the district authorities. However, until recently, the district authorities did not take much cognizance of these maps. After sustained representations, the Gujarat Government decided to take cognizance of these maps and appointed GEER foundation (Gujarat Ecological Education and Research), a state government agency for forest research, to verify these maps on a trial basis for one district – Narmada. GEER foundation has completed verification process for nearly 5000 claims from 50 villages of Narmada district and has recommended approval of nearly 97percent of the claims and the average area recommended for approval is also as high as 1.70 hectares per claim. The district authorities are expected to give final approval to these claims based on reports from GEER foundation. The same process would be extended for other pending and disputed claims from Narmada and other districts.

Recognition by MOTA

The Ministry of Tribal Affairs (MOTA) has recognized the significance of this method and issued guidelines for the use of geo-referencing tools to review the pending and rejected claims by all state governments in July 2015, in which it has recommended adoption of this method. However, most of the state governments have still not adopted this method. Though, it is clear that if this method is adopted for the review of all pending and rejected claims, then it can give credible evidence for providing titles to large number of tribal and OTFD families. Throughout the country, there are huge pockets (where tribal farmers who have been farming in what is now categorised as forest lands) of areas where this model can be used to fill the gap in property documentation as part of the National Land Records Modernisation Programme. Without filling this gap, the program will not be fully successful.

Notes

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