Project Dissertation Report on

GOVERNANCE WITHOUT GOVERNMENT – A Blockchain Improvised PDS

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DECLARATION

I Vivek Dhuwan, student of MBA 2016-18 of Delhi School of Management, Delhi Technological University, hereby declare that Project Dissertation Report on **"GOVERNANCE WITHOUT GOVERNMENT – a Blockchain improvised PDS"** submitted in partial fulfilment of Degree of Masters of Business Administration is the original work conducted by me.

The information and data given in the report is authentic to the best of my knowledge.

This report is not being submitted to any other University for award of any Degree, Diploma and Fellowship.

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This is to certify that Project Dissertation Report on "**GOVERNANCE WITHOUT GOVERNMENT – a Blockchain improvised PDS**" is a bona fide work carried out by Vivek Dhuwan who is a student of MBA 2016-18 Batch. The project is submitted to Delhi School of Management, Delhi Technological University in partial fulfilment of the requirement for the award of degree of Masters of Business Administration.

Signature of Guide

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ACKNOWLEDGEMENT

Due to the fact that all the knowledge required was not in the literature, it was imperative that the people who guide be very resourceful and knowledgeable. A deep sense of gratitude for the above reason is thus owed to Dr. Rajan Yadav for his continuous guidance and motivation and for helping in whatever capacity he could at various stages in the project. I would also like to thank all the professors of DSM, my colleagues for their guidance and help in all the matters, whenever required. I really appreciate their involvement in the project and their regular advices that helped me refine the project as I went along and also inculcate all the points that help significantly with the growth in my learning.

I would also like to thank employees working in Gurgaon and Noida for answering the questionnaire using which I could perform my research project. I also would like to thank the customers at fair price shop for sharing the problems faced by them and suggesting the probable solutions to the problem. They have also contributed heavily in completion of this research.

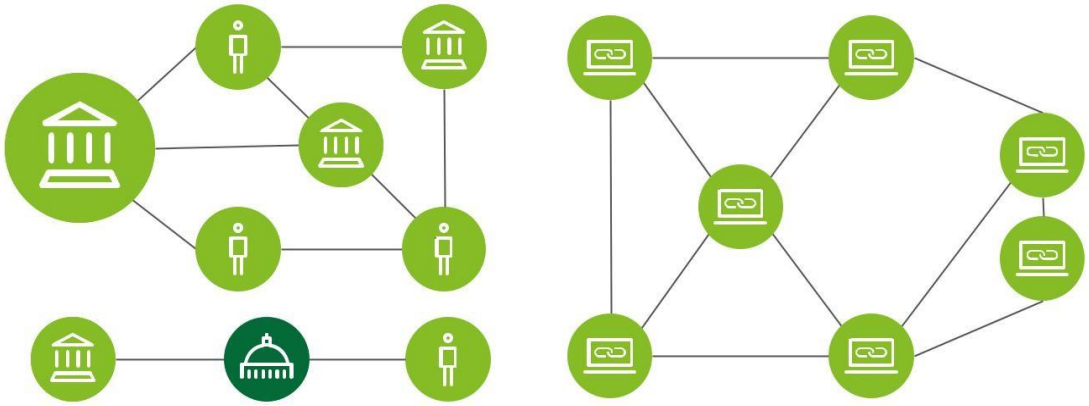
Finally a note of thanks is due to all those, too many to single out by names, who have helped in no small measure by cooperating during the project.

Vivek Dhuwan

EXECUTIVE SUMMARY

What is Blockchain?

"A Blockchain is a digital, immutable, distributed ledger that chronologically records transactions (Value and hash to previous node) in near real time. The prerequisite for each subsequent transaction to be added to the ledger is the respective consensus of the network participants (called nodes), thereby creating a continuous mechanism of control in terms manipulation, errors, and data quality." Simply put, Blockchain is a protocol to exchange value over the internet without any intermediation.



Current Paradigm Blockchain Paradigm

Fig 1: Traditional database vs. Blockchain base distributed ledger

Changing a Blockchain is nearly impossible once made. It increases confidence in data integrity and reduces opportunities for fraud and making it immutable. The immutability and

irreversibility feature of a Blockchain are derived from the underlying data structure which is called a Merkle tree or Hash tree.

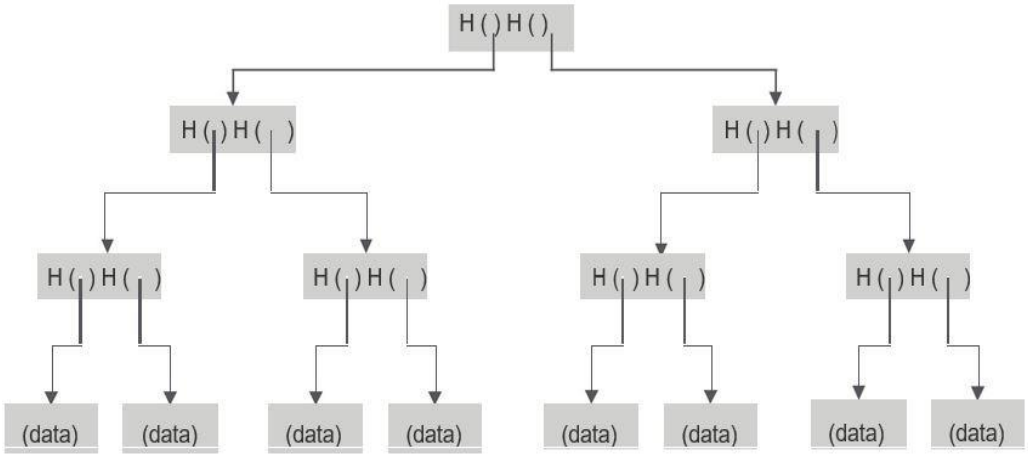


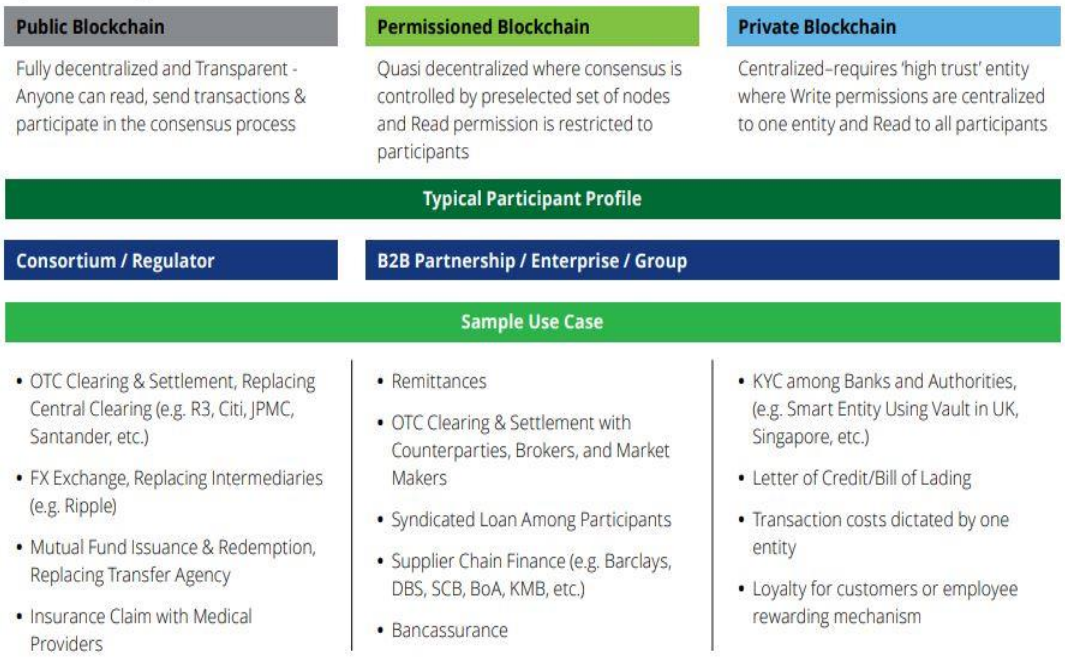
Fig 2: Merkle Tree Structure

The cryptographic security in Blockchain is due to binary data structure with hash pointers. Merkle tree, or hash tree, is a distributed data structure in which data blocks are grouped in pairs and the hash of each of these blocks is stored in a parent node. This grouping of hash codes is done till the root node making it immutable and temper free. Tampering of any block will lead to tampering of all the preceding hashes till the root node which is tamper proof. The other advantage of Merkle tree is the proof of membership/ownership as if you know the root member you can know all the members in the tree and hence hash tree gives faster processing of data as compared to traditional binary tree. Hence Merkle Tree is the basis of the Blockchain Technology.

Types of Blockchain:

All the Blockchains are divided into three categories: Public, Permissioned, and Private. In a public Blockchain anyone can read or write on the platform, but only on showing proof of work. In a permissioned Blockchain only selected nodes have the rights to access and provide consensus on that transaction, hence selective transparency. Lastly in a private Blockchain only chosen players have the rights to join the network which creates a closed loop environment.

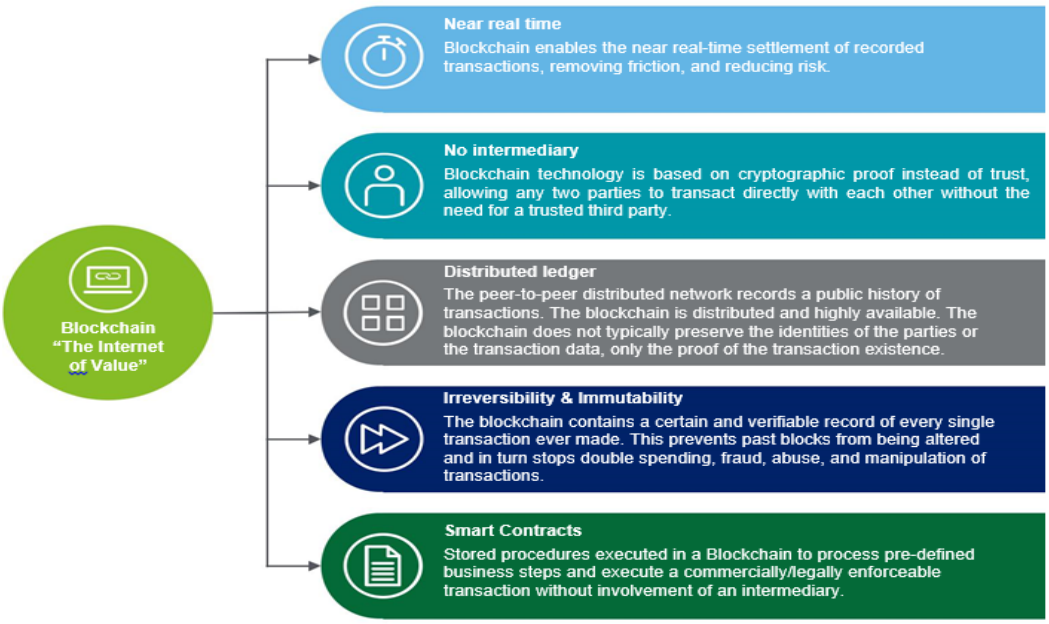
Fig 3: Different types of Blockchain



Inherent features of Blockchain

Blockchain offers some inherent benefits which is the present day need of the industry because of its design and architecture. This distributed nature of Blockchain brings in a lot of transparency in processing. It further reduces the need for manual verification and authorisation.

Fig 4: Blockchain key features



Benefits of using Blockchain:

Due to its wide application the benefits of Blockchain vary from case to case. However the benefits of a Blockchain can be best reaped when there is a lot of data that is shared across multiple parties with no established trust mechanism amongst the participants.

Fig 5: Blockchain benefits

Key Advantages of Blockchain Technology:

Blockchain technology offers immense possibilities, when seen in social perspective which are currently unavailable particularly in moving records to the blockchain can allow for:

—Self-sovereignty - for users to identify themselves while at the same time maintaining control over the storage and management of their personal data;

—Faith - in a technical infrastructure. Hence it gives people a confidence to carry out transactions such as payments or the issue of certificates without any second thought;

—Transparency & Provenance - for users to conduct transactions in knowledge that each party has the capacity to enter into that transaction;

—Immutability - for records to be written and stored permanently, without the possibility of modification;

—Disintermediation - the removal of the need for a central controlling authority to manage transactions or keep records;

—Collaboration - the ability of parties to transact directly with each other without the need for mediating third parties.

CONTENTS

CHAPTER - 1

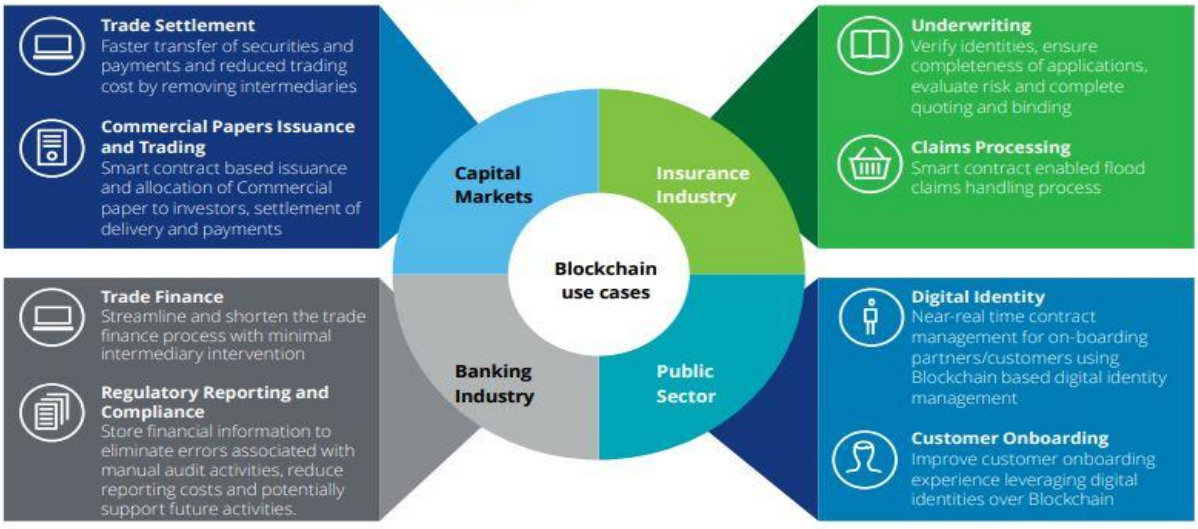
BLOCKCHAIN APPLICATIONS

1.1. FINANCIAL MARKETS

1.1.1 Clearing, trading and replacing the intermediary

The clearing and settlement of financial assets is a traditional function of the banking industry. Major markets such as the U.S., Canada and Japan still have a 3-day settlement cycle in place. In U.S. payments systems have increased end-to-end payment speed, among other things because of blockchain. The lag between the time the trade is made and the time at which it settles is what drives a number of credit- and liquidity-related risks and presents substantial opportunities for improvement. Some are of the view that the Blockchain does not only move value but it also integrates several components of the trading-clearing-settlement value chain in an elegant and efficient way. Thus clearing and settling trades is one of the potential applications of Blockchain.

Fig 6: Blockchain use cases in Financial Services industry



When a buyer and a seller agree to trade a particular security, the lifecycle of a trade begins. After reaching an agreement, the two counterparties update their accounts. They also arrange for the transfer of the security and the associated monies, known as clearing the trade. Once the process is complete, the monies and the security actually change hands. It generally occurs 2 to 3 days after the original agreement is reached. Several participants are involved in the clearing process, such as: (i) clearing house/CCP, which stands between two clearing members, and (ii) clearing members, who have access to the clearing house to settle trades.

This example of central clearing, when central counterparty or CCP, a middleman becomes a counterparty to each party making the trade, is becoming more common. Regulators are encouraging the shift from bilateral trading to central clearing. This simplifies the risk management process. Firms now have a single counterparty to their transactions. The CCP, through a process termed novation enters into bilateral contracts with the two counterparties. These contracts essentially replace what would have been a single contract in the bilateral clearing case. This leads to some contract standardization. It also reduces the capital required due to multilateral netting of cash and fungible securities.

A longer settlement cycle may present mainly following two risks: (i) settlement risk, which is 'the risk that one leg of the transaction may be completed but not the other', and (ii) counterparty risk between trade execution and settlement, and associated margin requirements, which leads to a requirement for clearing members to maintain a prescribed level of capital with the CCP. A shorter settlement time would reduce both of these risks. It entails in trades being completed more reliably and clearing members being subject to lower capital requirements. An institution's balance sheet capital requirements are reduced by reducing the risk of purchaser default and thus lowering counterparty credit risk. Credit and liquidity risk are virtually eliminated by distributed ledger technology by requiring pre -funding, in which the cash and collateral to be traded pre-exist prior to trading.

Decentralization and disintermediation brought by Blockchain technology can disrupt the clearing and settlement process. For example, a consortium of clearing members could eliminate the need for a CCP by setting up a distributed clearing house. Clearing then becomes closer to bilateral clearing. However as the contract stipulations through the Blockchain administered through a smart contract, there are reduced risk management issues. The speed of the entire

settlement cycle could also be increased from days to minutes or even seconds, eventually leading to continuous settlement using Blockchain technology. Apart from this all reporting, compliance and collateral management can also be handled through the Blockchain, reducing back-office costs.

Placing funds in escrow and not allowing them to be released until each party is satisfied with the performance of the other as reflected in a digital signature, is an improtant feature. Security could also be added to a transaction by requiring the signature of a third or even more parties, who play a role in authenticating performance.

Not everyone is so much optimistic of Blockchain technology. Some authors indicate that Blockchain is always going to be more expensive than a central clearer because a multiple of agents have to do the processing job rather than just one. Need of multiple agents makes it a premium clearing service – especially if delinked from an equity coupon – not a cheaper one.

1.1.2 Payment systems

Another promising application for distributed ledger technologies such as Blockchain is payments. Currently, payments are cleared and settled through trusted, central third party intermediaries. Industry experts predict that private, permissioned Blockchains will gain significant volume in the payments space by 2020. For example, in June 2016, Santander UK partnered with the Blockchain startup Ripple to become the first UK bank to introduce Blockchain technology for international payments.

More particularly, in the US, states have traditionally regulated non-depository financial services providers such as Blockchain payment companies. Existing state laws establishing licensing and compliance standards for money transmitters, such as the Uniform Money Services Act, may be expanded as Blockchain-based payment systems proliferate. Additionally, certain Blockchain-based payment providers may be subject to money services business (MSB) regulations issued by the Department of the Treasury's Financial Crimes Enforcement Network (FinCEN). On the other hand, the EU has a uniform legal framework–the Electronic Money Institutions Directive–for regulating electronic money.

1.1.3 Operational risks in financial markets

In the financial regulatory world, clearing intermediaries as well as most payment systems fall within a category of regulated entities called financial market infrastructures ("FMIs"). The Federal Reserve, consistent with standards set by the G20 and Financial Stability Board, defines FMIs as multilateral systems among participating financial institutions. It also includes the system operator, used for the purposes of clearing, settling, or recording payments, securities, derivatives, or other financial transactions,' which 'include payment systems, central counterparties, central securities depositories, securities settlement systems, and trade repositories. Therefore FMIs are regulated. The automation of trade clearing or of payment systems through the Blockchain technology could eliminate the need for a trusted intermediary which could in turn also present operational risks. These risks will have to be clearly identified, disclosed and monitored.

1.2 Smart contracts

The Blockchain was developed to facilitate cryptocurrency transactions, entrepreneurs. Now this technology develops a technology to use smart contracts. To develop an intelligent contract, some of the terms that make up a traditional contract are encoded and loaded into Blockchain, producing a decentralized intelligent contract that does not depend on a third party for record maintenance or compliance. The contractual clauses are automatically executed when the pre-programmed conditions are satisfied. This eliminates the ambiguity about the terms of the agreement and the disagreement about the existence of external dependencies.

Smart contracts are computer protocols that facilitate, verify or require the negotiation or execution of a contract. They render a contractual clause useless. Smart contracts typically have a user interface and often mimic the logic of contract terms. Advocates of smart contracts say that many types of contract terms can be partially or fully self-executing, self-executing, or both. Smart contracts are designed to provide greater security than traditional contract law and reduce other transaction costs associated with contracts.

One of the most important features of Blockchain is that it is linked to smart offers, it is the possibility of entering "unreliable" transactions. Non-fiduciary transactions are transactions that

can be validated, monitored and executed bilaterally through a digital network without the need for a trusted intermediary and third parties. Multiple Signatures (or "multi-sig") can be incorporated into smart contracts when two or more parts are approved before one aspect of the contract can be executed (for example, a custody agreement between two parties). When the intelligent contract terms depend on real data such as the price of a product's future at a given time, it is possible to develop approved external systems called "oracles" to monitor and verify rewards, performance or other real events. .

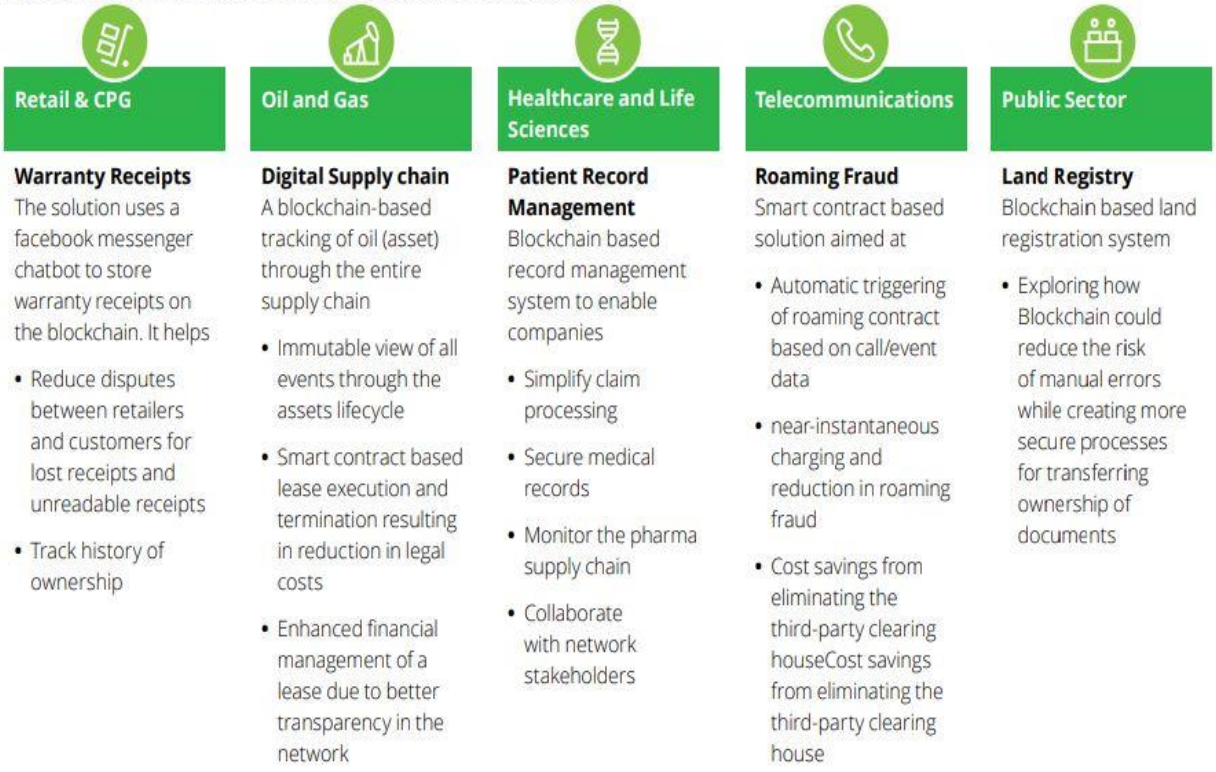
Financial transactions are a case of potential use for smart contracts. Smart derivative contracts could be coded so that payment, clearing and settlement take place automatically in a decentralized way without the need for an intermediary, such as a change house or a clearing house. For instance, a smart derivatives contract could be pre-programmed with all contractual terms such as quality, quantity, delivery with the exception of price, which could be determined algorithmically by market data fed through an oracle. The margin could be transferred automatically into margin calls and the contract could be terminated in the event of counterparty default. The Blockchain will perform the functions of record keeping, review and custody traditionally carried out by the intermediaries, with consequent savings in transaction costs for the contracting parties.

As ESMA states in its recent Discussion Paper on BLOCKCHAIN, Smart contracts, which would sit on top of the ledgers, may help reduce the uncertainty attached to contract terms and increase the automation of the processing of corporate actions, even if their use may be limited to certain types of instruments or contracts for complexity reasons, at least in the short term. Smart contracts are self-executing codes meant to replicate the terms of a given contract. They effectively translate contractual terms (e.g., payment terms and conditions, confidentiality agreements) into computational material.

1.3 OTHER INDUSTRY APPLICATIONS

As we all know that financial applications have received considerable attention. Blockchain technology has a lot of potential to provide disruptive applications to other industries.

Fig 7: Blockchain use cases across non-Financial Services industry



1.3.1 Real Estate Industry

Applications of Blockchain technology in the real estate industry can be applied to both public and private sectors. In the public sector, land registry records and public records of land ownership can be placed on the Blockchain, allowing the relevant stakeholders and agencies real time access to the ownership records. This considerably reduces ownership disputes and the need for middlemen to authentic documents and adjudicate disputes, ultimately saving cost and time for the end consumer. This application is explored by various jurisdictions around the world including the government of Honduras.

Within the private sector, residential rental agreements between private counter-parties can be placed on Blockchain and executed using smart contracts. This will streamline private contracts and real estate agency workflow, saving resources and time.

1.3.2 Health Care Industry

There are multiple applications of Blockchain technology to the healthcare industry, including in the distribution pipeline for various goods and services. One specific case is the drug delivery pipeline from the factory floor to the end user, whereby the drug packages are authenticated and time stamped at each intermediate delivery point. For instance, for a batch of drugs being shipped from the factory floor, the batch record is authenticated, time-stamped and placed on the Blockchain. It is subsequently authenticated and time-stamped again at each intermediate delivery point. This allows for tracking of the drug as it makes its way through the delivery pipeline. This greatly simplifies and streamlines the drug distribution pipeline management which can prevent the drugs from falling into the wrong hands, authenticating the drug for the end consumer which greatly reduces the counterfeiting possibility, price manipulation and delivery of expired drugs.

1.3.3 Smart Government

Government agencies can benefit considerably from the near instantaneous and simultaneous access to a distributed database that stores public records. An important example is identity management, e.g. “are you who you say you are”. Although solutions for identity management on the Blockchain are yet to be fully developed, there is a considerable amount work being done on this topic. For instance, passports or drivers’ licenses can be placed on the Blockchain. It will enable multiple agencies to share, access and verify identification in real time. The Estonian government is experimenting with identity management solutions on the Blockchain.

Another example is in Regulatory & Taxation applications. Many banks and financial institutions are currently working towards placing institutional and personal financial transaction on the Blockchain. Regulators can directly impose restrictions on the execution of transactions on the Blockchain that can be enforced automatically. This reduces the regulatory compliance and auditing costs which contributes to considerable cost reduction. Financial transactions can also be taxed automatically since the ledger keeps track of transfer of ownership of assets, as each transaction is visible to the relevant Tax agencies. This reduces the overhead

in terms of filing and auditing of taxes, and reduces the need for various intermediaries in the process.

Another interesting application is in Foreign Aid. Using cross-border transfers' foreign aid can be distributed in a far more targeted and efficient manner to reach its intended recipients directly in disaster zones, war zones or planned foreign aid. This results in a more timely and efficient delivery of the aid and considerably reduces the need for middlemen, and eliminates multiple channels and opportunities for corruption and misuse of funds.

Finally, another application of Blockchain technology in Smart Government is in voting systems. Using Blockchain technology, each citizen (or recognized member of a group) can submit their vote on an anonymised Blockchain, and the results of the voting can be determined by consensus between participant without the details of each person's vote or identity ever becoming public. This eliminates considerable voting environment overhead, from preparation to technology to staff to counts and recounts.

1.3.4 Artificial Intelligence

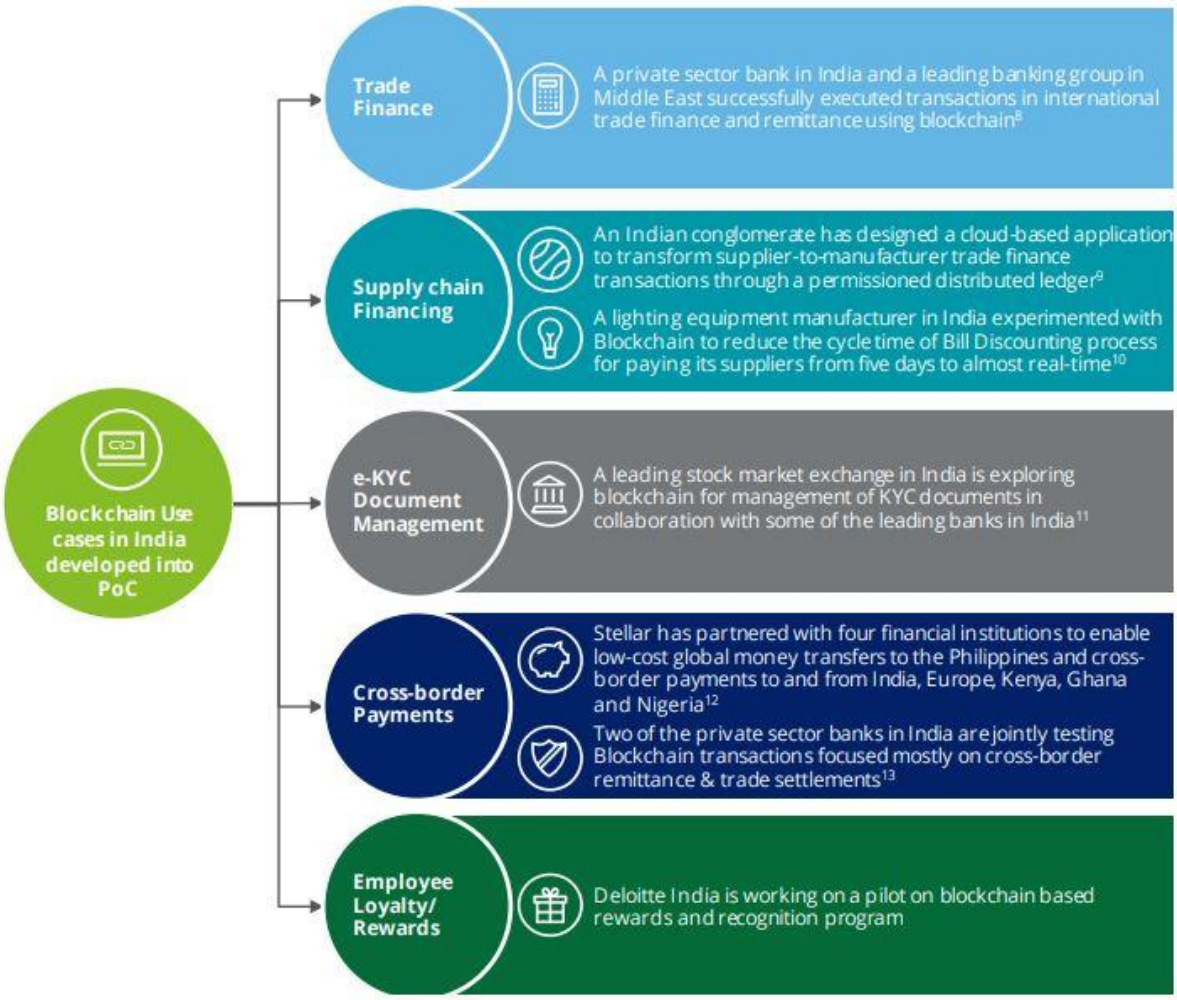
A very interesting application is the integration of Blockchain technology and artificial intelligence. This will have many and far-reaching implications in the future. Currently, smart contracts have very basic "narrow intelligence"; they can be programmed to execute a number of actions based on pre-determined rules and conditions, for example the timing of transaction execution. As Blockchain technology develops, smart contracts' implementation and development will advance and become more sophisticated. Nodes on the Blockchain can "learn certain functions" and be able to function on their own in a semi-autonomous way, due to integration of AI.

Further development that could result from this collaboration of technologies are,

- Negotiations between nodes on the Blockchain on asset price discovery;
- Discovering ownership networks of financial assets. It shall highly improve the KYC process in financial applications and expose tax havens, a rather relevant topic these days in wake of the recent RBI instructions;

- Blockchain nodes cooperating to optimize household energy consumption within the broader Internet of Things model.

Fig 8. Blockchain experiments by Indian Players



CHAPTER - 2

THE BLOCKCHAIN-BASED GOVERNANCE: PRINCIPLES & ASSUMPTIONS

To date, there is not even a complete discussion on possible models of governance based on blockchain at the academic level. Given that there is no coherent and coherent corpus on this subject, for the purpose of our work we have collected information from various sources as accurately as possible, although probably not exhaustively. Some views, assumptions, and proposals presented below have emerged through the Internet within a growing global network of advocates, developers and entrepreneurs of new technologies. While few other ideas seem to be recurrent themes in conferences, blogs, forums and specialized websites. As far as we know, they are not exclusively attributable to a specific author.

That said, the basic principles of government based on blockchain are:

(a) Centralized organizations and problems of scale.

(b) State as a single bankruptcy point (SPOF).

(c) Distributed architecture and trust-by-computation “Code is law”.

(d) Politics by instant, atomic interactions along with power of individuals and

(e) “Putting a nation on the blockchain”: a Starbucks -style public administration.

(f) Boarder-less, globalized government services.

(g) Systems of direct democracy.

(h) Futarchy: “Vote for values, but bet on belief”.

(i) A decentralized society, still based upon the State authority.

(j) A new social contract, characterized by Decentralized Autonomous Societies and the final demise of the State.

(k) Franchulates.

(l) Authority floating freely, cognitive dissonance and societal maturity.

2.1. Decentralization and new models of governance

With reference to recent political scenario in India, the drive towards decentralization can be seen as a part of a wider anti-government phenomenon, which has progressively emerged in past few years, modifying the relationship between citizens and central authority. In this new trend, different interest groups, political groups in society are more and more inclined than previously to compete against each other for the control of the State: rather, they cease to recognize political monopoly, emphasizing its weak performance and failures, and exploring new possibilities to organizing activities and services in a more efficient way.

The concept of deliberative democracy has been discussed since the 1980's as an ideal of political autonomy and self-governance. It expresses criticism against the limits of the traditional forms of political participation. In a representative democracy core political principles should be followed. They should be rather strengthened by direct civic participation, this approach has put particular emphasis on values such as public reasoning, deliberation among equal citizens, transparency, and accountability of the decision- making process.

At the same time, the view of the state monopoly as a Single Point of Failure (SPOF) and the search for less state-centric policy instruments in the era of digital and social media revolution have also paved the way to an increased interaction among public, private and nongovernmental subjects for the fulfilment of public interest activities. The notion of New Public Administration – and thereafter New Public Governance – has been proposed to define such new framework of decentralized governing practices, emerged in the India since the 1991. Governments should act as an enabler by setting priorities and goals instead of directly deliver services, in order to better meet citizens' needs. Firstly, these practices have addressed the growing need to experiment an entrepreneurial model of leadership, finding innovative solutions to the mismanagement of State, redtapism and bureaucracy across the traditional organizational and institutional boundaries; secondly however, they have resulted in a controversial and socially costly process of public expenditure review, deregulation and privatisation of public bodies, in the attempt to improve efficiency and reduce costs of services through neo-liberal policies. It has increased the corporate culture decreasing ethics as business works on the principles of profit, and services should not be motivated by profit as their aim is different.

Governance without government is the emerging pattern of management. It characterizes a major shift of power from public to private sector, and by an increasingly dominant role of the market in public affairs. In this context, researchers has also given particular emphasis to the power of networks to downplay the role of State and dominate public policy, due to ability of networks to self-organize, develop resilience and evade government control.

In the last two decades, the effects of globalization have put a new pressures on institutions for further decentralization and more participative political practices, resulting in control and social coordination – which have always been essential roles of a Socialist State like India – have become far more complex and fractured than in the past, now involving the sharing of authority with a growing number of non-state actors, operative agencies, stakeholders, and networks at local and global level. Concepts and practices of public governance have evolved accordingly. Literature has conceptualized a rich variety of new organizational models, with the discussion of multi-stakeholder, decentralized, distributed and collaborative governance. These models share some basic features, such as: a trend towards deconcentration of hierarchical structures; a more responsive, transparent and accountable approach to decision-making; the inclusion of multiple interest bearers in a platform of dialogue, in order to find consensus-based solutions to common problems, although their meanings and definitions may change depending on context.

2.2 The role of cyberspace, peer-to-peer networks and encryption.

The revolutionary development of information technology, the increasing focus on digitization, and the ubiquitous nature of connectivity have represented a further catalyst for governance decentralization. Overcoming the barrier of cost of communication and using a distributed architecture with multidirectional connections among all nodes, the Internet and cyberspace have paved the way for the emergence of the "networked public sphere" as a great facilitator of freedom of expression. To intensify interactions between interest groups and social movements at local and transnational level; express grievances and discontent through non-institutional channels; engage in new collaborative processes and experiment alternative governance models, in a climate of greater political awareness, like never before in history, citizens have had the possibility – among many other things – but also growing distrust of government actors.

Ancient concept of Westphalian nation state and territorial-based governance has further been eroded by traditional functions related to sovereignty, authority and national boundaries increasingly called into question.

Even the diffused enthusiasm towards cryptography as a defensive political instrument has certainly played a crucial role. The idea to use strong encryption to protect citizens' freedom and privacy from governments and big corporations can be traced back to Indian constitution which ensures privacy as a fundamental right. Freedom of speech, individual privacy in communication and anonymous transaction systems are essential conditions for an open society, and they should be used to foster social and political change.

2.3. The final stage of decentralization: the blockchain-based governance

All the above mentioned processes have few things in common: they have explored new forms of coordination and interaction between State and society, with a significant shift of power from central institutions to individuals and/or markets.This final stage of this process of decentralization and disempowerment of institutions, is facilitated by blockchain-based governance as insofar as:

- Social benefits of a bottom-up approach to politics, emphasizing consensual forms of self-government and direct participation of citizens to decision-making process, are proclaimed in a similar way as deliberative democracy.
- It doesn’t see any value creation in central coordination and it promotes the primacy of economics over politics, following a logic of privatization of government services, as prompted by the New Public Governance (“governments need to become more like business; “markets can do better than the State”).
- It strongly recommends the political use of strong encryption to enhance citizens' freedom and privacy.
- It relies on peer-to-peer global networks and online interest groups, not on any government. It aims to decentralize hierarchical structures, be independent as far as possible from government powers, and challenge their agenda.

CHAPTER - 3

DECENTRALIZING GOVERNMENT SERVICES THROUGH THE BLOCKCHAIN:

3.1 issues and concerns

IN what extent is it possible to decentralized public administration and government services through the blockchain technology? Can the State archives, physical ledgers and human notaries, be dismissed and "a nation be put on the blockchain"?

Obviously, the blockchain has remarkable properties as a distributed ledger, such as efficiency, cost-effectiveness, irreversibility, transparency, auditability and censorship resistance. Yet, the proposal to decentralize government services through an open, unpermissioned blockchain entails a whole set of unknown consequences, problems, limitations, which may overweight the benefits. Although the blockchain is frequently described as a "universal, permanent, continuous ledger", they do not take enough account of the several performance risks at stake. Hence the claims are overstated.

3.1.1 Security problems and technical weakness of current distributed blockchains

The first problematic aspect is that current public, unpermissioned distributed ledgers as Bitcoin have been seen with speculation by the public, with an inherent trade-off between dimension of the network and decentralization. Scalability naturally will lead to centralization of the computing power in the network, due to the decrease of the number of miners able to perform the mathematical verification required by the protocol, which has growing costs. Bitcoin, for example, is currently run by increasingly centralized mining farms. It has turned out to be engaged in secretive, colossal mining operations in China posing further security threats. They are traded on the stock-exchange in Australia, with possible risks of collusion or cartelization. A decentralized Starbuck-style governance based on such a blockchain definitely would expose citizens' records and essential rights to private interests and to unpredictable market dynamics such as uncertainty of mining profitability, volatility of prices, discontinuity of investments, speculative attacks, etc. which is way too dangerous than even a bad government.

Apart from this an apparently robust peer-to-peer network, a public blockchain is inherently volatile. It can be forked or dismissed by the community at any time, if it is not attractive or

remunerative anymore. Hence it is questionable whether a fully decentralized blockchain like Bitcoin can be defined as a “universal ledger” as there is no conclusive evidene thatguarantee that it will still be operative or even exist in the future, persistence and preservation of contracts and government services may become “susceptible to invalidity through obsolescence and boredom”.

A further complication is that blockchain based government will be entirely reliant on connectivity. Have the electronic network be shut off, or if everyone moved on to a new system, there will be no paper-based backup archiving the existence (or execution) of these contracts, by contrast, are all about managing uncertainty.

Before considering to migrate government services to an open, unpermissioned blockchain, there are several other technical issues that should be carefully assessed.

Despite the enthusiasm of its advocates, the scientific community generally agrees in stating that Bitcoin and its many clones are based on a technology which is still immature and highly vulnerable.

Experts have raised the conecerns about the incentive mechanism of Bitcoin mining protocol that a colluding, minority group of “selfish miners”, consisting of 1/3 of all miners of the network. It may in fact strategically control the system and break its decentralized nature. The research has therefore concluded that services and data built on the top of the Bitcoin blockchain, such as virtual notaries, are currently at risk. According to the theory of Programmed Self-Destruction, till now unkonwn fatal engineering mistakes in the Bitcoin architecture, certainly will result in a process of programmed decline and rapid self-destruction. Problems are:

- Erosion of profitability for existing mining machines is excessively fast;
- enormous investments in hashing infrastructure, still with poor general security of the system;
- insufficient network neutrality;
- lack of reliable data about the volume of transactions and irrational expectations of investors.

In particular, the self-destruction of Bitcoin network could be caused by a fatal combination of four factors:

- inefficiency of the The Longest Chain Rule, which leads to unnecessary instability and growing risks of attacks to the network;
- deflationary monetary policies;
- poor network neutrality and moral hazard;
- rapid hash power shifting from one coin to another, due to high competition.

Although "In Cryptography We Trust" is the motto of many supporters around the world, researches also show that Bitcoin blockchain currently suffers from major vulnerabilities related to the use of elliptic curve cryptography (ECC), including weak key generation, poor signature randomness, and insufficient entropy and software bugs.

In particular, Bitcoin elliptic curve cryptography is not quantum-safe and the emergence of quantum computers could disrupt it at any time. In this regard, Bitcoin core developers simply claim that given an appropriate amount of advance warning (such as one month), they may be able to take emergency measures through a centralized authority and keep the blockchain safe: The authority system will introduce centralization, but it will only be a temporary emergency measure, and after a few years the system can be retired entirely.

The solution proposed is rather naive, if we consider that in all probability quantum computers may already be secretly in use by some governments and in any case they may merge with little or no warning to the public or other interested parties. But most importantly, the proposal to fix technical problems through a central authority or "benevolent dictator" would entail the direct power of private entities over government services and essential citizens' data, without any formal legitimacy nor control.

Needless to say, history is full of "benevolent dictators" who bypassed procedural legality and gave themselves full powers, with the declared noble objective of serving the community and restore order. But if history has taught us anything, it is that the question of legitimacy is crucial: it should hence be considered with great care, especially by those libertarians who genuinely believe in decentralization through the blockchain – and through Bitcoin in particular – as a new political model to enhance individual freedoms and collective rights.

In overall, the benefits of open, unpermissioned blockchains for government services seems to be offset by several risks, related to:

- moral hazard, scalability problems, trend towards centralization and likely dependency of networks on private oligarchies, such as miner corporations, which may rapidly conduct stock exchange mergers and acquisitions, gaining considerable power on global scale;
- domination of market logic over essential public services and citizens' rights, which should be rather protected by speculations of any kind;
- possible lack of service continuity and /or preservation of data in the medium-long run with no delineation of liability, due to market dynamics and/or serious technical flaws;
- raising of a dominant techno-elite with growing supervisory powers over strategic services at global level, without the necessary formal legitimacy.

We should thus conclude that government services can hardly represent the best area of applicability for fully decentralized blockchains, such as Bitcoin. Government records require high performance and a high degree of reliability, accessibility and predictability, being not tolerant of any service interruption or failure: a flaw in the management or in the implementation of the network would compromise the security and the civil rights of millions of citizens. Moreover, a formal and transparent process of legitimization must be strictly required when dealing with government services, in order to avoid the indiscriminate emergence of private powers over public affairs.

Centralized and democratically legitimated public institutions are therefore crucial to ensure accessibility for extremely sensitive data in the long run and to preserve them from uncontrolled centralization, market speculations, technical flaws, and private supervisory powers. On the contrary, an indiscriminate process of decentralization and gamification of public administration through token-based incentives may turn out to be an irresponsible choice, with detrimental effects on citizens' fundamental rights.

3.1.2 Advantages of permissioned, token-less blockchains for public sector

If fully distributed, unpermissioned blockchains like Bitcoin have their own inherent limits, permissioned blockchains may represent instead a valid solution for governmental online

services. Applications may include, for example: ID cards and driving licenses; land, school, medical records; certificates of birth, marriage, and death; tamper-proof and auditable e-vote systems; tax collection, etc.

Permissioned blockchains are replicated, shared ledgers, which can be administrated by one or more organizations – e.g. a government agency– in order to guarantee adequate levels of network coordination, reliability and security through human intervention, when necessary. These ledgers present advantages over both fully distributed blockchains and traditional databases.

Firstly, they are separated from speculative verification mechanisms, such as cryptocurrency or token rewards: they can therefore be used for services that are of general interests only, with data properly protected in the long term and no interference from cryptocurrency markets.

Secondly, they are distributed and synchronized, but their network is restricted to few trusted nodes and members, identifiable by controlled access permissions. Since nodes are very few, with no need for mining nor computationally intensive proof- of- work, validations and propagation of data are much faster than public blockchains. Networks are also substantially free of scalability issues and may have slight performance advantages over public blockchains because they are only dealing with the functionality required for that chain rather than all the functionality for all of the people for all of the time.

Permissioned blockchain-based architectures can be designed for specific purposes, with different consensus and verification systems, and with different levels of control, security, visibility and permissioning.

Traditional databases are overall inefficient, since they generally use a master-slave, centralized structure for data replication: the master database is the only original and authoritative source, and any change on data performed on the master is propagated to the slave databases, which are kept synchronized. This kind of architecture, however, may raise problems related to reliability, volume of traffic, and latency, since the master database performs all the writing operations. A more involute system, called multi-master replication, allows any slave database to perform changes, sharing updates to each other to remain in sync: this entails, however, complex

strategies to ensure data consistency, in order to prevent and solve possible conflicts between information.

Compared to master-slave databases, the distributed architecture of permissioned blockchains may bring significant advantages to public administration in terms of efficiency, data security, data integrity, availability, reduction of errors and infrastructural costs. Data integrity, in particular, consisting of accuracy and consistency of data, includes both the provenance of the data and the preservation of integrity through transformation. Along with security and availability, it is particularly important for government services and it can be significantly enhanced by the blockchain technology.

Although they are still at an early stage of development, the advantages of permissioned blockchains should be definitely discussed more, with a view to a possible application in the public sector.

Despite their potential benefits, however, permissioned blockchains are often the target of a great deal of criticisms, mostly because they are centralized, closed systems and they cannot provide censorship resistance. They can thus be resisted by those techno-libertarians "who see such developments as either compromising the whole point of decentralization or being a desperate act of dinosaurish middlemen trying to stay relevant".

We have already seen, however, that there are limits to what fully distributed ledgers are suited for, and such limits should be clearly recognized, in order to make reasoned choices.

In regard with security, although the dominant narrative tends to consider centralized institutions as incapable to rapidly react to sudden changes, I argue that the opposite is the case: vertical centralization is definitely better suited to deal with rapid technical challenges, compared to horizontally- scaled structures. Scalability, for example, is a problematic factor. In a distributed architecture with thousands or millions of nodes on global scale, to modify a protocol may result in a complex and time-consuming procedure: it requires wide consensus of core developers, miners and nodes; consensus can be conditioned by reasons of economic expediency; and in the end, the ecosystem may fail to respond to unexpected challenges in a timely fashion.

For this very reason, we should conclude that human use is probably our best chance for preserving complex systems of software. When citizens' rights are concerned, however, it is worth recalling that human agents cannot be hi-tech elites who proclaim themselves benevolent dictators: they must rather be public officers legitimated through formal, accountable and transparent procedures.

3.2 Government services and the technological imperative of decentralization

The assumption that decentralization of services through a fully distributed blockchain represents an inescapable future or a natural progression of humanity is common between its advocates, albeit rather deterministic. Firstly, it is questionable that there is such a thing as a natural progression of humanity: rather, humanity sets priorities and makes choices among many possible options and scenarios, often in a conflicting way. It is even less acceptable the idea that individuals and societies can be forced to grow into a new level of maturity by technology, since the success of a new technology depends much more on social factors and interactions, than on the superiority of the technology itself, and in this regard every society has different social practice, with unpredictable.

The idea that technological developments are inevitable, with fatal, unstoppable and irreversible consequences on society, is usually defined as technological imperative by scholars, and interestingly, it tends to grow as technological systems become large, complex, interconnected and interdependent. When dealing with essential government services, however, determinism should never be the driving force behind decentralization. Indeed, the point is not to challenge the centralized model of governance at any cost: decentralization presents trade-offs and it can be instrumental in promoting development and good governance but it is not an end in itself. Hence, it should not be uncritically embraced in the name of anti-government feelings, technological imperative or wish for innovation at any cost.

In this regard, it also worth recalling that innovation is a specific tool of entrepreneurs: as such, it generally belongs to a market-oriented vision of the world, which sets as priorities profit, competition and commercial interests, but it does not necessarily represent the most desirable characteristic for government services, which are connected to preservation of social, economic and political rights, and must rather prove security, reliability and long-term durability, in the face of societal evolution.

Decentralization through distributed blockchains mostly means privatization of public functions, with the transformation of government services and citizens' rights into a new profitable private business. Since the so-called freedoms often claimed by exuberant postmodern political thinkers have in fact become potent sources of insecurity, I should recall the main reason why central coordination of public institutions was originally created – and why I should keep it: to protect common good and collective rights in the long term from transitory individual interests and from any reckless logic of profit. And in this regard, it cannot be ignored that permissioned, token-less blockchains hold a considerable advantage over fully distributed blockchains.

3.3 The myth of an egalitarian, blockchain-based society

Techno-libertarians usually place particular emphasis on blockchain capability to reach consensus between participants on large scale, considering centralized vertical authority detrimental to individual powers. They often advocate the wishful scenario of a flat, non-hierarchical and coercion-less society run through algorithm- based consensus, in which individuals can cooperate freely. This vision, however, seems to come in addition to the number of many others ICTs myths emerged in the last decades – including for instance the myth of a new and better government, the myth of technological progress, the myth of rational information planning and the myth of the intelligent and empowered consumer.

We will briefly discuss reasons why the blockchain governance does not solve neither the - political problem of coercion, nor the problem of hierarchic structures in society.

3.3.1 The issue of coercion

In the rhetoric of decentralization, consensus and coercion have become concepts related to opposite models of social and political organization. By semantic association, the word consensus seems to evoke principles such us equality, fairness, agreement, brotherhood, cooperation. On the contrary, both the words centralization and coercion seem to be related to the idea of constrain, oppression, violence, lack of freedom, infringement of individual rights. This perspective, however, is quite objectionable. It does not take into account, for instance, that centralization and coercion are legal means originally designed to gain stability, protection of individual rights and long-term cohesion between groups. To see coercion solely as an

instrument of oppression is another typical element of anarchic and Marxist doctrines: according to this view, the individual autonomy is to be considered a supreme value and there is no difference between force of authority based upon the law and mere violence.

At theoretical level, however, modern Western constitutions have already solved the problem of finding a balance between central power and individual rights, through the concept of rule of law: coercion based upon the law is thus source of rights for citizens, and not only of duties, and it constitutes the necessary common ground between liberalism and democracy.

Examining the fundamental assumptions of democratic theory, Robert Dahl explained that anarchists considers the coercive authority as an undesirable model, which should be replaced entirely by voluntary associations based on continuing consent. Today, a strong anti-government feeling and technological determinism lead many crypto-anarchists and techno-libertarians to believe in the blockchain as a disruptive technology capable to gain such continuing consent, in order to create a society with horizontal structures and distributed authority.

Dahl, however, proposed many valid theoretical points which contradict these assumptions. Firstly, if we judge societies as relatively good or bad according to the extent to which they maximize consent and minimize coercion, then we are dealing with moral doctrine and not with political philosophy. But most importantly, since coercion is indeed a moral problem, it does not disappear with the demise of the State, nor with a horizontal distribution of authority. Coercion is very likely to exist even in the absence of the state, simply because recalcitrant wrongdoers will always exist. Since continuous consent is in practice impossible, all that remains is to decide whether and in what circumstances it might be justifiable to use coercion.

Showing that the problem of coercion is all but solved, Dahl leads us back again to the inescapable problem of setting a higher level of political coordination, with legitimate procedures to achieve organized coercion – as discussed earlier. But this does not have to be a negative thing per se. Indeed, the philosopher asks himself: “Why is avoiding coercion a supreme end that dominates all other ends? What makes non coercion superior to justice, equality, freedom, security, happiness, and other values?

It is clear that noncoercion, like decentralization, cannot be regarded as an end in itself.

3.3.2 The emerging of new hierarchies: the blockchain governance oligarchy

A part from the issue of coercion, the blockchain-based governance is not likely to solve the problem of social hierarchical structures either.

Despite the open source nature of protocols and the much-vaunted egalitarianism of peer-to-peer networks, a massive adoption of blockchain services would most probably end up creating new oligarchies and a strong polarization in society. In virtue of their technical skills, code developers, miners, fintech professionals and technopreneurs would easily have a privileged position in society, becoming the new policy makers to detriment of a big mass of computer illiterate or low skilled individuals, reduced to mere passive recipients of services. Elites can assume many forms according to the social and political context, and we are in a phase of human development where the power to develop codes and select algorithms has – and it will increasingly have – major implications in contemporary society: this power entails assertion of authority and it constitutes politics pursued by other means, calling into question the egalitarian nature of technology and networks. Regrettably, indeed, open source does not automatically mean neither equal opportunity, nor inclusiveness. Since open source networks presents major cognitive entry barriers, discussions about the formation of new global cosmopolitan democracies need to be measured against the whole issue of access and regulation.

According to many observers, a tendency to elitism and centralization is already observable in the current state of Bitcoin network, as well as in decentralized platforms.

In theory, the open source protocol is designed to foster cooperation on global scale and anyone can contribute to code development through the GitHub forum. In practice, however, decisions are made—or executed at least—by a team of core developers because only they have the technical permissions to accept submissions. Those core developers form, at least at first sight, Bitcoin's governance group in a narrower sense. Every adjustment to Bitcoin's governance structure must pass through the bottleneck of this small group of people.

Even Gervais, Karame, Capkun and Capkun (2013) have exposed the lack of transparent decision making in Bitcoin and its centralized nature, due to the privileged position of developers in conflict resolution and to the emergence of many profitable businesses, mostly related to mining operations, which control the market.

These entities altogether can decide the fate of the entire Bitcoin system, thus bypassing the will, rights, and computing power of the multitude of users that populate the network … On the one hand, the Bitcoin ecosystem is far from being decentralized; on the other hand, the increasing centralization of the system does not abide by any transparent regulations/legislations. This could, in turn, lead to severe consequences on the fate and reputation of the system.

Given the huge computing power harnessed in the Bitcoin system ... users believe that it is unlikely for any entity to acquire such power alone. However, even a quick look at the distribution of computing power in Bitcoin reveals that the power of dedicated 'miners' far exceeds the power that individual users dedicate to mining, allowing few parties to effectively control the currency.

Curtois (2014) warned about the existing imbalances in the Bitcoin ecosystem, both from a technical and economic point of view. Bitcoin stakeholders – to name but one example – generally lack essential information about security issues, because there is a strong asymmetry in information between core developers, pool managers and users. Further, Curtois confirmed that the design of the entire Bitcoin architecture always gives mining pool operators a greater strategical power in decision making, compared to nodes. But most importantly, Curtois stressed that open communities tend to aggregate into clusters: sub-communities of Bitcoin enthusiasts, well-established service providers and other influential stakeholders interested in promoting their brand name and their business interests, for instance, tend to set up an authoritative power, especially if there are major economic interests at stake.

The most compelling evidence of this is perhaps Bitcoin XT, a much criticized hard fork launched in August 2015, for which the Bitcoin Foundation took upon itself the power of decision over global policy strategies30. Albeit not formally vested with centralized decisional powers, Bitcoin Foundation is endowed with a formal structure and legal obligations, and according to global governance researchers, this has led to an increased significance of voting in the decisional process.

Foundations or similar institutions may achieve a significant and unaccountable soft power in decentralized ecosystems, but there is also a number of prominent individuals in the Bitcoin and blockchain industry, which have a strong influence on the community and its discussions. This

elite group may consists of startup founders, key executives, chief scientists and evangelists, who easily make headlines for their leading role in technical debate. These celebrities generally gain charismatic power through a strong visibility in international conferences and media, by virtue of their technical and rhetoric skills, or because of their reputation as big private investors. In this global theathrocracy grounded on online and stage presence, by acting as industry thought leaders, they become leaders de facto, promoting their ideas on how the industry should move forward, and using financial power, technical skills and persuasion – namely influence over beliefs – as means of hegemony. This Steve Job-style charismatic power can strategically use information to steer network policy or shape users consensus at global level.

While the good faith of these public figures is generally taken for granted, it is significant that they may have previously had high-rank careers in IT or financial giants, such as Google or JP Morgan. Is the global financial techno-elite exploring new profitable geographies of capital, jumping on the bandwagon of decentralization? And if so, with what political aim in view? Whatever the answer is, the revolving door issue may raise legitimate concerns, being potentially harmful to the public interest, especially in case of massive adoption of the new technologies at stake.

Considerations made so far may as well apply for crowd-funded decentralized platforms like Ethereum, a token-based service from which depends the execution of smart contracts and other applications. Ethereum is developed by a worldwide team of contributors called ETHDEV, through GitHub platform. The platform is run on behalf of the Ethereum Foundation, a non-profit organization registered in Switzerland, and its centralized structure consists of a Board of Directors and an Executive Chief33. Albeit functional to the development of the platform, Ethereum model of governance is founded on ownership and vertically structured power: this inevitably raises the issue of legitimacy, integrity of the management team and adequate transparency in the mechanisms for reviewing development proposals, especially when dealing with citizens' essential services. In a world increasingly reliant on technology and ruled by networks, whoever owns and controls these platforms will always have a significant power over civil society on a global scale.

Elitist theorists like Gaetano Mosca claimed that any socio-political regime is always ruled by an organized minority. The examples discussed so far confirm that even cyberspace and open

networks have an inherent elitist nature, in which debate and decisions still tend to be dominated by few. Indeed, networks based on distributed consensus are far from having a homogeneous and egalitarian structure: despite the incorruptible nature of algorithms, individuals are inclined to form clusters based on similar interests and networks are thus likely to present subtle or hidden points of control, other directly managed by core developers or indirectly shaped by diffused, charismatic powers.

All these elements confirm that the revolutionary potential of governance- by- network as an absolute, horizontal mode of political and social organization is often overstated and unrealistic. In particular, the case studies provided by these authors show that networks are not a mode of organization based on pure cooperation: indeed, networks also have centres and central modes of steering and governance, without which they easily fall apart.

Despite any utopian vision about a blockchain-based, horizontal distribution of authority in society, there is empirical evidence that no technology can turn vertical relationship of governance into horizontal. Hierarchies, markets and networks constitute the three main components of any society and they will always exist, restlessly competing against each other for power. In the end, according to the researchers, these very dynamics prevent both utopias and dystopias to become real.

But since a mix of centralization, decentralization and competition for power appears to be inevitable in society, in spite of any disruptive information technology, we are back again to the problem of selecting leaders through legitimate procedures, defining transparent and accountable mechanisms to limit their power. An issue that the blockchain governance leaves unresolved, promising instead a utopian and universal social levelling.

3.4. Conclusions

The blockchain is a disruptive technology with a tremendous transformative potential for our societies. Risks and benefits related to its possible applications, however, must be carefully weighted, avoiding utopian expectations, as well as the pitfalls of technocratic reasoning and determinism.

If properly managed, decentralization of government services through permissioned blockchains is possible and desirable, since it can significantly increase public administration functionality. Decentralization of governance through open, distributed blockchains like Bitcoin, however, presents serious risks and drawbacks, which offset the benefits.

Although originally designed as disintermediation tools, the ecosystems of fully distributed blockchains are characterized by a great amount of third parties and profitable businesses offering intermediation services, with strong asymmetries of information and power between developers and users. Trend towards centralization, digital divide, lack of transparency in decision making process, and unaccountable power of core developers – all these factors call into question the egalitarian nature of current distributed networks, making some blockchain advocates' expectations overestimated and unrealistic. In particular, the idea of a blockchain-based authority “floating freely” (Section II, point l) turns out to be deceptive, since authority is in fact proven to morph into more subtle or hidden centralized forms.

There are hence reasons to question the role of the blockchain-based governance as a great facilitator of individual power, in an absolute sense. On one hand, the promise of empowering individuals is likely to remain unfulfilled, because of the dominant role of markets and the speculative verification systems of fully distributed blockchains. On the other hand, the process of downplaying of public institutions, the primacy of economics over politics, and the transformation of citizens into costumers with the promise of more freedom, efficiency, and equality may hide yet another insidious process of corporatization of politics, which invariably empowers markets to the detriment of citizens. Far from being new, such shift of power from public to private sector has been ongoing in various forms for decades, with huge social and economic costs.

Insofar as: the State is not recognized as a necessary collective body, it is weakened or mostly dissolved in economy; a new elite of code developers with unaccountable power reduces politics to electronic service delivery; citizens are mere consumers of services provided by private platforms; collective rights “float freely”, treated like any other commodity; and betting digital tokens on public policies.

A reasonable conclusion is that the blockchain-based governance should be seen as an organizational theory – with significant technical and managerial advantages for markets,

private services, and communities – while it is not meant to be a stand-alone political theory. Likewise, blockchain technology and decentralized platforms are not hyper-political, but rather pre-political tools. If not balanced out by the functions of centralized, political institutions, the blockchain-based governance risk to fall within the concept of amoral antipolitics, dressed up in the language of inevitability concerning the working of globalization and the free-market and these antipolitical forces are able to disrupt those very democratic values that today many libertarians strive to defend.

When assessing risks and benefits of blockchain applications, we cannot overlook the fact that to overthrow the State and to absorb its functions is a profitable business: while the blockchain was originally created to eliminate the need of a third party in transactions, the paradox is that stakeholders now involved in blockchain governance. A rejoicing third that attains economic benefits by replacing the State in some or all its functions; even worse, these agents may also intentionally pursue a strategy of divide et impera (divide and rule) between civil society and State, aimed to undermine the traditional democratic order, modify the existing balance of power and achieve a dominant position in society. Dahl warned that in the absence of the State, some associates might in any case acquire sufficient resources to create a highly oppressive state". If it is true that the neo-liberal ascendancy and its corporate agenda are producing its own version of democracy, it is not unreasonable to assume that this will take on the features of an algorithm-based decentralized society.

In such scenario, to advocate the idea of State means to reaffirm the primacy of politics over economics and to recognize the need for a coordination point in society, in which the tensions between individual interests and common good find a constructive, political compromise. Needless to say, this in no way means to defend the current deplorable degeneration of public institutions into mass surveillance systems, nor to justify the reduction of politics to a "culture of security", which is increasingly transforming citizens into public enemies. On the contrary, it means to revert to the original spirit of our Constitutions and to their genuine democratic principles, so often perceived as an encumbrance by political practice.

It is the conscientious application of principles and rights enshrined in law that can really empower individuals – rather than the privatization of government services through market-

driven decentralized platforms. Indeed, if we wish to maximize autonomy our only reasonable and responsible choice is to seek the best possible state.

While the strong public dissent of techno-libertarians and cypherpunks is honorable, for it brings the issue of civil rights into focus, now more than ever the theoretical principles of the State should not be confused with bad governance or corrupted politicians; in other words, the State and the constitutional provisions should be carefully disassociated from the long history of the arbitrary use of force and the law that have been perpetrated by state rulers throughout the centuries.

The major challenge for global civil society will soon be to explore new political and social dimensions, with the aim of integrating the applications of disruptive technologies such as the blockchain with citizens' rights, equality, social cohesion, inclusiveness, and protection of public sector.

Such integration is vital and cannot be left to the (anti-) political engineering of IT experts, financial investors, and code developers: it requires indeed a mature and interdisciplinary effort by all the fields of human knowledge, with particular regard to political theory, humanities and social sciences, to best assess risks, benefits and outcomes of the new technologies.

In the very next future, this integration might be the only safeguard left against many possible technological dystopias.

CHAPTER-4

RESEARCH METHODOLOGY

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. It comprises the theoretical analysis of the body of methods and principles associated with a branch of knowledge. Typically, it encompasses concepts such as paradigm, theoretical model, phases and quantitative or qualitative techniques.

A methodology does not set out to provide solutions - it is, therefore, not the same thing as a method. Instead, it offers the theoretical underpinning for understanding which method, set of methods or so called “best practices” can be applied to specific case, for example, to calculate a specific result.

It has been defined also as follows:

1. "the analysis of the principles of methods, rules, and postulates employed by a discipline"

2. "the systematic study of methods that are, can be, or have been applied within a discipline"

3. "the study or description of methods”

RESEARCH DESIGN

The research design is purely and simply the framework of plan for a study that guides the collection and analysis of data. I have used following types of Research Design:

- Exploratory Research – The main purpose of such studies is that of formulating a problem for more precise investigation or of developing the working hypotheses from an operational point of view.

- Descriptive Research – Those studies which are concerned with describing the characteristics of a particular individual, or of a group.

- Hypothesis Testing Research – They are those where the researchers tests the hypotheses of casual relationships between variables.

- Descriptive research was used for quantitative analysis and used the data for analysis.
- Hypothesis Testing was done to find the sigma, level of relatedness etc.
- Exploratory research was used to find the problems and their solutions.

A research design is a systematic plan to study a scientific problem. The design of a study defines the study type (descriptive, correlation, semi-experimental, experimental, review, meta-analytic) and sub-type (e.g., descriptive-longitudinal case study), research question, hypotheses, independent and dependent variables, experimental design, and, if applicable, data collection methods and a statistical analysis plan.

Design types and sub-types:

There are many ways to classify research designs, but sometimes the distinction is artificial and other times different designs are combined. Nonetheless, the list below offers a number of useful distinctions between possible research designs.

- Descriptive (e.g., case-study, naturalistic observation, Survey)
- Co relational (e.g., case-control study, observational study)
- Semi-experimental (e.g., field experiment, quasi-experiment)
- Experimental (Experiment with random assignment)
- Review (Literature review, Systematic review)
- Meta-analytic (Meta-analysis)

Sometimes a distinction is made between "fixed" and "flexible" or, synonymously, "quantitative" and "qualitative" research designs. However, fixed designs need not be quantitative, and flexible design need not be qualitative. In fixed designs, the design of the study is fixed before the main stage of data collection takes place. Fixed designs are normally theory driven; otherwise it is impossible to know in advance which variables need to be controlled and measured. Often, these variables are measured quantitatively. Flexible designs allow for more freedom during the data collection process. One reason for using a flexible research design can be that the variable of interest is not quantitatively measurable, such as culture. In other cases, theory might not be available before one starts the research. However, these distinctions are not

recognized by many researchers, such as Stephen Gorard who presents a simpler and cleaner definition of research design.

DATA COLLECTION:

Primary Data: The data which is collected first hand or by the investigator himself. It means that this is the information which the investigator collects himself/herself through interviews, door to door survey, questionnaire and others.

Secondary Data: The data which is collected second hand or through an already existing piece of information. It means the information which we take from the internet, newspaper, newsprint or a journal. This includes all the thing which are already printed and we are taking out information from them.

I have collected both primary and secondary data for this research project. Primary data was collected from the customers at fair price shops in Delhi. Secondary data has been collected from various websites, research and other reports as mentioned in Bibliography.

SOURCES FOR DATA COLLECTION:

(a) Primary Data Collection Sources:

It has been collected by forming a proper questionnaire. Questionnaire is a systematic and structured manner of collecting data for conducting experiment. The nature of the questionnaire is very inductive and fundamental. It has been kept in a proper framework to make it clear to the retailers.

Primary data can be collected in five main ways:

i) Observation

ii) Interview

iii) Surveys

iv) Questionnaire

v) Experiments

Among these, ‘survey method’ was selected to collect the primary data. 100 user were visited & collected the required data relevant to this project.

(b) Secondary Data Collection Sources:

Secondary sources

Information was collected from secondary sources such as customer survey, newspapers advertisements, newsletters, etc.

Internet was used to collect secondary data. Various platforms have been the source of it. They have been mentioned in the Bibliography.

UNIVERSE/POPULATION:

- Univariate analysis is the simplest form of quantitative (statistical) analysis. The analysis is carried out with the description of a single variable in terms of the applicable unit of analysis. For example, if the variable "age" was the subject of the analysis, the researcher would look at how many subjects fall into given age attribute categories.
- Univariate analysis contrasts with bivariate analysis – the analysis of two variables simultaneously – or multivariate analysis – the analysis of multiple variables simultaneous. Univariate analysis is commonly used in the first, descriptive stages of research, before being supplemented by more advanced, inferential bivariate or multivariate analysis.

SAMPLING UNIT

Sampling techniques can be broadly classified in to two types:

- Probability Sampling
- Non Probability Sampling

This project will be based on the non-probability, purposive, quota sampling. As in the given project the sample will be considered specific to predetermined New Delhi.

Types of Research:

Research are mostly categorized in to four major categories:

- First is descriptive & Analytical
- Second Applied & Fundamental
- Third Quantitative & Qualitative
- Fourth Conceptual & Empirical

The project will be based on Descriptive Research type.

SAMPLE SIZE:

It is the process of selecting representative subset of a total population for obtaining data for the study of the whole population the subset is known as sample. The sample size is selected for the study 100 user. The techniques of sampling unit in this study are convenience sampling.

Sampling Technique

Sampling techniques can be broadly classified in to two types:

- Probability Sampling (here the every item in the universe have the equal chance of inclusion in the sample)
- Non Probability Sampling (Here the item in the sample are deliberately selected by the researcher)

This project will be based on the non-probability, purposive, quota sampling. As in the given project the sample will be considered specific to predetermined New Delhi.

Tools Used for Data Analysis

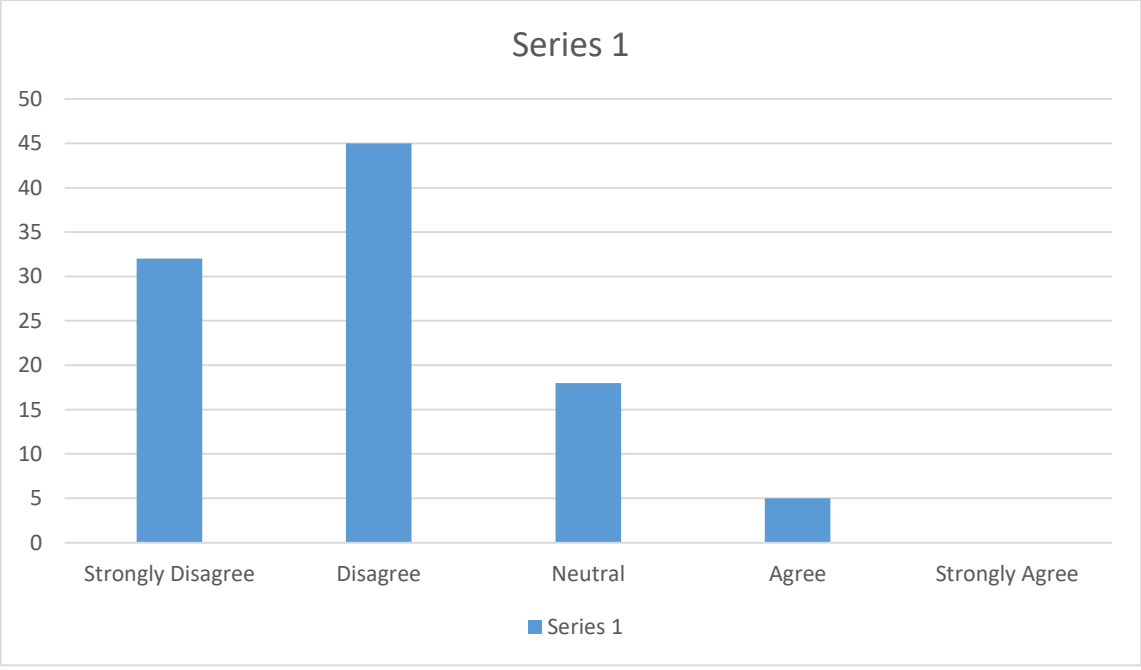
- Bar chart (Bar charts will be used for comparing two or more values that will be taken over time or on different conditions, usually on small data set)
- Pie-chart (Circular chart divided in to sectors, illustrating relative magnitudes or frequencies)

CHAPTER - 5

ANALYSIS & INTERPRETATION

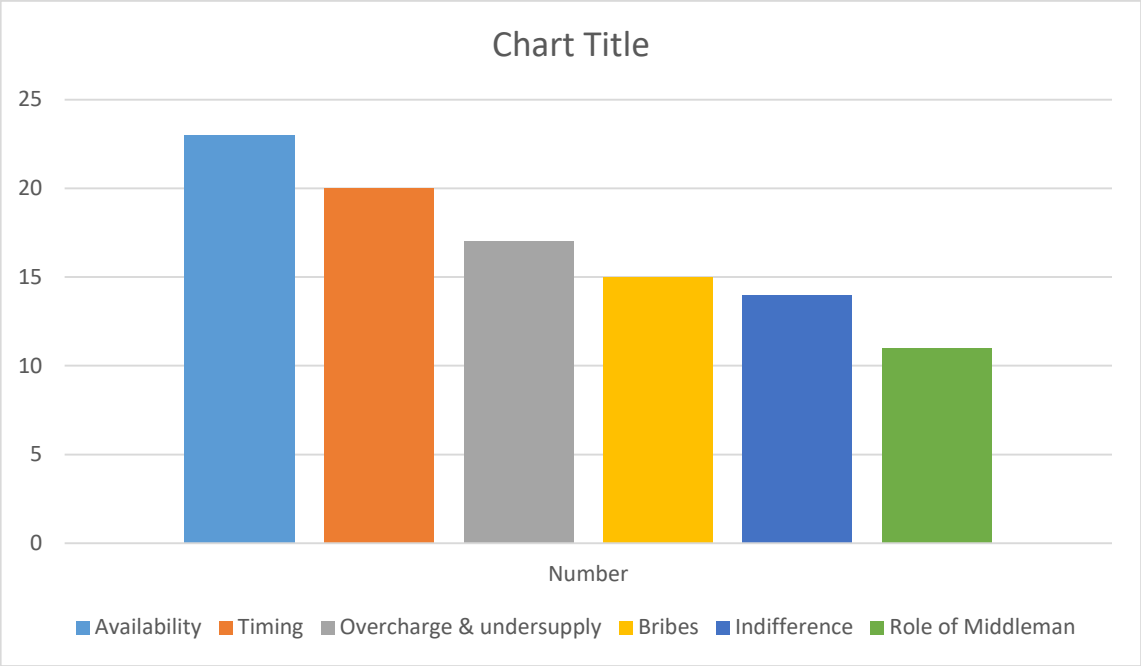
1. You get a fair deal at the fair price shop.

Particulars	No. of Respondents	Percentage
Strongly Disagree	32	32%
Disagree	45	45%
Neutral	18	18%
Agree	5	5%
Strongly Agree	0	0%
Total	100	100%



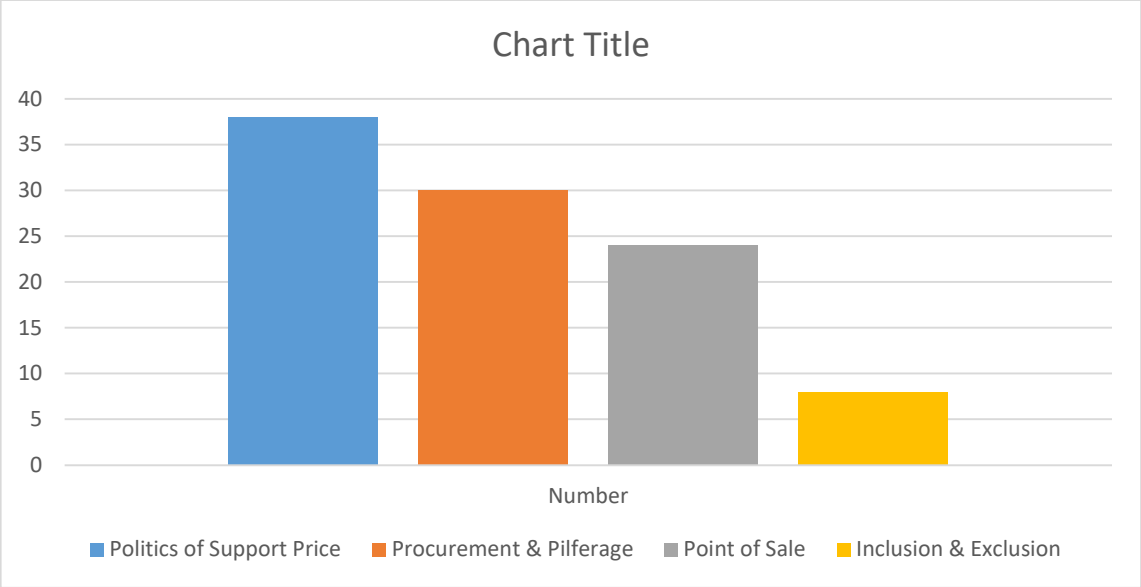
2. What are top irregularities?

Irregularity	Availability	Timing	Overcharge & undersupply	Bribes	Indifference	Role of Middleman
Number	23	20	17	15	14	11



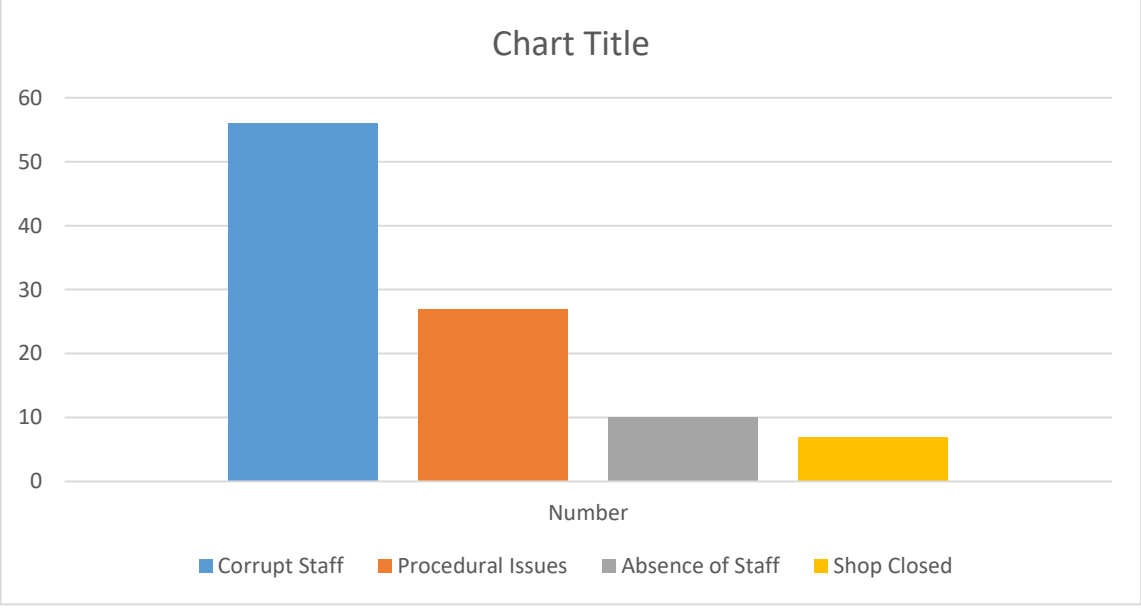
3. What are top sources of corruption?

Source	Politics of Support Price	Procurement & Pilferage	Point of Sale	Inclusion & Exclusion
Number	38	30	24	8



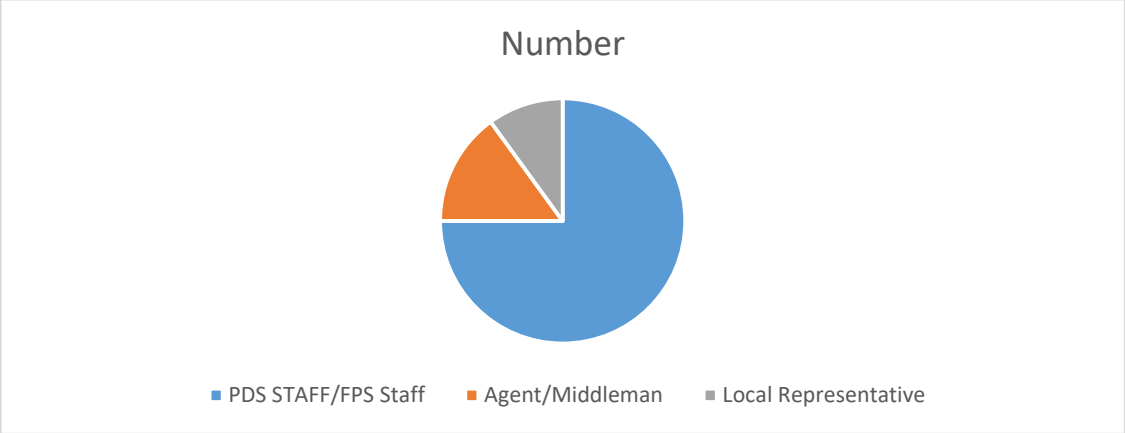
4. What are the top procedural issues?

Issue	Corrupt Staff	Procedural Issues	Absence of Staff	Shop Closed
Number	56	27	10	7



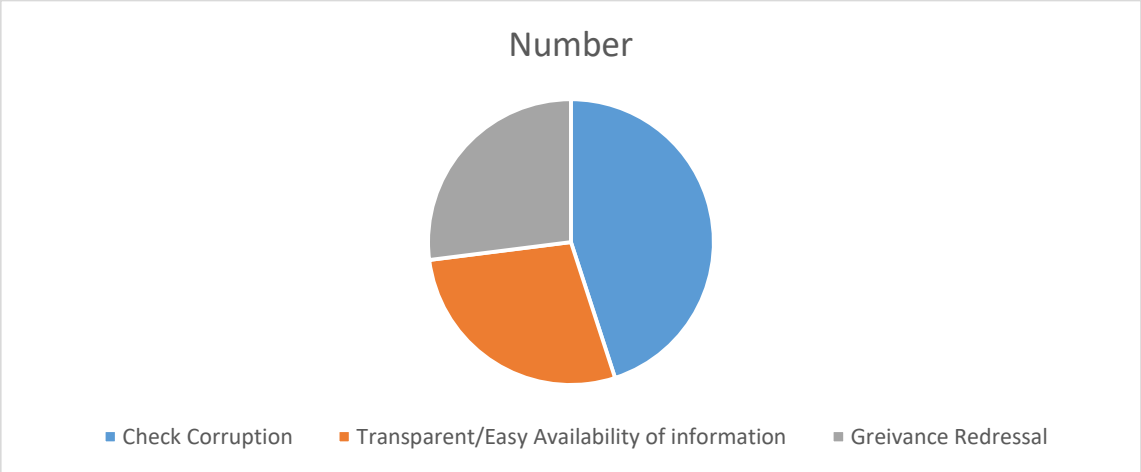
5. Who are top bribe collectors?

Person	PDS Staff/FPS Dealer	Agent	Local Representative
Number	75	15	10



6. What steps should be taken to improve service?

Step	Check Corruption	Transparent/Easy Availability of information	Grievance Redressal
Number	45	28	27



CHAPTER – 6

CONCLUSION

Various blockchain projects led by governments

Actually, there are so many projects that are conducted by governments. One can see the projects driven by governments around the world in the tables below. Table 1 contains various projects conducted by governments except voting system and digital currency projects. Table 2 contains the electronic voting system projects based on blockchain, and Table 3 contains the digital currency projects based on blockchain around the world. (Please note that not all projects are listed. There are much more projects than listed in tables below.)

What leads countries to rapidly initiate blockchain projects? In this article, I will argue that it is due to blockchain technology being directly related to social organization. Unlike other technologies, a consensus mechanism forms the core of blockchain. Traditionally, consensus is not the domain of machines but rather humankind. However blockchain operates through a consensus algorithm with human intervention. Consensus algorithms work every moment when the blockchain decides what data should be regarded as genuine and therefore stored in the blockchain. Blockchain has a structure in which all the participants validate the data and all the participants store the original version of the verified data.

Therefore, once the data is confirmed, which is synonymous with consensus being made and data stored in blockchain, it cannot be modified or forged. Blockchain is a cutting-edge social and physical technology that simultaneously makes possible an immutable and tamper-proof system. Thus, blockchain is an optimal technology for dealing with public data that should not be forged. However, the blockchain is not simply a data storage technique. With the smart contracts feature that comes with blockchain technology, it goes much further that it has the potential to replace existing social organizations.

Social technology

I think it would be helpful to adopt the concept of ‘social technology’ to understand the features of blockchain technology. To understand the concept of social technology, we first must distinguish between two kinds of technologies; “physical technology” and “social technology”.

In addition to physical technology, which involves the transformation and modification of things with engineering and scientific knowledge, there is another kind of technology that we can call "social technology." The concept of social technology comes from the analysis of Richard Nelson and Katherine Nelson who distinguished physical technology from social technology. In short, Social technology is defined as ways to communicate, cooperate, compromise, and make consensus with other people. Social technology contains the division of labour, social institutions, and decision making process in communities. Social technology refers to the technology that directly affects the structure of society, systems, social relations, and individual interactions. Social technology is a concept that allows us to identify and analyse these features of technology.

However, physical technology and social technology are also interwoven. Physical technology influences social technology and enables the construction of new social technology. For example, Internet technology allows people to communicate together immediately, regardless of their physical locations. Therefore, some smart people have endeavored to develop unpreceded physical technology to improve existing social technologies or to make a new social technology. (I think the effort of Satoshi Nakamoto who invented the blockchain technology is an exact case of these kinds of efforts.)

Table 1 Examples of government-led blockchain projects

Name	Project	Status
Australia	Australian senators launch parliamentary friends of blockchain group. The Australian Securities Exchange (ASX) announced that they will use blockchain technology to clear and settle trades by replacing the outdated Clearing House Electronic Sub register System, also known as CHESS.	Announced in August 9, 2017. Announced in December, 2017. The proposed transition is expected to take place in March 2018.

China	Social security funds management system Mortgage valuations on blockchain Blockchain-based asset custody system (PSBC) Blockchain city project (By Wanxiang Group)	Announced in 2016 Announced in 2016 Successfully executed more than 100 real business transactions on the blockchain since the system went live in October 2016. The project was announced by Wanxiang Group in 2016 and backed by Chinese government.
Dubai	Government documents management system to be enacted by 2020. Global blockchain council (GBC) was established in 2016 with 32 members, including government entities, international companies, leading UAE banks, free zones, and international blockchain technology firms. Digital passport based on blockchain. Real-time information system about shipments to Dubai	Ongoing Ongoing Announced in June'17. Announced in 2017.
Estonia	eID (electronic ID management system) E-health (medical information management system) e-Residency (a first-of-a-kind a transnational digital identity)	The government is currently upgrading the existing system with blockchain technology. The government is currently upgrading the existing system with blockchain technology. Since 2015, more than 27,000 people from 143 countries have applied and 4272 companies have been established as of December 2017

France	French government has adopted new rules that will enable banks and fintech firms to establish blockchain platforms for unlisted securities trading.	Amended in December 2017.
Ghana	Land title registry project by NGO "Bitland"	Ongoing
Georgia	Land title registry project	Ongoing
Honduras	Land title registry project	Announced in 2015 and known as failure now
Kazakhstan	Announced that they will make the most favorable business climate for cryptocurrency and Financial technology (Fintech).	Announced in December 2017
Russia	Blockchain based documents management system announced by Moscow government Russia's ministry of health is launching a blockchain pilot	Announced in 2016 Announced in 10th Aug, 2017
Singapore	Cross border interbank payment	A proof-of-concept project has been initiated in 2016.
Sweden	Trials of a blockchain smart contracts technology for land registry	Tested in early 2017
Switxerland	The city of Zug (the capital of the canton of Zug) started accepting bitcoin as payment for city fees. The large number of companies engaged in cryptocurrency are located in Crypto Valley in Zug Zug offers blockchain-based digital identity to their residents	Since July 2016 (Crypto Valley was named by Ethereum co-founder Mihai Alisie) Announced in 2017
UAE	The central banks of the United Arab Emirates and Saudi Arabia announced that they would launch a pilot initiative that two institutions test a new cryptocurrency for cross-border payments.	Announced in December 2017

Ukrain	E-vox (Ethereum blockchain-based election platform) Blockchain-based auction system	Announced in 2016 Announced in 2016
UK	The UK government's Department of Work and Pensions tested an experiment in which a blockchain system is used to distribute welfare payments. Blockchain as a service for each government Department Blockchain based digital currency Blockchain-based payment system between banks	Announced in July 2016 and successfully finished trail system Available since August 2016 UK's Financial Conduct Authority (FCA) permitted blockchain startup, Tramonex, to issue digital money Announced in 2017
USA	Pilot project for secure exchange of personal health data online Approving plan to issue stock via Bitcoin's blockchain (Securities and Exchange Commission) Arizona bill to make blockchain smart contracts "legal" Governor of Delaware has officially signed a bill making it explicitly legal for those entities to use blockchain for stock trading and record-keeping. Illinois launches blockchain pilot to digitize birth certificates	A two-year agreement for the tests was announced in 2016 Announced in 2015 Officially became state law in March 29, 2017 Announced in July 2017 Announced on 31st August 2017

Indeed, the history of humankind has been interwoven with the development of technology. In twenty-first century society, individuals do not interact directly through the face-to-face

communication. It is now common that technology mediates the interactions of individuals. We now use technologies everyday such as email, BBS, mobile messages, messengers, SNS etc. In this sense, the nature and characteristics of technology that weaves between individuals and individuals, individuals and groups, or groups and groups become an important subject. We are now facing Blockchain technology.

The reason why blockchain is expected to change social organization is because it can replace the role played by existing social technologies including the bureaucracy, the most elaborate and dominant organization form in modern society.

Table 2 Electronic voting systems based on blockchain around the world

Nation or Organisation	System Name	Base Technology	Application
Abu Dhabi Securities Exchange (Stock Exchange)			Shareholder Voting System
Australia Postal Service		Digital Assets Holding	Digital voting of Victoria government
Denmark Liberal Alliance	Follow My Vote	Graphene Blockchain Framework	Ballot system for political parties
Estonia	i-Voting	KSI	National Voting System
LSE (London Stock Exchange)		Hyperledger	Shareholder Voting System
Moscow Government		Ethereum	Digital voting of Moscow govt.
Nasdaq			Shareholder Voting System

Podemos (Spain)	Agora Voting	Bitcoin	Ballot System for Political Parties
Texas Liberation Party	VoteWatcher (by Blockchain Technologies Corp)	Florincoin Blockchain	Ballot System for Political Parties
Ukrani	e-Vox	Ethereum	Voting system for various voting
Utab Republican Party	Blockchain Apparatus	Smartmatic (private blockchain)	Ballot System for Political Parties

India has finished testing blockchain solutions for core banking processes in the country in May 2017.

Indian bureaucracy

The analyses of bureaucracy, so far, have focused on its moral and emotional aspects such as its inhuman characteristics or inefficiency. If you study bureaucracy only as an inhuman tool or in terms of efficiency, you will not be able to grasp why bureaucracy emerged in society. You will also be unable to grasp how bureaucracy survived in human society for thousands of years despite the heavy and severe criticism it received. In addition, this view makes it impossible to see the essential role that bureaucracy plays in society, which also makes it impossible to see how its role will change in the future, especially in the era of blockchain.

I define the nature of bureaucracy as a social technology that works as an "information processing machine" for the community to which it belongs. In other words, bureaucracy is a social technology dedicated to the distribution and processing of information that is needed in a specific community. They made a lot of tablets with their early letters, which provide information of lending, debt, interest, and so on. Why did they have to write down the lending, debt, interest? It was an effort to maintain the trust of society in the extended community. In a large community where a reputation system does not works as a trust machine, the society cannot maintain trust unless some-one is managing these information. Therefore, bureaucracy

is not an organization for charity, cooperation, or innovation, but an "information processing machine" that pro-cesses all kinds of information according to predefined laws. The primary role of bureaucracy is to produce and circulate information forcibly within a large community.

There are close similarities between the blockchain and bureaucracy. Bureaucracy is very similar to the tasks performed by computer systems. First, both of them are de-fined by the rules and execute predetermined rules. The blockchain technology is, of course, a kind of computer system and works according to the predetermined rules. Therefore, it is theoretically not problematic to claim that the blockchain technology would replace the role of bureaucracy. Second, both of them work as society's information processing machines. Third, both of them work as trust machines. Therefore, I think that not only is it possible to replace bureaucracy with the blockchain system, but that it is unavoidable.

In addition, the blockchain technology make it possible to implements the "absolute law," so it can process information more efficiently and accurately than does the bureaucracy. In addition, Smart Contracts can automate the administrative process. New bureaucratic systems based on blockchain technology would be faster, more secure, more accurate, and more efficient than traditional bureaucracies. This is why it is inevitable that the current bureaucratic system based on human activities will be replaced by a new system based on blockchain. This is why so many projects are being driven by the governments of over 40 countries within a span of 2 years.

Blockchain technology can act as a precise technology that can replace the bureaucracy, because it can create, store, and process information with safety and non-falsification.

Furthermore, blockchain technology can handle existing governments' tasks significantly faster and efficiently. I will call a government that uses blockchain technology as a key instrument in its work a "Blockchain Government." If this concept of a blockchain government is realized, our society will undergo revolutionary changes. Blockchain technology is a really innovative technology that can transform the very basis of our society.

Blockchain government

I suggest the principles for implementing a blockchain-based government system. The first principle is the "Blockchain Statute law." Blockchain technology ensures "absolute coercion," thus enabling the creation of a law that cannot be violated. We can put this law on the blockchain

and allow it to run automatically with Smart Contracts. We have already discussed how the code is law. It means that we should treat the rules written on the soft-ware as a level of law. The concept of Blockchain Statute law should now be introduced, since blockchain enables "absolute law" that cannot be tampered or violated. In addition, this is the only way to prevent society from falling into a catastrophe with unintended mistakes or bad intentions, particularly in the era of the Fourth Industrial Revolution wherein we cohabit with living things everywhere.

The second principle is "transparent disclosure," or open source strategy. The scope of the disclosure here contains from the blockchain software code itself that constitutes the public infrastructure to the data contained in it. They must be disclosed to the maximum extent possible. The Government 2.0 guide, formulated by the Australian government, already claims that all data, excluding the data having clear reasons for non-disclosure, should be disclosed. In addition, since the blockchain technology is a distributed ledger, it is suitable for disclosing and sharing information. There are two other reasons for claiming "Transparent disclosure." One reason why blockchain software should be disclosed is that it is necessary for everyone to be able to verify the laws embedded in the code. The other reason is that open source strategy is the best way to make software more secure and to encourage the development of an ecosystem.

The third principle is the implementation of "An automated process." This would allow us to build a significantly faster and more efficient government system. The automation of government administrative systems using Smart Contracts is already being conducted in several places. We do not need to be afraid of the automation of government administrative systems because it is possible to manage the laws implemented in the blockchain with the consent of all the community members. This leads to the following fourth principle.

The fourth principle is to build "A direct democratic governance system." Many projects have already been implemented to rebuild existing voting systems using block-chain technology worldwide, but we can think beyond the voting system we have known so far. The laws that are implemented in the blockchain can be determined and revised through a consensus process involving all community members. In other words, we can build a mechanism that allows to modify "the law" stored in the blockchain automatically through democratic voting and consent of all community members. Several blockchain projects that aim to overcome the shortcomings of Bitcoin or Ethereum blockchains are attempting to implement automated revision with the

consensus of the participants of the blockchain network. Although it is not easy to apply this feature to the current administration system, we can apply this feature to the Block-chain government in the near future.

The fifth principle is building a Distributed Autonomous Government (DAG). If all of us, the entire community, participates and provides consent for government laws through a consensus process, and make it run on a blockchain automatically, we can create a government that is completely different from existing governments. It means that it is possible to construct a government system as a social operating infrastructure, as an information processing machine of the community that executes automatically and whose rules are decided with the consent of the whole community. Such a government can be termed DAG.

Conclusion

It can be said that the blockchain technology will be a great tool for social innovation not only for the enhancement of the effectiveness of government but for the innovation of society from the grass root. But blockchain is not a fully developed technology but an emerging one. We need more time to harness the full potential of blockchain technology, and several tasks must be solved. Here, I suggest the tasks that need to be improved or supplemented in the future.

The first is to ensure the integrity of the program. We have experienced that there is loophole in Ethereum's Smart Contracts with "The DAO" project. Therefore, it is necessary to find a way to supplement the shortcomings of Smart Contracts. Several projects such as BOScoin, Tezos, Qtum, EOS and Cardano are aiming to find alternative ways to build a more secure and efficient Smart Contracts platform.

The second issue is to introduce a governance feature, a consensus mechanism involving all network participants, in order to modify and revise the blockchain algorithm itself. This function is introduced now in newly designed blockchains such as Tezos, BOScoin and Cardano. I think that these new concepts of Blockchains will form the third wave of block-chain technology.

The third issue is performance. Bitcoin processes transactions approximately four times per second, and Ethereum can only process transactions nine times per second at most. It is difficult

to expand the usage of the blockchain technology without increasing the processing performance. Fortunately, many different algorithms have been developed now to improve the performance of blockchains significantly. Therefore, it is a matter of time before we can solve the performance issue.

The fourth is to make it possible to accommodate the private data in public blockchains, such as personal identity (sex, age, name, address and etc.), health record, private keys, or ownership of assets. Ordinarily, the data in public blockchains is made transparent to every-one; therefore, it is almost impossible to accommodate private data in it. However, if we plan to use blockchain technology widely including for identification, secret ballots, health record management or so, we need another technology, such as Zero knowledge proof, Multi-party computation, or Homomorphic Encryption algorithm, that can handle the secret and private data in the blockchain. Several projects, such as Zcash and Zcoin are currently attempting to develop this technology.

Finally, there may be an epistemological repulsion towards the idea of an automated system based on blockchains replacing our familiar public domains, such as bureaucracy. It is necessary for society to admit that these kinds of transformation are inevitable and to conduct open discussions to reduce the fear and side effects of introducing new and revolutionary technologies.

CHAPTER – 7

RESULTS

PUBLIC DISTRIBUTION SYSTEM (PDS):

India's Public Distribution System (PDS) is the largest distribution network of its kind in the world. PDS was introduced around World War II as a war-time rationing measure. Before the 1960s, distribution through PDS was generally dependant on imports of food grains. It was expanded in the 1960s as a response to the food shortages of the time; subsequently, the government set up the Agriculture Prices Commission and the Food Corporation of India to improve domestic procurement and storage of food grains for PDS. By the 1970s, PDS had evolved into a universal scheme for the distribution of subsidised food. In the 1990s, the scheme was revamped to improve access of food grains to people in hilly and inaccessible areas, and to target the poor.

Subsequently, in 1997, the government launched the Targeted Public Distribution System (TPDS), with a focus on the poor. TPDS aims to provide subsidised food and fuel to the poor through a network of ration shops. Food grains such as rice and wheat that are provided under TPDS are procured from farmers, allocated to states and delivered to the ration shop where the beneficiary buys his entitlement. The centre and states share the responsibilities of identifying the poor, procuring grains and delivering food grains to beneficiaries.

In September 2013, Parliament enacted the National Food Security Act, 2013. It relies largely on the existing TPDS to deliver food grains as legal entitlements to poor households. This marks a shift by making the right to food a justiciable right. In order to understand the implications of this Act, the note maps the food supply chain from the farmer to the beneficiary, identifies challenges to implementation of TPDS, and discusses alternatives to reform TPDS. It also details state-wise variations in the implementation of TPDS and discusses changes to the existing system by the Act.

Identification of eligible households under existing TPDS: The government launched TPDS in order to target food grains entitlements to poor households. Therefore, identification and classification of beneficiaries is crucial to fulfil the goals of the scheme.

Categorisation of beneficiaries

APL and BPL

Under TPDS, beneficiaries were divided into two categories:

- Households below the poverty line or BPL; and
- Households above the poverty line or APL.

BPL beneficiaries that are currently covered under TPDS were identified through a detailed process when TPDS was initially launched. The Planning Commission calculated state-wise estimates of the total number of BPL beneficiaries that would be covered under TPDS. Each state government was responsible for identifying eligible BPL households on the basis of inclusion and exclusion criteria evolved by the Ministry of Rural Development. Such households were entitled to receive a BPL ration card. APL households were not identified and any household above the poverty line could typically apply for an APL ration card.

Antyodaya Anna Yojana (AAY)

The AAY scheme was launched in December 2000 for the poorest among the BPL families.5 Individuals in the following priority groups are entitled to an AAY card, including: (i) landless agricultural labourers, (ii) marginal farmers, (iii) rural artisans/craftsmen such as potters and tanners, (iv) slum dwellers, (v) persons earning their livelihood on a daily basis in the informal sector such as porters, rickshaw pullers, cobblers, (vi) destitute, (vii) households headed by widows or terminally ill persons, disabled persons, persons aged 60 years or more with no assured means of subsistence, and (viii) all primitive tribal households.

LEAKAGE OF FOOD GRAINS:

TPDS suffers from large leakages of food grains during transportation to and from ration shops into the open market. In an evaluation of TPDS, the Planning Commission found 36% leakage of PDS rice and wheat at the all-India level. The following tables provide data on states with varying leakage of food grains.

Table: Overall Leakage of food grains across states

Low Leakage (< 25%)	Andhra Pradesh, Kerala, Orissa, Tamil Nadu, West Bengal
High Leakage (50%-75%)	Assam, Gujarat, H.P., Karnataka, M.H., Rajasthan
Very High Leakage (50%-75%)	Haryana, M.P., U.P.
Abnormal Leakage (>75%)	Bihar, Punjab

Table: Leakage of food grains at the Fair Price Shop

Very Low Leakage (< 10%)	Assam, H.P., M.P., Orissa, T.N., W.B.
Moderate Leakage (10% - 25%)	Andhra P., Gujarat, Karnataka, Kerala, M.H.
High Leakage (25% - 50%)	Rajasthan, U.P.
Very High Leakage (>50%)	Bihar, Haryana, Punjab

The CACP observed high leakage of food grains in 2004-05 and 2009-10, the two years for which National Sample Survey data on consumption from TPDS are available. In 2009-10, of a total allocation of 47.6 million tonnes, 42.4 million tonnes were lifted by states. However, CACP noted that only 25.3 million tonnes were actually consumed, implying a leakage of 40.4 percent of food grains from the TPDS network. Leakage also decreased from 54.1 per cent in 2004-05 to 40 per cent in 2009-10. Table, reproduced from the CACP discussion paper, indicates the allocation, off take and consumption of grains in 2004-05 and 2009-10.

What ails PDS?

1. Availability

Users often do not get their rightful entitlement in terms of quantity. What's meant for them is diverted to the open market. This happens at the beginning of the chain itself.

2. Timing

Ration shops do not open every day. Nor do they keep regular hours. The objective would appear to be to limit access to people and divert grain and other produce to the open market.

3. Overcharge and undersupply

This is a common practice adopted by most people that run ration shops. They charge people more than the mandated rates, and they often under-weigh the commodities.

4. Bribes

People have to pay bribes for small things, such as getting a ration card in the first place, adding or deleting the name of a family member, or changing the address mentioned in it.

5. Indifference

The staff at ration shops doesn't know the meaning of the term customer service in most cases. People are harassed and have to make multiple visits.

6. Role of middlemen

The supply offices are lorded over by middlemen and touts. Procedures are made to appear so complicated that people usually end up using middlemen for small tasks too.

How Corruption Creeps In

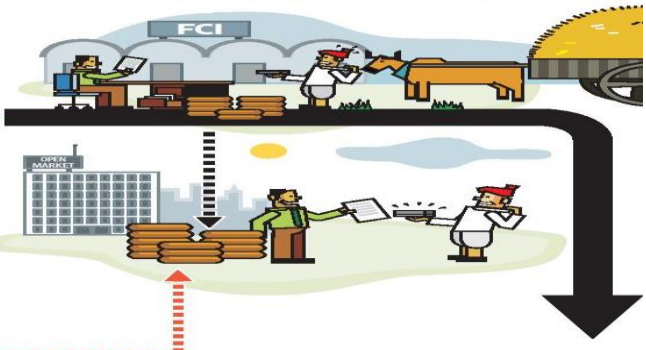
The chain of corruption in the public distribution system begins at the sourcing stage itself. Some of the produce that is sourced by the government for public distribution finds its way into the open market. Then, there are issues related to obtaining a ration card, and the quality of service at the ration shops.

1 The politics of support prices

The government allocates funds for the public distribution scheme. The scheme aims to provide foodgrains and commodities to poor people at affordable prices. The government sources produce for the system from farmers; it sets a minimum support price to do so. The MSP is usually governed by factors such as the monsoon, crop yield, and vote-bank politics.

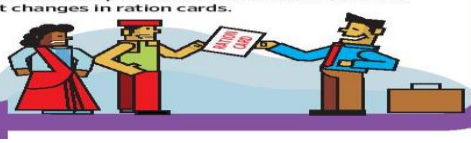
2 Procurement and pilferage

The government-owned Food Corporation of India procures farm produce. Sometimes, the support price is so low that it can only attract low-quality produce; the rest goes to the open market. The government tries to avoid this by upping the support price if it looks like it cannot procure the amount of grain it needs. Still, a portion of the procured grain sometimes finds its way into the open market. The study says that in Nagaland, 100% of the grain procured ends up in the open market. The figure is 70% for Punjab.



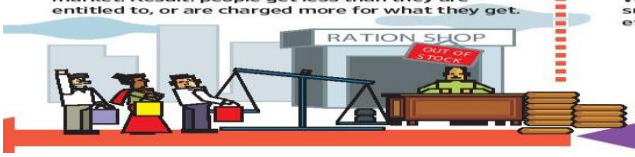
3 Identification, inclusion and exclusion

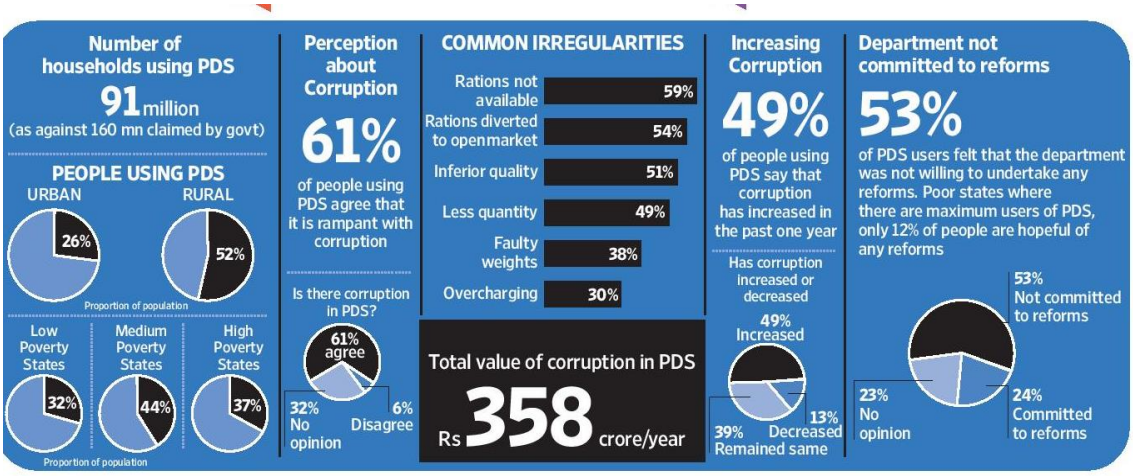
Ration cards are suppposed to be issued to people living below or on the verge of the poverty line. The process of issuing cards is, again, rife with corruption. Money and influence are the usual determinants of who gets ration cards, and who doesn't. Worse, bogus cards are often used to divert supplies to the open market. And it takes a lot to effect changes in ration cards.



4 Pain at the point of sale

People have difficulty in getting whatever little reaches ration shops. Shop-owners usually get licences to run shops on the basis of political patronage or outright bribes. The only way they can earn profits is by diverting produce to the open market. Result: people get less than they are entitled to, or are charged more for what they get.





Why Blockchain is a game changer?

As digitisation connects more organisations they gain the ability to share more information, quickly and widely. However, managing each organisation's traditional transactional ledgers across a community or supply chain comprising thousands or potentially millions of organisations becomes exponentially more difficult and costly. Without significantly improved levels of transparency, traceability and trust the risk of mistake and costly delay mounts.

Many major national and international projects have had no choice but to operate massive and centralised registers or databases, updated perhaps twice daily, in the knowledge that more accurate and up to date information would exist elsewhere in the supply chain. Blockchain changes this by providing all parties with the correct rights or permissions and automatically have a local copy of the register or database.

<u>Strengths and opportunities:</u>

Blockchain is a game changer because it provides new levels of:

- Transaction data assurance as any attempt to tamper with or alter data will be evident;
- Distributed data at scale, reducing complexity and requiring minimal or no intermediation;
- Focus on outcomes and the delivery of end-user benefits enabled by a connected and assured digital infrastructure;

- Efficient management of data identifiers, enabling more systems to interoperate;
- Cross-organisational harmonisation and simplification through data re-use and the elimination of redundant manual reconciliation processes and back-office functions;
- Support for value exchange with evidential quality data providing greater resilience in relation to evidence of provenance and ownership of assets;
- Embedded use of advanced cryptography that provides built-in assurance of data origin and integrity; and
- Support for smart contracts and business automation.

Weaknesses and threats:

Blockchain is a rapidly developing, though immature, technology.

- There is a small, though growing, and pool of expertise;
- Inaction or too poor investment decisions;
- Business and investment cases based on financial models that focus on net present value and free cash flows and don't recognise or put a value on broader and longer-term benefits that may accrue as a result of collaboration;
- There is a need for collaborative governance based on a community of trust;
- Initial Coin Offerings (ICOs) are controversial and risk reputational damage;
- There are several unresolved issues and unproven aspects that require further research;
- It depends on the preparedness of two transacting parties to share information, which may be determined by the availability and application of strong authentication of users and assets to ensure high quality, authoritative data at the point of initial input;
- As ledger participants may be transacting across different legal regimes dispute resolution carries legal risk;
- Its interaction with data protection laws such as GDPR requires close analysis. Compliance may require "permissioned" or access-controlled blockchain, rather than the "permissionless" models which underpin Bitcoin. GDPR issues include reconciling "immutable" ledger entries with the data subject's rights to rectification and erasure and with the need to ensure that international data transfers are lawful;

- Value of "immutable" ledger entries depends in any event upon the initial quality of the data. It is good for maintaining quality, but cannot overcome poor data quality at the point of input; and
- Creation of its platforms will be heavily dependent on IT budgets which for many large organisations are continually under pressure with regulatory demand and "Business as Usual" fixes which account for an estimated 70% of typical IT budgets.

Enablers: It is a new multipurpose technology in the digital information toolbox, and one that is gaining a degree of traction across industries and business processes. To realise its potential BLOCKCHAIN requires other tools or enablers which include:

- Increased executive awareness within government of its capacity to make effective use of fragmented data sources to deliver faster and better decisions. Work already done as part of the government's digital strategy could be harnessed to reduce data fragmentation, to improve data authentication and to develop a data-driven communication strategy for business, government, and society;
- Collaborative governance across sectors and organisations, focusing on shared benefits, information sharing, coordination, and a facilitative approach to regulation;
- Digital trust based on validation of organisational and entity data for all Indian organisations doing business on the internet to a high level of assurance.
- Authentication (prove your point);
- Authorisation (prove that you are permitted to do for what you are requesting);
- Accountability (prove that who did what, and when);
- Interoperability and assurance based on international standards;
- Data analytics to link entities and events where appropriate (for example, linking a payment to a particular asset and its user) for providing shared benefit and shared risk management;
- Secure electronic communications (including mobile phones) to give users greater ownership and control over their digital identity and privacy while promoting greater financial and social inclusion;
- Training and education of citizens envisaged as end-users in the broader community.

What do we understand by public service?

Same as the private sector, government also faces the problem of how to manage an increasing quantity of data stored in a variety of databases and in different format. Government and public-sector data is of varying age and complexity and its use is subject to many legal, privacy and confidentiality restrictions (especially in the wake of recent decision of honourable SC of India mentioning that “Right to Privacy” is a fundamental right). Many departments have already made good progress in improving the inevitable "legacy" problems. It is clear that sound strategies underpin the move towards "canonical registers" and the govt. verified programme run by the Government Digital Service.

Blockchain can complement and enhance that work by providing an extra layer of connectivity and capability, not only allowing identity verification and authentication to take place, but also allowing subsequent use of data to be controlled in a transparent and auditable manner. A thin operating layer enabling that connection can not only leverage the usefulness of existing data sources but also be the location in which data protection rights and obligations can be implemented, audited and assured.

Perhaps even more fundamentally, blockchain presents us with an opportunity not just to consider how we might make what government currently does better, but to rethink what government can and should be doing to promote democratic engagement and the welfare of Indian citizens and to stimulate and strengthen the Indian economy.

The legitimacy of Indian government and the terms of the social contract have long been predicated on the "bargain" between a central authority guaranteeing safety and property rights through the enforcement of laws in return for the citizens' agreement to obey that law, to accept the imposition of sanctions for breach and to provide government through payment of taxes with the means to meet its side of the contract.

Blockchain alters that traditional relationship between government and citizens. It’s distributed and decentralised trust mechanisms offer the prospect of contracts being agreed, settled and audited without the need, or with diminished need, for an operational central authority. To an extent it establishes transactional data about government as a public good. Trust protection and compliance monitoring are central attributes of blockchain. Anyone who needs and is permitted,

to know about a transaction having taken place can access that knowledge in real time, with full assurance, automatically, and with no additional processes required.

In addition to the practical use cases set out in this report, blockchain prompts a policy and perhaps even a philosophical debate about the role of government within a new "smart social contract" and about what "distributed democracy" might mean for India, its citizens and its governance. Blockchain provides a real opportunity to consider how technology might enable:

A reduction in the "democratic deficit"; greater responsibility and accountability in our public institutions; greater social and financial inclusion; and greater trust between citizens and the state.

How can Indian government benefit from industry experience?

Industry has been exploring blockchain for several years, resulting in a large body of experience from which practical lessons can be learnt. The financial services industry has been particularly active in the blockchain space, including: Identifying a large number of candidate use cases; Producing many technology prototypes; and allocating appropriately-targeted funding to specific projects and to strategic investments in blockchain start-ups.

There have also been important advances made by trade associations in producing foundational blockchain standards for financial products. The most notable progress has been in blockchain industry initiatives in capital markets where collaboration is already at the heart of their ways of working. This section identifies three example global industry blockchain initiatives where banks are contributing input and guidance; it also highlights lessons learnt that could potentially also benefit government blockchain initiatives.

E.g. 1: The International Swaps and Derivatives Association is a trade association which works to make the global derivatives markets safer and more efficient. This has historically included developing standardised legal documentation (such as the ISDA Master Agreement) and business information exchange standards (such as the Financial products Markup Language (FpML)). ISDA recently expanded its remit to also include establishing a common set of processing and data standards that all participants can access and deploy in order to enhance consistency, interoperability across firms and platforms. ISDA is working with its members to

develop the ISDA Common Domain Model, which will provide a standard representation of data, actions and events that occur during the life of a derivatives trade.

This bold standardisation initiative will provide a common foundation to realise the full potential of new technologies, including distributed ledgers and smart contracts.

E.g. 2: The Depository Trust & Clearing Corporation is a post-trade market infrastructure company that provides clearing and settlement services to the financial markets. DTCC is currently upgrading its Trade Information Warehouse (TIW) by building a derivatives distributed ledger solution for post-trade processing based on existing TIW capabilities and interfaces with technology providers and market participants. The blockchain solution should permit further streamlining, automation and cost reduction across the industry by eliminating the need for disjointed, redundant processing and associated reconciliation costs.

E.g. 3: CLS is a financial institution which provides settlement services in the foreign exchange (FX) market. CLS is currently developing a new bilateral payment netting solution, built on a distributed ledger platform. Clients can access it via their SWIFT systems or directly by hosting a blockchain node on CLS' network. The solution should eventually allow clients to drive operational process efficiencies, and reduce risk.

<u>The lessons learnt from these global industry Blockchain initiatives include:</u>

The key enablers of blockchain include common business processes, common reference data, and common transaction data across participants. Implementation is easier where these exist – as with the examples above – though requires clear senior executive sponsorship, and a commercial and operational model that delivers value; extensive collaboration is essential at all stages of the project life cycle, from gathering and articulating initial requirements to software testing and on to solution deployment and use; market infrastructure incumbents can help the speed to market. This can include leveraging existing membership organisations to accelerate network effects and leveraging existing governance policies and procedures as dispute resolution protocols.

Service operators can potentially support networks where the participants are at different stages of maturity in relation to blockchain. This could include hosting the technology for participants

that are not yet willing or able to host their own. To maximise ease of use for particular participants, blockchain may even be accessed via existing industry-standard message formats;

Trade associations can leverage their members to both define and drive the adoption of standardised processes and data for their particular business domains. Process and data standards are foundational for smart contracts; legally-enforceable smart contracts can be constructed from standardised smart contract code governed by standardised legal agreements. Such agreements can potentially include suites of counterparty agreements, network agreements, and overriding rule books (such as clearing rule books).

Key benefits of blockchain include process simplification, rationalisation of infrastructure and operations and risk reduction. It is relatively easy to identify many existing inefficient processes as candidate use cases that could benefit from blockchain. However, it is much more difficult to construct viable business cases, particularly when taking account of the effort required to integrate with existing systems and the timeline to migrate off and decommission legacy systems.

These lessons learnt within global industry blockchain initiatives could potentially benefit government blockchain initiatives. They could be applied throughout project life cycles, ranging from the initial scoping and shaping of approaches to accelerating the speed to market and solution deployment.

Collaboration also brings broader economic advantage. Indian industry is, for now, a significant force in relation to blockchain innovation. However, India may soon find itself outperformed and overtaken by countries whose governments have engaged with industry to support innovation and to create an environment that attracts investment and technical talent. India has a significant, but time-limited, opportunity to harness and promote home-grown blockchain innovation by: Collaborating with industry sectors to maximise the early benefit to government; and Supporting industry's innovative capacity and use of blockchain.

<u>Government promote and realise such opportunities by:</u>

- A digitally-informed leadership;

- Empowered, focused government department for all national digital transformation,, which is internationally minded and collaborates closely with all industry sectors and across departments;
- A living, collaborative national plan, that is industry-led with government investment and departmental engagement;
- Technologically-aware, qualified and experienced senior officials in every government organisation; and
- Engineers and digital business leaders as elected politicians.

Independent assessment of the government's digital maturity should be established as a priority, with strong participation of the National Audit Office and Department of Statistics, reporting to the nation and Parliament. Such assessments, conducted regularly, would provide the basis for measuring tangible progress, assessing the impact of projects and comparison with the maturity of other leading nations.

India requires greater executive awareness of the importance of verified and high-quality information as the basis for improved decision making, and of the transformational nature of blockchain, across and within government and industry organisations, to achieve a necessary change in approach.

Citizen, business and consumer engagement is also required. Citizens, businesses and consumers create, use and manage information, but with widely varying levels of safety and consistency. Government support for wider communication, training and education would promote greater understanding and personal responsibility for digital identity.

Collaborative governance:

Most organisations depend on the ability to share information under stated and agreed terms of control with customers, suppliers, partners and allies; organisations and people are simultaneously suppliers and users of controlled information. There is significant shared interest for the purpose of shared benefits. However, there are also shared risks. The management of shared risks and benefits requires a collaborative governance model based on a common policy, procedures and mechanisms enabled by interoperability, trust and assurance together with the legal framework for acceptance that supports real world implementation and use.

To ensure that the India succeeds digitally, the government should establish collaborative governance arrangements across government organisations internally, and also externally with allies and partners, with a focus on information sharing under control.

Collaborative governance is required across any community. This applies across government organisations and industry sectors, as well as across communities of communities. Effective collaboration permits the achievement of shared benefit at a shared cost. Individual organisations can attain strategic benefits at a fraction of the cost of trying to do something alone.

SPECIFIC USE CASES AND AREAS OF OPPORTUNITY:

Supply Chain control, customs and immigration:

Presence of hostile neighbours like China, Pakistan stronger but frictionless land, sea and air border control is required based on access to trusted and authoritative data about travellers, employees, vehicles, ships, aircraft and their cargoes. India shares those needs with major allies and industry partners including the SAARC members, Partners of Look East Policy, Seychelles, African countries etc.

Risks and challenges:

- Lack of traceability and accountability in supply chains;
- Airports suffer from passport check volumes, fake identity documents and inability to check documents;
- Aviation freight cannot see further back than two or three steps into the freight-handling chain;
- Maritime problems with bulk freight, manifest manipulation, port security and ‘box in a box’ visibility;
- Maritime difficulties with checking crew and passenger identity documents;
- Land borders and ports lack the physical capacity to cope with volume, speed and cargo visibility; and
- Customs checks are a gating operation and lack early digital visibility of end-to-end transportation.

Requirements:

- Traceability of people based on source data, communications data, device identifiers and better facial matching;
- Transparency as to the source and/or the method through which data has been verified; Access to authoritative source data;
- Better use of privacy-friendly technologies that support traceability and user consent, but without disclosing personal data unnecessarily;
- Linking of asset traceability data, backed by authoritative data on organisations, ships, aircraft, vehicles and payments. It should be possible to match a licensed driver to a registered vehicle to an owning organisation to the cargo items to the transportation companies and manufacturers. These should match to customs, export control and safety licences and documents;
- The ability to identify counterfeit products and establish the provenance of valid products; and
- The ability to identify counterfeit documents by validating securely against authoritative data from authoritative sources.

Opportunities and enablers:

- Communication infrastructure and interoperability are reasonably good;
- Data standards exist that can support interoperability and information sharing. They could be more widely used;
- Standards and capabilities for trusted mobile driving licences and passports exist;
- UIDAI has data of almost 125 Crore Indians, which could be used to validate citizens at high assurance using secure mobile applications [and gain an industry-estimated £1500 million in revenue]. This would reduce the level of risk stemming from fake Indian passports, directly reducing identity fraud and cybercrime and solve problem of illegal Bangladeshi and other migrants.

<u>Food standards and safety, traceability and accountability:</u>

Food fraud is a global issue, but public awareness is low. However, unlike other highly regulated sectors, the food supply chain is fragmented and there is an urgent need to establish the data-

centric means for accountability and traceability across the supply chain to establish a food sector community of trust through which the supply of high quality Indian food can be assured.

Blockchain is already making a positive contribution. Local blockchains are being used in some areas, and the Food Safety and Standards Authority of India (FSSAI) should establish distributed ledgers for India. Establishing blockchain network for food traceability across the borders could provide a model for customs and border control in general, which could contribute significantly towards meeting the land border control challenges. It can also help take care of the Indian food stocks at FCI godowns, their apt use, monitoring of the tenders, selling of PDS food by fair price shopkeepers, distribution of sub-standard food and black marketing.

Risks and challenges:

- The risks of a major food fraud or contamination incident;
- Rising international food fraud;
- Lack of traceability and accountability to assure the safety of all food consumed in India;
- Lack of traceability and accountability to assure the quality and of food products for export; and
- Long term damage to the agricultural industry and its regional economic impact;
- Nexus of fair price shopkeepers, FCI officials, local shopkeepers, local leaders.

Requirements:

- To establish strong food traceability and accountability, nationally and internationally, from farm to fork, including animal feed and animal ancestry; and
- To link food traceability to transportation, logistics and payments, particularly with backward states such as Bihar, West Bengal, Chhattisgarh, Jharkhand etc.

Opportunities and enablers:

- Leverage the national and international progress;
- Leverage innovative practices used by states like Tamilnadu, Chhattisgarh; and
- Leverage food traceability developments and the agricultural; this would also link to intelligence-related developments in relation to cyber security and cybercrime.

Public procurement, contracting, payments, visibility of spending and asset traceability:

Blockchain increases transparency, traceability and trust and therefore has the ability to effect radical change in public buying by:

- Improving government and public-sector performance as a buyer by providing greater visibility into and understanding of the entire supply market; and, as a result, potentially enabling moves towards a more distributed model for government and public- sector buying, improving access for SMEs, promoting local growth and supporting regional policies.

Efficient and effective procurement decisions depend on the contracting authority's ability to trust in bidders' identity, experience, eligibility and reputation. Blockchain provides powerful support, enabling high quality digital identity management, together with a verified record of previous transactions.

Major Public-sector departments and agencies have always had difficulty in establishing the identity of contractors and their extended supply chains. Globalisation, outsourcing, offshoring and cost pressures have exacerbated this difficulty, significantly reducing government's ability to see into supply and distribution chains for purposes such as the enforcement of export controls or the assessment and collection of customs duties. Government also experiences difficulties in reconciling electronic payments with assets and services majorly due to infrastructure lack. This makes it difficult to identify, understand and address major financial, informational and cyber security risks within those supply chains.

With blockchain the provenance of a particular supplier could be verified, allowing contracting authorities to check, for example, that a supplier meets minimum requirements of financial standing, compliance status in relation to tax and experience, or to validate references and prices. Tracking of assets or products also support broader compliance and regulatory enquiries, for example providing assurance in relation to a supplier's working practices in relation to child or forced labour and of its directors, officers or staff in relation to Anti-Bribery issues or compliance with international sanctions.

Blockchain as a core capability could enable the linking procurement and finance platforms to existing and legacy databases creating a transparent view of government spending. The outcome

of this would be the ability to identify greater efficiencies through demand aggregation, price amortisation, specification of requirements etc. It could then have an instrumental impact on payments and the efficiency with which government pays its supply base, notwithstanding the clear benefit of creating full traceability in government contractors' supply chains.

While there are multiple benefits, the potential to improve efficiency in the appropriation of government funds is arguably the greatest. Furthermore, increasing transparency through blockchain could also champion the long-sought achievement of policy objectives such as increased SME engagement and success in public procurements. It reduces or eliminates factors that have tended to aggregate spend towards a limited number of suppliers and to favour incumbents rather than supporting procedures and contract sizes that allow SMEs credibly to compete.

This dis-aggregation of government spending, however, should not erode the fiscal benefits seen through aggregation of demand. Instead it should deliver further fiscal benefits through the amortisation of pricing and service delivery reducing waste across the public sector. Finally, the impact of this potential greater distribution is increased competition and therefore increased innovation. This connected chain of impacts is something India will require to build a strong economy going forward.

With regards to contracting, blockchain provide the foundation for "smart" contracts, allowing government to develop an approach to dynamic procurement similar to that underpinning recent innovation in the shipping and manufacturing sectors.

Blockchain is emerging as a foundational layer in private sector procurement. It is also being explored and embraced by forward-looking governments. In March 2017 Estonia and Finland established the Nordic Institute for Interoperability Solutions, with a remit that includes the development of Estonia's X-Road technology to enhance the ability of organisations freely and security to exchange and reuse data between their respective systems. The projected advantages for procurement are clear. Interoperability minimises the time and costs incurred in populating and managing procurement documents, connecting them with official publications or registries and with contracting authorities' and (potentially) bidders' internal documents and financial management systems.

Risks and challenges:

- Lack of information quality management within information systems;
- Lack of interoperability between information systems within and across government organisations;
- Lack of interoperability and trust mechanisms between industry and government procurement systems, sufficient to support procurement efficiency and effectiveness;
- Lack of ability to manage information quality to make more timely and effective decisions at all levels in an organisation;
- Lack of adequate traceability between the through-life management of assets and services, and the payments for them;
- Lack of good management information, based on accurate data, to inform buying decisions; and
- The desire to iterate solutions to meet existing business needs rather than understanding the root cause of issues with government buying and how blockchain could create change to mitigate them.

Requirements:

- A standard set of unique identifiers for all cross-organisational activities involving public procurement, payments and asset traceability;
- An authoritative source for those unique identifiers;
- A collaborative governance regime, with stakeholder members, to assure and manage those identifiers; and
- An information quality management capability that could embed information quality management in government organisations.

Opportunities and enablers:

- Experience from industry;
- Experience of the various governments across the globe on the management and mandatory use of unique identifiers, information quality and digital identity management to ensure:
- Interoperability;

- Information quality;
- Asset and electronic payments traceability and trust across thousands of systems.

Experience of the Estonian government in the development and use of X-Roads to ensure the provision and use of quality information across government; the use of its Estonian identity card and e-Residency card for government and business; and for its use of blockchains for patient records, government procurement, citizen privacy management and value exchange (using Estcoin).

BIBLIOGRAPHY

- Websites and useful contacts
- AddressBase products, Ordnance Survey: https://www.ordnancesurvey.co.uk/business-and- government/products/addressbase-products.html
- BBFA: www.bbfa.info
- Data for Policy, http://dataforpolicy.org/
- Gov.Tech, https://www.pwc.co.uk/industries/government-public-sector/govtech.html
- Wall Street Blockchain Alliance: https://www.wsba.co/
- Whitechapel Think Tank LinkedIn page: https://www.linkedin.com/company/10001556/
- Articles and reports - Adopting Blockchain for enterprise asset management, IBM March 17, 2017: https://www.ibm.com/developerworks/cloud/library/cl-adopting blockchain-for-enterprise-asset- management-eam/index.html
- Beginner's Guide to Traceability and Trackability, Food Quality & Safety, September 7, 2017:
- http://www.foodqualityandsafety.com/article/beginners-guide-traceability-trackability/
- Blockchain for fraud prevention: Industry use cases, IBM, July 12, 2017: https://www.ibm.com/blogs/blockchain/2017/07/blockchain-for-fraud-prevention-industry-use- cases/
- Blockchain Technology A game-changer in accounting? Deloitte & Touche GmbH Wirtschaftsprüfungsgesellschaft, 2017: https://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=4&ved=0ahUKEwjTz4J18rXAhWECewKHR4aAvAQFgg5MAM&url=https%3A%2F%2Fwww2.deloitte.com%2Fcontent%2Fdam%2FDeloitte%2Fde%2FDocuments%2FInnovation%2FBlockchain_A%2520gamechanger%2520in%2520accounting.pdf&usg=AOvVaw0OK3Xavc4oPEgh-oPXAL0Y
- Blockchain: what are the opportunities for Procurement?, Procurement Tidbits, July 17, 2017: https://medium.com/procurement-tidbits/blockchain-what-are-the-opportunities-for-procurement- d38cfd5446fa

ANNEXURE - I

Survey Questionnaire

This research is concerned with PDS and lacunas in this system. Your opinion would be very helpful for purpose of the study. Please be rest assured that the survey data is only for academic purposes and would not be used for any commercial purpose.

1. Age_____
2. Gender ☐ Male ☐ Female
3. Current occupation
   ☐ Unemployed ☐ Self-employed/Business ☐ Homemaker ☐ Service
   ☐ Retired ☐ Others (kindly specify) _____
4. Please tick your annual family income (Indian Rupees)
   ☐ Below Poverty Line (<27000)
   ☐ Less than 1 lacs
   ☐ 1 lacs and above but less than 2 .5lacs
   ☐ 2.5 lacs and above but less than 5 lacs
   ☐ Greater than 16 lacs
5. Marital Status: ☐ Married ☐ Single
6. What is your educational qualification? ☐ Illiterate ☐ Literate ☐ 10th ☐ Above
7. Since how long you have been buying from fair price shop? _____

8. Is there any middle man? How much he influences the distribution?

9. Does the shop owner practices fair practices?

10. Is the arrival of stock regular or there are frequent stock outs?

Section II- Give below are a number of statements. Please indicate your level of agreement or disagreement with each of these statements.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. You get fair deal at these shops.					
2. There is always adequate stock.					
3. They are highly helpful in food consumption.					
4. Using m-commerce applications enhances my effectiveness.					
5. Behaviour of the shop owner is good.					
6. Quality of food and other items is good i.e. at par with the normal general store.					
7. These shops always open on time and get closed only after closing time.					
8. There are no queues and I get the items easily.					
9. Shopping from these shops is convenient.					
10. There is good complaint redressal mechanism.					

11. Shop keeper never asks for bribe or extra facours.					

Section III. Explain in brief.

1. List top 6 problems or irregularities faced.

2. Highlight top forms of corruption prevalent.

3. Steps taken by the government to improve the situation.

4. Suggest possible solutions.

5. Factors of Harassment

6. Major bribe collectors

7. Other Remarks (if any).

Thank you for taking out time and filling this survey. It is always nice to keep on touch, please provide your contact number below for future communications-

Contact (optional)-_____