COMPENDIUM
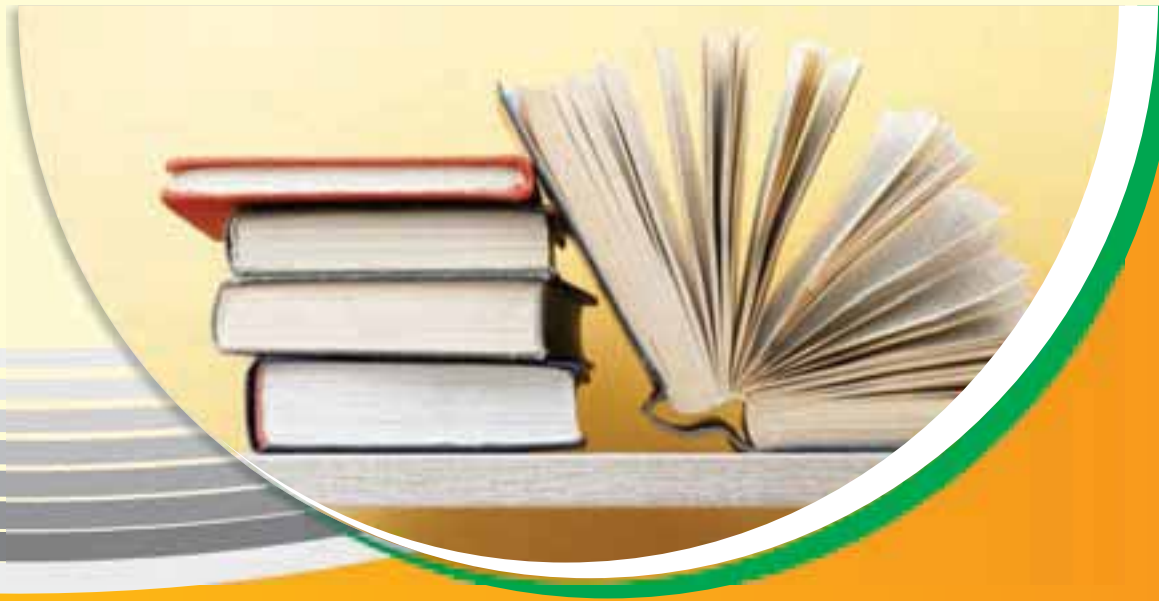## OF
SELECTED PAPERS
2019

Department of Administrative Reforms & Public Grievances
Ministry of Personnel, Public Grievances & Pensions
Government of India

CONTENTS

Page No.

Chapter 1

A cost-effective Fingerprint based Voting Machine (FeVM) for election in small organization

Y.Venkateshwar Rao, Dr. Shrabani Mallick, Dr. Utpal Sharma,
Dr. B. R. Ambedkar Institute of Technology, Port Blair
yvenkateswarrao91@gmail.com, shrabani.reek@gmail.com, utp.sharma@gmail.com

Abstract –The process of holding election is a time-consuming and tedious job. In small and medium organizations like municipal corporations, registered societies, educational institution etc. the process of election is an inherent system to elect representatives. In addition to this, as per Hon'ble Supreme Court guidelines, every higher education institution should conduct student election as per Lyngdoh committee guidelines. In order to ensure free, fair and speedier election process, this paper presents a cost-effective Fingerprint based Electronic Voting Machine (FeVM) for conduction of elections in small and medium organizations. The Fingerprint identification is one of the most reliable biometric technologies for authentication because of it's the well known distinctiveness, persistence, case of acquisition and high matching accuracy rates. The presented FeVM has been indigenously developed by the students of engineering college under A & N Administration as part of their final year project. FeVM provides a simplified, error free and secured identification for the voter with the functionalities of automated vote casting and counting which ensures better election system and thus efficient process management. FeVM also alleviates the problem of any duplicate voting. Final Results are displayed instantly with due fingerprint authentication of authorized Election Officer.

I. INTRODUCTION

Many small and medium scale organizations, higher educational institutions require elections to be held frequently for electing governing and executive bodies. The core of any election process is trust. Trust with manual voting process is always subjective. Hence use of EVMs would mitigate numerous problems such as –

- Saving of considerable printing stationery and transport of large volumes of electoral material.
- Easy transportation, storage, and maintenance.
- No invalid votes.
- Reduction in polling time, resulting in fewer problems in electoral preparations, laws and order, candidates, expenditure, etc.
- Easy and accurate counting without any mischief at the counting center.
- Eco friendly.

The accuracy and impartiality using biometric feature based identification and authentication trails very high.

Among these biometric signs, fingerprint has been researched for the longest period of time, and shows the most promising future in real world applications. Because of their uniqueness and consistency over time, fingerprint has been widely used for personal identification, authentication and ensuring security ranging from e-Gov application like UAIDI (AADHAR) database to banking databases, personal devices/ gadgets. Harnessing the efficacy of the fingerprint based identification system the existing model of EVM has been improvised in the presented FeVM, by integrating fingerprint scan based authentication for both voter and Election Officer so as to make the model fool proof. The presented FeVM has been indigenously developed by the students of engineering college A & N Administration, Y.Venkateshwar Rao and et. al under the guidance of Shri. Ranjit Yadav supported by Dr. Utpal Sharma, as part of their final year project. Further the model was completed under project assistance scheme.

The broad modules of the FeVM include:
  - a. Election Officer Registration using biometric feature (fingerprint) capturing
  - b. Voter Registration using biometric feature (fingerprint) capturing
  - c. Voter identification and authentication (matching fingerprint with master database)
  - d. Voting and recording of vote
  - e. Election Officer identification and authentication (matching fingerprint with master database)
  - f. Automated Vote counting authorized by Presiding Officer
  - g. Display of election results authorized by Presiding Officer

The next section presents the process-re-engineering through a comparison between as-is and to-be approach related to the prevalent manual process of voting and FeVM.

II. Process Re-engineering/Motivation (As Is : To Be)

The existing system of voting followed in various small and medium organizations in A & N Administration is manual. As already discussed in earlier section, manual system comes with lot of disadvantages and is very time-consuming.

The FeVM consists of only one integrated unit which comprises both the Balloting as well as the Control Unit. Presently it can accommodate 6-8 candidates, which may be extended. Any number of voters can be accommodated to cast their votes. By using Finger print module only an authorized person will cast his vote. The voter after proving his biometric identification, casts his vote by pressing the red button against the name of his desired candidate. A categorical comparison between as-is and to-be approach related to the manual voting process and FeVM is as follows:

TABLE I: Comparison of EVM (As-is) and FeVM (To-Be)

Feature	Manual (As-is)	FeVM (to Be)
Pre-Election formalities & time required	Preparing Authentic voter list 2 days	Fingerprint registration 1-2 Hour
Manpower required for holding elections	4-5 persons	01 persons (only to oversee)
Probability of Invalid votes	Very High	Almost nil. Audible message for invalid votes enables voter to recast properly
Authentication of Voter	Manual Verification of Paper_Id Card	Fingerprint based Verification
Authentication of Presiding Officer	Manual Verification of Paper_Id Card	Automatic Fingerprint based Verification
Probability of Duplicate Voting	Very High	Not possible in any case once the vote is registered, even in the case of power failure as the data stored in eeprom of the controller (to clear the data, separate command is required) which confirms no duplicate casting.
Counting	Manual 1-2 days	Automatic Few minutes
Time based locking available	No provision	Timer based Activation and deactivation of devices ensures more
		transparency and check on the voting process.

III. Design Methodology and Working

The Finger Print Module at first captures the fingerprints of all the potential voters in an EEPROM prior to the election process. Voter identifies himself in Fingerprint Module, if authenticated, his unique data will send to the controller. The voter details will be displayed in LCD along with audible output and a high signal will be send to Ballot unit to activate it for voting. In order to prevent duplicate voting, the controller matches any second attempt with the EEPROM data. And accordingly, 'an already voted msg' will be display in LCD and no signal will send to the ballot unit) At last after voting process completed, to out the results, Authorized Election Officer has to identify himself in fingerprint module and then the results will be out. Major components of the FeVM comprises of the following:

- AT89S52 Microcontroller – The Control Unit
- SM 630 Fingerprint Module – For Fingerprint capture and Database Matching
- 16X2 Character LCD Display – Display of Messages/ Results
- MAX 232 - converts signals an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits. The MAX232 is a dual driver/receiver and typically converts the RX, TX, CTS and RTS signals.
- DB9 connector – 9 PIN Male/ Female connectors
- Voltage Regulator - a voltage regulator or linear regulator is a system used to maintain a steady voltage. The resistance of the regulator varies in accordance with the load resulting in a constant output voltage.
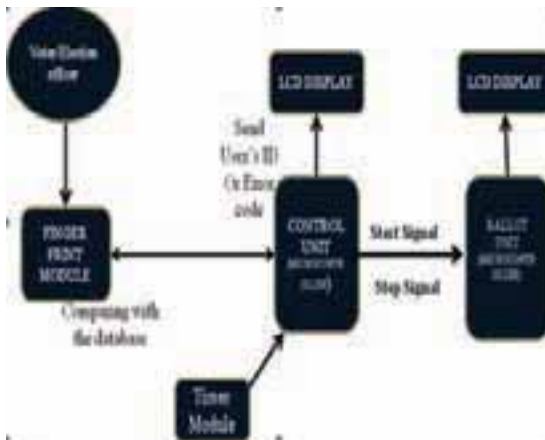- PC With two COM Ports

Figure 1: Functional Block Diagram of FeVM

The project assembly and interface are detailed as follows:

IV. Project Assembly and Interface Details:

The biometric fingerprint based voting machine consists of control unit and ballot unit; both are connected with each other as one unit with the help of four wire i.e +vcc, Gnd, start and stop signals. Initially the system display welcome message in the LCD. The final project assembly is shown below:

Figure 2: FeVM Project assembly

a. Capturing the Fingerprint
The interface designed for adding/deleting/changing fingerprint patterns is shown below.
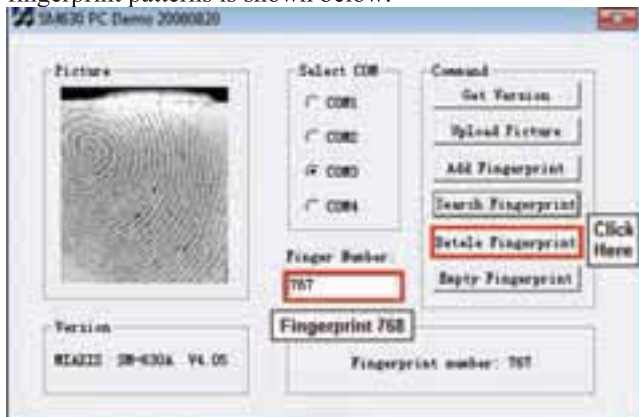
Figure 3: Add fingerprint

b. LCD Interface of the FeVM Unit
Initially the system display welcome message in the LCD as shown.
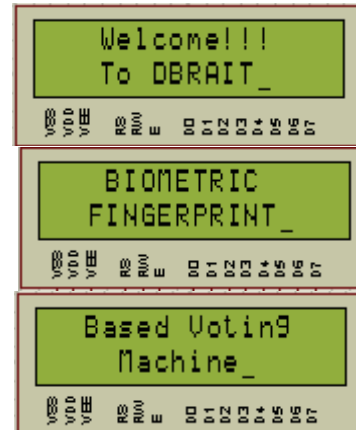
Figure 4: Welcome Screen of FevM

Then the user's fingerprint is checked whether he/she is authorized or not. If the user is authorized his/her name is displayed in the LCD and a high signal is given to the ballot unit and the ballot unit is activated. Thus the user is allowed to cast the vote to anyone of the candidate.
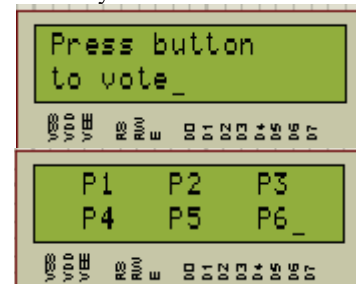
Figure 5: Voting Status

c. Interacting with software interface

Whenever a switch is pressed for casting the vote a "Thank You" message will be displayed and the ballot unit is deactivated. Even if the user press any switch, the vote will not be counted. When the Election Officer identifies his/her fingerprint "Welcome Officer" will be displayed in control unit and the result is shown is the ballot unit. Here the fingerprint module is interfaced with COM3 of PC and the control unit is interfaced with COM4 of PC. When the fingerprint is recognized, its ID is send to the control unit for displaying the user name by an application made in visual basic.

Figure 6: Software Display Interface

When a user identifies his/her fingerprint, his/her ID is written in a text file and the application is used to send the content of the text file, thus the microcontroller receives the ID number of the user and display his/her name accordingly.
Application:
The various response codes used are shown in Table 2.

TABLE II: RESPONSE CODES used in FeVM

No.	Name of Command	Internal Response Code
1.	Receive correct	0x01
2.	Receive error	0x02
3.	Operation Successfully	0x31
4.	Finger detected	0x32
5.	Time out	0x33
6.	Fingerprint process failure	0x34
7.	Parameter error	0x35
8.	Fingerprint matching with this ID found	0x37
9.	No matching fingerprint with this ID	0x38
10.	Fingerprint found	0x39
11.	Fingerprint unfound	0x3A

V. Conclusion

The whole process of voting even for a small/medium organization when done manually takes effectively 4-5 days, whereas using FeVM, the entire process can be completed in matter of few hours. In addition to this, the cost of stationeries, usage of paper and chances of discrepancies is very high as compared to an automated process like FeVM. The cost of developing FeVM is around Rs. 12000/- to Rs. 15000/-

Thus FeVM presents a cost-effective, easy, simple and efficient solution for holding elections in small/medium organization that eliminates manual intervention involved in the voting process and ensures larger accuracy in verifying the identity of an authentic voter and controlling officer. It provides a fool-proof system by denying any duplicate voting.

The FeVM has been successfully implemented in the Engineering college of A & N Administration to conduct student elections from past 04 years.
Related works:

1. The 8051 Microcontroller and embedded system By Muhammad Ali Mazidi.
2. Tamper Proof Electronic Voting Machine Implementation on FPGA By International Journal of Engg. Research & Technology (IJERT), Mr. Sharan Kumar, Ms. Rama C. Mane, Ms. R.R. Naik.
3. A Case study on Indian EVMs using Biometric By International Journal of Engg. Science & Advanced Technology, Aduri Kishore Reddy

Chapter 2

A New Digital Infrastructure for Indian Telecom
Anil Kumar Sinha- Deputy Director General, Vivek Gupta –Sr. Technical Director,
Gargi Bhakta –Technical Director, Archana Bhusri– Systems Analyst,
Ramya Rajamanickam – Systems Analyst, Shivangi Gupta – Scholar
National Informatics Centre, A-Block, CGO Complex, Lodhi Road, New Delhi – 110 003
anilksinha@nic.in, vivek.gupta@nic.in, gbakhta@gov.in,
abhusri@gov.in, ramya.rajamanickam@nic.in, shiviknp@gmail.com

ABSTRACT

In this current techno-filled era, blockchain technology along with cloud services is a combination of State of Art Technologies. This paper describes technology perspectives that led to the blockchain database design comprising - distributed ledgers, smart contracts, Artificial Intelligence, Machine Learning and a case study –Indian Telecom with Scrubbing as a Service (SaaS). Featuring a rich permissioning system that supports public and private blockchains, it is complementary to decentralized processing technologies & decentralized file systems, and can be a building block within blockchain platforms. This paper discusses how Telecom Regulatory Authority of India has gone ahead with the co-founding combination of technologies and regulations in implementing a secure and safe system in the Unsolicited Commercial Communication eco-system.

Key words: Unsolicited Commercial Communication UCC, National Customer Preference RegisterNCPR, Distributed Ledger TechnologyDLT, Blockchain, TRAI

INTRODUCTION

Telecom Commercial Communications Customer Preference (TCCCP) Portal of the TRAI (Telecom Regulatory Authority of India) has a big reach since its launch in 2011. The purpose of TCCCP is to provide transparent, efficient and secured delivery of service. As these services are integrated through the portal, the citizen and businesses can track the status of their service request as well as information required to avail the service. This portal allows understanding the process of blocking Unsolicited Commercial Communication (UCC) and performing secured transactions.

NCCPR(National Commercial Communication Preference Registry) maintains database of subscriber call preference, registered/unregistered/blacklisted Telemarketers, UCC complaint details. It facilitates the Telemarketers to register, along with their telecom resources as per subscriber preference for permissible commercial communications. UCC complaints registered are monitored by TRAI for taking suitable action against violators. The portal faces various set of concerns like choice of preferences of UCC messages, partial / complete block/allow, escalation of complaints and their resolution within stipulated time frame, complaint status to customer and monitoring of Service Providers. The spread of TCCCP is all across India (29 states and 7 Union territories). There are total of 2.3million telecom customers registered with NCCP Registry. Apart from telecom customers, all Telemarketers(TM) are registered with TCCCP. A TM can operate from n number of regional area with a single registration. Hence it is easy and feasible for any

telemarketer. Total 8395 TMs are registered with TCCCP portal.

FINDINGS IN THE CURRENT SYSTEM

Various problem areas which are related to effectiveness and efficiency of the current regulatory framework are:

i. The existing system takes about 24 hours to register preferences and requires up to seven days to enforce the revised preferences

ii. Usually time required to resolve UCC complaints and take action against defaulter is more than seven days. This long-time window is exploited by the unregistered telemarketers to send UCC, Despite measures taken by the TSPs to control UCC from Unregistered Telemarketers (UTMs) and provisions in the regulations for the disconnection of telecom resources, UCC from Unregistered Telemarketers is still continuing

iii. Due to false complaints or fake identities against which connections are taken, the telecom resources of person who might not have indulged in sending UCC are sometimes disconnected.

iv. Intuitive and Intelligent Mobile App for registering preferences and making complaints is required for most Operating Systems and Platforms in the mobile device market, which would enable device users to make complaints against the sender of UCC in a convenient and userfriendly manner

v. The existing system takes a long time to make preferences made by the customer effective

vi. Cases where the request (consent) is taken by organizations or individuals to send transactional messages are unverifiable and accessible, as well as, customers don't have the choice to revoke such consent.

vii. Transactional Message headers are abused to send promotional messages ,Cases of non-traceability of Senders of UCC, and intermediaries ,Cases brought to notice by SEBI and RBI about UCC messages related to financial, trade and security market (by unauthorized entities)

New ways used by telemarketers to make UCC, such as robocalls and silent calls which may be of concern to the customer.

RESEARCH &ANALYSIS

The analysis of how the data could be secured and how various changes at each module has to be implemented were discussed in detail and few resultants are mentioned below:

Securing Preference Data:

Unscrupulous telemarketers and other intermediaries may deliberately leak preference data to unregistered telemarketers or data may also leak out because of inadequate measures taken by RTMs (Registered Telemarketer) or intermediaries to protect or secure data. Therefore, it is necessary to devise a mechanism to ensure that preference data or consent data used to scrub is protected. Scrubbing as a service model could be useful for doing so. OTP based authentication or cryptographic encryption methods for queries made by individuals may be introduced for protecting preference data.

Principal Entities for the DSAs:

Presently Direct Sales Agents (DSAs) or agents authorized by principal entities register themselves as telemarketers. Principal entities may be required to take control of commercial communication activity being done on its behalf. Telemarketer registration system and header assignment process would thus require enhancements to provide more flexibility and better control to principal entities over their DSAs or authorized agents to whom they have delegated commercial communication related functions. New system may provide capabilities to Principal entities to manage header assignments to their DSAs and authorized agents. It may also provide better control and management of header life cycles assigned to DSAs and authorized entities.

Unbundling and Delegation of Functions:

Registered Telemarketers at present carry out multiple functions, such as scrubbing against record of preferences, checking against records of consents provided by principal entities, delivering messages or voice calls, etc. Under the revised regulations more functions are required, such as consent acquisition, entity registration, etc. Unbundling of composite functions as independent functions and introducing new functions, which can also be independently performed, provide opportunities to new players to participate in the UCC eco system and offer existing players to shed any role they do not wish to perform.

Flexibility to customize the agreements and requirements:

UCC eco system would be multi layered and participating entities may play single or multiple roles. Scope of such entities may be quite different from each other, and to more effectively or efficiently perform a function, an entity might take additional specific measures. In such scenarios, it would not be practically possible to define procedures, fees and actions to be taken against participating entities in a prescriptive

manner. Granting flexibility would help make the system more agile and adaptive in response. Codes of Practice are to be formulated and submitted by access providers in a manner that fulfils the purpose of the regulations. Going forward, the system may develop customized legal agreements that serve the needs of all parties in a specific instance.

TECHNOLOGIES ADAPTED

In the recent years new technologies such as cloud computing and distributed ledgers have emerged and evolved. New challenges have also emerged, such as those from Robocalls. This has necessitated an upgrade of technology in fighting unwanted communication. Use of state of Art technology not only make the process effective, but also reduces human intervention and cost of regulatory compliances.

The first thing to consider in the process is that the system detects & prevents misuse of the provided user information to the stakeholders. It can be implemented as a cloud platform where the stakeholder is only granted access for permitted services. The second is to develop a secure mechanism for protecting the data.

Distributed Ledger Technology

Distributed ledger technology (DLT) is a digital system for recording the transaction of assets in which the transactions and their details are recorded in multiple places at the same time. Unlike traditional databases, distributed ledgers have no central data store or administration functionality.

Distributed Ledger Technology are adopted with permissioned and private DLT networks for implementation of the system, functions and processes as prescribed in Codes of Practice. Ensuring that all necessary regulatory pre-checks are carried out for sending Commercial Communication and to operate smart contracts among entities for effectively controlling the flow of Commercial Communication.

Access Providers shall deploy, maintain and operate a system, to ensure that requisite functions are performed in a non-repudiable and immutable manner - to record preferences, consents, revocation of consents, complaints etc. to carry out regulatory pre-checks and post-checks in respect of Commercial Communication being offered for delivery and also to keep records of actions performed.Distributed Ledgers are also used for registering complaints in an immutable and non repudiable manner.

Smart Contracts

Smart contracts can be encoded into the blocks to carry out instructions about the secured data. These smart contracts will be activated by events that the Blockchain can read from another source. Blockchain can provide secure proof of the ownership by storing hash value of the digital data in a time stamped transaction. The ownership data are kept in

the Blockchain to remain trustfully traceable and irreversible.

Cloud Services

Introduction of cloud-based services for scrubbing (Process of comparing target list of telephone numbers provided by the sender, to whom it wishes to send commercial communication with the list of telephone numbers in DL-Preference (Distributed ledger for Preference) and DL-Consent (Distributed Ledger for Consent) to check whether commercial communications can be sent to the Recipient as per consent), handling registration of headers or managing the complaints process provides the benefits of scale compared to the current system where infrastructure is owned by stakeholders themselves, such as telemarketers. The cost advantage of cloud-based services is proven by the explosive growth of these services and widely recognized.

Artificial Intelligence and Machine Learning

Artificial Intelligence (AI) and Machine Learning (ML) techniques would help to match the type and category of content being delivered with the interest area of the customer who has exercised option for preference or has given consent. It would also be helpful to design scope of consent by using them.

Virtual Identities and Scrubbing List Case Study

Unsolicited Commercial Communication (UCC) eco system is built to carry out checks while protecting preference and consent data even when different entities independently perform certain functions. This would require access providers to develop trusted environment and enroll participating entities to carryout delegated functions in such environments. Virtual identities, exchanging information will not expose the real identities but also help in carrying out regulatory checks by delegated entities.

Fig1: Illustration for matching interest area using AI and ML

CASE STUDY: SCRUBBING LIST OF PHONE NUMBERS

For illustration, a case study of telephone number list submission is considered. The case is considered where

sender has to submit list of target telephone numbers to a scrubber in a safe and secure manner and for the scrubber to carry out its function in a trusted environment, while assigning virtual identities to the telephone numbers after scrubbing. Tokens and virtual identities are assigned either for a complete list or to each specific telephone number in the list. List may also segregate telephone numbers Service Provider-wise and provide Location Routing Number (LRN) for each telephone number. Virtual identities play a role where it can be reverse mapped to the real identities and for this purpose, scrubber has to exchange information with the concerned Service Provider. Reverse mapping at Service Provider level provide more security to data by not disclosing real identities to any of intermediaries but by a special arrangement to route the traffic between OAP(Originating Access Provider) and TAP(Terminating Access Provider) as virtual identities have digits and characters.
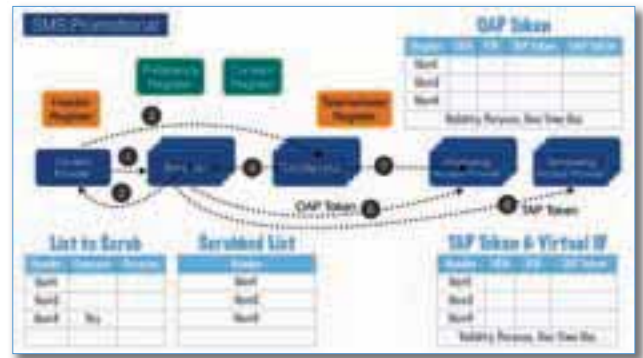
Fig2: Illustration of use of Virtual Identities in scrubbing

Scrubbing as a Service

Distributed Ledger Technologies with complementing technology and platforms enable sharing of preference data and execution of scrubbing processes, in a multi participant environment, in safe and secure manner. This paper focuses on utilizing blockchain technology to introduce a new model as a service for digital identity management. The proposed Scrubbing as a service (SaaS) is explained with one practical example that shows how the proposed SaaS works as an authentication management system.

The proposed blockchain based Scrubbing as a Service (SaaS) is a new type of service model where we may use OTP and cryptographic keys. The main procedures of SaaS creation is a cryptographic hash function over $K^{tsp}pub$ which is used to generate I_{usr}. The SaaS provider then registers $K^{tsp}pub$ and I_{usr} with the created signature Sig $K^{p}pri(K^{usr}pub; I_{usr})$ in the SaaS blockchain. This registration is performed as a blockchain transaction that is broadcasted to blockchain stakeholder nodes. The registration is then stored at the SaaS blockchain. The technology also makes it easier to implement the proposed 'Scrubbing as a Service' model. This model may be useful to improve gap between time when preference was opted by customer and time it came into force, and it may also be helpful to improve gap between time when UCC complaint was made and its resolution.

COMPARISON OF EXISTING SYSTEM WITH DLT

Transparency and Privacy:

Many parties have a copy of the ledger, and parties can verify every record, a shared ledger has a high degree of transparency. This can enable a participant with the right access privileges to ascertain with confidence whether the contents of a database have been edited or modified in any fraudulent way. Records are added with a cryptographic signature that is unique to each participant. This allows the entity examining the ledger to determine whether the right participant added the right record according to the right rules.

Permissioned DLT Networks:

Permissioned DLT Networks are often split into consortium DLT Networks, or fully private DLT Networks. With permissioned private DLT networks there is an inherent trust as the users must be given consent by a Governing body or entity to participate in that DLT network. This reduces the amount of computational power required for that DLT Network, as well as increases the speed of the DLT Network. In case of permissioned DLT Networks, participants are pre-approved, identities are known and only member of consortium can validate transactions. From the UCC regulatory framework perspective, a permission private consortium DLT Network seems to be the most suitable regulatory technology (RegTech) for all stakeholders. For TSPs, application of DLT-powered RegTech solution for UCC regulation will lead to lower compliance cost. In addition to governance of DLT network(s) by entities operating it, observer nodes of this DLT network available with TRAI or any agency authorized by TRAI for supervision and audit purpose.
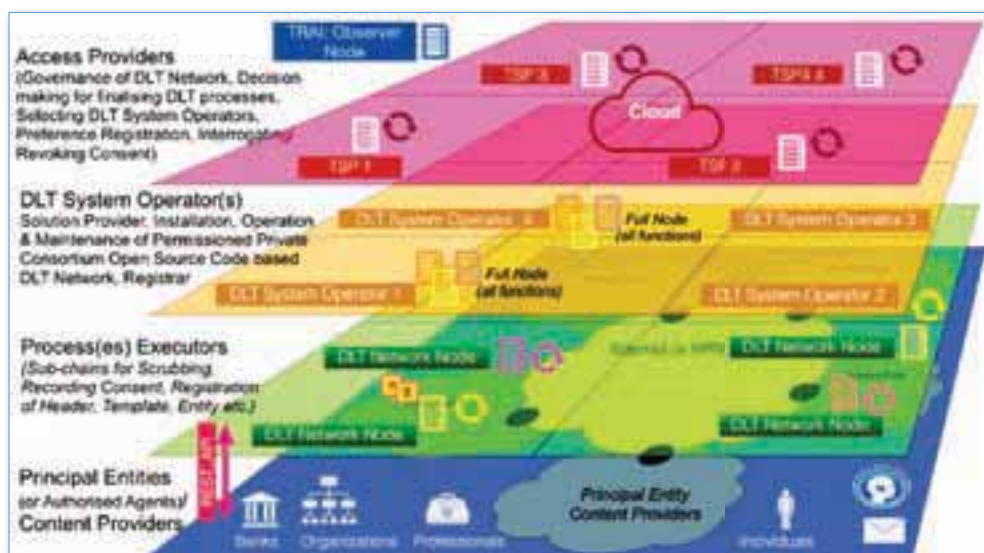

Fig3: Illustration of Distributed Ledger Technology in UCC eco system

Automation, Flat architecture, Speed, sharing of data, shared cost:

DLT has the potential to provide several benefits for processes of registration of entities like telemarketers, content providers and identities like SMS headers, calling line identities for voice calls. These benefits are likely to emerge in commercial communication space as multiple participants need to share data and processes safely, particularly for registration of entities and consent taking process where firms are still reliant on paper-based records. The distributed nature of DLT based records, can increase the speed of making latest updated data available for scrubbing, complaint handling, and reconciliation to multiple involved parties. It also reduces cost and reducing costs makes it most promising option for adopting it as a regulatory technology for control and management of commercial communications.

Adaptability of DLT to meet evolving requirements:

In commercial communication space, nature of content of communication, preferences of customers are constantly evolving and may require regular update of business rules which are to be followed. DLT's can be designed to integrate intelligent and programmable contracts and business rules with bookkeeping functions. The functionality can be combined with the machine learning algorithms to give it the flexibility and agility that is used to regulate the compliances for commercial communications ecosystem. Further, the creation of DLT systems as shared infrastructure will allow TSPs to ensure regulatory compliance of UCC norms while optimizing the capital and operational expenditures. DLT therefore has many advantages in terms of efficiency and effectiveness.

When combined, these properties can solve challenges of UCC regulatory checks and compliance that were previously very expensive or challenging. For the reasons discussed above, DLT seems to have exciting potential to support the needs of TSPs, Telemarketers, and users for commercial communications with better control and management over UCC.

BENEFITS OF IMPLEMENTATION

i. Implementation of new regulatory framework with a happening technology like blockchain would benefit all stakeholders.

ii. Enhance business opportunities for them by providing better ways and means to reach out to target customers according to their interest areas

iii. Enhance chances for them to strike the deal as they would be dealing with targeted customer base and communicating them in accordance to recipient's interest areas and their preferred timings and modes of communication

iv. Enable to keep client data in safe and secure manner while sharing it with other entities or carrying out activities or functions required to ensure regulatory compliances

v. Protect their Brand as it would provide capabilities to display their identity after authentication and would also enable to display their brand name by using calling name functionality

vi. Lower risks because of avoiding chances of non-compliances by their DSAs or authorized agents as they would have better control over them by using technology driven solutions

vii. Provide options to connect directly with the entities that are actually carrying out regulatory functions or providing resources from access providers to deliver communications and avoid unnecessary intermediaries.

ROAD AHEAD

The new framework prescribed through these regulations is user friendly and automated using latest technological advancements to curb the menace of Unsolicited Commercial Communications. The paper has discussed that the use of advanced technology not only smoothen various processes but also drastically reduces the compliance cost. These regulations also permit access providers to authorize DLT network operators to establish the infrastructure, operate and maintain the same which will further reduce the financial burden on access providers. Such infrastructures may also be in shared mode among access providers which would further reduce implementation and operation cost. Technology solutions further unbundles the functions required to be performed for regulatory compliances. This opens up the opportunity for various stakeholders to

consolidate infrastructure resource requirements and share resources among themselves to bring down the cost of compliance. These entities will have a business model considering large number of commercial communication messages flowing through telecom networks. It is expected that cost of compliance to implement these regulations if calculated on per message basis would be minuscule while it will give flexibility to consumers to exercise various options relating to receipt of commercial communications, manage their consent effectively and also reduce the regulatory burden of the telecom service provider due to automation of processes and sharing various functions with participating entities.

CONCLUSION

Blockchain will ensure two things—non-repudiative and confidentiality. Block chain presents many promises for the future. The first one is that in many areas, users could be in control of all their data and transactions. They can trust that transactions will be executed exactly as the protocol commands removing the need for a trusted third party. This concept can influence users to find a solution for storing and managing data in a distributed manner on a P2P network. Blockchain technology can be a new part of the surrounding ecosystem of tools with various other technologies. Actually it can play a crucial role in security for user authentication, restricting access based on a user's need, recording data access histories and proper use of encryption on data.

THEME

"Digital India: Success to Excellence"

SUB THEMES

Digital Infrastructure

REFERENCES

[1] AnastasMishev, Elena Karafiloski "Blockchain Solutions for Big Data Challenges" IeeeEurocon 2017, Ohrid, R. Macedonia, July, 2017

[2] Dr. Rakesh Gupta, "e-Transformation in Indian Telecom Sector through m-Governance", ICEGOV, Delhi, March, 2017

[3] Jong-Hyouk Lee, "BIDaaS- Blockchain Based ID As a Service" IEEE Access in Special Section on Intelligent Systems for the Internet of Things, Dec ,2017

[4] https://www.thehindubusinessline.com/info-tech/trai-proposes-use-of-blockchain-technology-to-curb-pesky-calls-sms/article24022511.ece

[5] https://trai.gov.in/sites/default/files/RegulationUcc19072018.pdf

Chapter 3

BhuSeva Enterprise Architecture using IndEA as a blueprint for e-governance Architecture

Sub Theme: India Enterprise Architecture (IndEA)

P.Gayatri
Senior Technical Director
National Informatics Centre
BRKR Bhavan, Tank Bund Road
Hyderabad
+91 9490410270
gayatri.ap@nic.in

Dr.V.S.R.Krishnaiah
Deputy Director General (Retd.)
National Informatics Centre
New Delhi
vskr@nic.in

Dr.V.NagaLakshmi
HoD, Dept of Computer Science
GITAM Institute of Science
Visakhapatnam
hod_cs@gitam.edu

Abstract - Governance in India in the past decade has undergone a rapid shift in paradigm towards e-Governance for effective and efficient Citizen-Servicing. This is achieved by the way of defined processes and practices based on policies, welfare schemes announced by the Government. Committing to an ongoing Enterprise Architecture (EA) Practice within an Enterprise enables a business-aligned and technology-adaptive enterprise that is effective, efficient and agile [1]. For Government Enterprises, an EA framework called India Enterprise Architecture (IndEA) is devised by Government of India. The LandHub also called as BhuSeva Project of Government of Andhra Pradesh (GoAP), is a pioneering project in the country to adopt IndEA. BhuSeva is envisioned to provide 360-degree comprehensive citizen friendly services using latest technologies by integrating and interoperating with eight departments dealing with land services. These departments constitute the Land Application Ecosystem (LAE). The reference models of IndEA are used to develop BhuSeva EA treating LAE as an Enterprise. The BhuSeva EA has aided to arrive at Solution Architecture which facilitated development and implementation of BhuSeva Software application in a methodical manner. This paper discusses achieving the Vision of BhuSeva through IndEA approach.

Index Terms – Bhudhaar, BhuSeva, e-Pragati, IndEA, LandHub

I. Introduction

Andhra Pradesh (AP) has been well into e-Governance and gained administrative expertise in this domain through its e-Governance initiatives. The vision of AP State is "To use e-Governance as a tool to provide integrated services to its citizens through a free flow of information, and to usher in an era of Good Governance, to ensure transparency, efficiency, accountability, accessibility and reliability in delivery of such services, to enhance citizen-centricity, responsiveness, inclusiveness and citizen engagement as essential ingredients of good governance" [2]

To achieve this vision, GoAP has constituted "Andhra Pradesh eGovernance Authority" called "ePragati Authority", which will support in various development missions including e-Governance. An EA framework called "e-Pragati" which is India's first initiative of State EA is developed. Its primary objective is to "enable citizen centric government to improve the quality of citizens lives and facilitate departmental coordination for an accountable and outcome oriented Government". The e-Pragati framework has identified 745 citizen centric services grouped into 72 projects under 33 departments and 315 agencies.

BhuSeva is one of the key projects within the portfolio of e-Pragati governed by Department of Revenue, GoAP. BhuSeva brings such benefits to land administration, as Aadhaar has brought to identity administration. This project aims at identification of land parcels of AP State, tagging them with geo coordinates, allotment of unique identification number to each land parcel and establishing a digitalized Land Information Database. This data-source is thereby used to deliver multi-channel, citizen-centric land services. To realize this objective, the department has constituted a domain team to architect BhuSeva requirements through IndEA approach.

This paper focuses on the approach taken to arrive at the end product, i.e., the BhuSeva Architecture which has provided a holistic view towards BhuSeva Software development and implementation.

The following sections describe the Need for EA in Government, IndEA approach, Adoption of Principles and Reference models of IndEA for BhuSeva.

II. Need for EA in Government

EA is a discipline of designing businesses well! Government Enterprises are no exception. Adhoc implementations, Systems developed to operate in silos, Non-scalable systems, Systems which cannot be migrated or upgraded to current technologies; they all indicate lack of long-term architectural vision and approach.

EA in the context of Government would mean such systems that are Integrated, Collaborative, Citizen-Participative, Outcome-driven, Transparent, Multi-channel servicing, Citizen-friendly and Citizen-centric.

IndEA, the EA framework designed specifically for Indian Government Enterprises caters to developing systems which are integrated, interoperable and scalable.

III. IndEA Framework

Fig. 1 gives a holistic view of the IndEA framework.

Figure 9: IndEA in a nutshell

Figure 1: IndEA – A Comprehensive View.

There are several standard frameworks available in the industry globally, such as Zachman, US FEA, Gartner, TOGAF. While these frameworks are equally applicable to Government Enterprises as well, an Indian context-specific, tailor-made for Indian conditions to fulfil the aspirations of a large and diverse country was designed and aptly named as IndEA.

IndEA is a framework for developing a comprehensive and wholesome architecture with a view of entire Government as a single Enterprise. It advocates ONE Government approach in achieving a shared goal, towards Integrated Governance. Adoption and success of IndEA Vision is facilitated through a set of principles and reference models [3].

The Vision of IndEA is "to establish best-in-class architectural governance, processes and practices with optimal utilization of ICT infrastructure and applications to offer ONE Government experience to the citizens and businesses" [4].

IndEA is founded on a set of principles that inform and guide the Architecture development process. In line with these principles, it advocates eight architectural domains for each of which reference models are prescribed viz., *Business, Data, Application, Technology, Performance, Application Integration, Security and Architecture Governance.*

IV. About BhuSeva

BhuSeva is an insightful project within the portfolio of e-Pragati. It seeks to address multiple issues relating to the management of textual and spatial data of land and properties. It deals with Agricultural Lands, Properties in Rural and Urban areas, Land Maps, Registration of Deeds affecting Land or Property and management of Public Properties, Endowment lands, WAKF lands and Forest Lands.

The following departments constituting LAE, which deal with land / property information, are participating in the BhuSeva Project.

i. Revenue
ii. Registration
iii. Survey & Land Records
iv. Municipal Administration
v. Panchayati Raj
vi. Forest
vii. Endowments
viii. WAKF board

Major problems relating to these departments include,

i. Departments of LAE operating in silos
ii. Processes followed in citizen servicing are through age-old procedures and acts
iii. Many Land services are multi-departmental, which require citizen to visit different departments for the same service
iv. Lack of a single view portal to view unified information on Land

BhuSeva is visualized to address these problems and provide additional value-added benefits.

The Vision of BhuSeva is

"to be the Single Source of Truth of information on any parcel of land or property, identified uniquely by Bhudhaar, and to provide integrated land services to the citizens."

The Objectives of BhuSeva are,

I. To create a hub of all the parcels of land and of the properties in AP
II. To create a unique identifier, called Bhudhaar, for all the parcels of lands and properties
III. To provide integrated and inter-departmental services relating to land and properties
IV. To provide comprehensive information of textual and spatial data on land
V. To create an open standards-based system for providing value-added land information services by 3rd party developers of applications and apps
VI. To create a repository of public lands and properties and to prevent unauthorized transactions on the same.

V. BhuSeva Architecture

BhuSeva is designed to meet these objectives by following the IndEA approach to architect Enterprises, especially complex projects such as this. Major architectural features are given below.

I. BhuSeva system has been designed following the best practices of registries especially the Aadhaar system.

II. Federated Architecture, whereby the participating departments can continue to evolve their own applications and services, following the standards set by BhuSeva.

III. Application Programming Interface (API) based architecture, which empowers effective integration of applications / data of the departments of LAE and yet permit the independent and parallel development of such departmental applications.

IV. A highly scalable system that can support substantial growth in the number of land / property-related transactions

V. Open Standards-based architecture that permits services to be developed and accessed via multiple channels like Web, Mobile, IVRS and call center.

BhuSeva has adopted the essential principles from IndEA. The Principles on which BhuSeva is architected are detailed in Table 1.

TABLE 1: BHUSEVA PRINCIPLES

IndEA Principle (Related Enterprise domain)	Description	Adoption of Principle in BhuSeva
Linkage to Sustainable Development Goals (SDGs) of United Nations (Performance Layer)	The Key Performance Indicators (KPIs) derived from the domain applications are linked to SDGs prioritized by the Government.	KPIs for BhuSeva are incorporated as Dashboard statistical parameters for monitoring by Senior Administration.
Integrated Services (Business Layer)	Interoperability across Government departments, realizing IndEA vision	The LAE is established through API gateway integration.
Sharing & Reusability (Application Layer)	Commonly required Application modules are Built Once and Used Many times across the Government.	The key and most essential API that binds LAE is the e-KYB (Know Your Bhudhaar).
Technology Independence (Application Layer)	Technology agnostic and Vendor-neutral architecture to meet long term goals	Technology chosen is Open Standards based, and Open API based.
Data Sharing	Data is shared across Government	Data Sharing is achieved through

IndEA Principle (Related Enterprise domain)	Description	Adoption of Principle in BhuSeva
(Data Layer)	subject to rights and privileges and in conformance with Security and Privacy policies	adoption of National level data standards for Location and Land Classification
Cloud First (Technology Layer)	Cloud Infrastructure to leverage the advantage of shared infrastructure and benefits of scalability, flexibility and efficiency of costs and maintenance.	The BhuSeva application is hosted on the NIC Cloud leveraging the benefits of Platform and Infrastructure as services.
Mobile First (Technology Layer)	Mobile channel for Service delivery to be chosen which has the potential to make services more flexible and citizens more informed with a caveat on Security and Authentication aspects.	The citizen services such as BhuSamacharam, Bhudhaar are Mobile enabled. The Web portal of BhuSeva itself is designed Mobile responsive.

VI. **Architecture Development and Implementation in BhuSeva**

BhuSeva Architecture is developed in due compliance with the 8 reference models of IndEA. Fig. 2 gives overview of the architectural dimensions of BhuSeva, which are explained in detail below.

Figure 2: BhuSeva Architecture Layers.

The most important among the architectural dimensions in a Government Department is the Business Architecture, which holds the essence of the Service Delivery. It contains information about

- The Organization
- Services
- Stakeholders and Service beneficiaries
- Business Domains, Capabilities, Processes

While the Architectures developed from Business, Data, Application and Technology models give the approach to realize the vision, the rest of models enhance the value of the Enterprise Services due to their respective architectures.

i. The Business Architecture defined the Vision of BhuSeva, and identified 20 major citizen services, which are multi-departmental. It recommended the process reforms to enhance the SLA. It also recommended methods to address the integration and interoperability issues; and identified reusable building blocks at the apex level of BhuSeva, for implementation across the departments

ii. The Application Architecture is developed to automate the business services for effective citizen service delivery. Open API architecture has facilitated interoperability across LAE departments in delivery of the Multi-departmental citizen services

iii. The Data Architecture has defined the data standards across the LAE applications which aided in interoperability at the software application level among the LAE departments.

iv. The Technology landscape to support the application software development and to incorporate the open technology standards is well described in the Technology Architecture.

v. The Application Integration Architecture facilitated to address the integration and interoperability issues within and beyond the LAE.

vi. The Security Architecture lead to publishing of BhuSeva Information Security (BSIS) Policy addressing the security concerns at various levels of the LAE.

vii. The Performance Architecture came out with the KPIs and derived methodologies to measure performance of services using the data points identified by the Data Architecture. The data points are derived from the application itself.

viii. The Governance Architecture is realized to form a BhuSeva domain committee to develop & control the architecture, and manage the architectural changes.

Fig. 3 describes the mission or approach of BhuSeva towards reaching the Vision/ Target / To-Be State from the Current / As-Is State. The As-Is State provided the way the business functions and processes are running prior to the implementation of Architecture. The Transition State dealt with Architecture development, implementation, and Migration plan to reach the Target State, i.e., the Vision.

Figure 3: BhuSeva Architecture Development Approach

VII. BhuSeva Artefacts

IndEA has prescribed certain templates, formats for developing and maintaining the architecture. Artefacts help in architectural standardization and for ease of maintenance.

For instance, the Heat map (refer to Business architecture in Table 2) represents the gaps identified and Business Process Re-engineering requirements and the transition envisaged. Fig. 4 illustrates usage of Heat map for Mutation Service.

TABLE 2: BHUSEVA ARCHITECTURAL ARTEFACTS

Architecture	Artefacts
Business Architecture (With Performance metrics)	- Organization Chart - Vision, Mission, Goals & KPIs - Service Matrix (mapped to KPIs) - Services Vs. Stakeholder Matrix - Heat Maps (for Gap Analysis) - Business Process Modeling - Unified Modeling Language (UML)
Data Architecture	- Data Steward (Ownership of Data) - Data Assets - E-R Models - Master data & Meta data Standards
Application Architecture	- Matrix of Business Processes Vs. Application Modules - API Description Matrix
Technology Architecture	Technology Stack adhering to open standards
Security Architecture	BhuSeva Information Security (BSIS) Policy
Governance Architecture	- Architectural Governance Board - IT Governance Board - Identification of Stakeholder Roles and Responsibilities

Figure 4: Heat Map for Gap analysis in Mutation Service.

Similarly, UML diagrams are developed to describe the To-Be state of processes (that are to be re-engineered) as identified during Heat maps preparation.

VIII. **Realization of EA**

The Key success factors that lead to successful implementation of BhuSeva application, establishing a sound LAE are

i.   Establishment of BhuSeva Core committee, following the norms of Governance Architecture. The committee comprises of nodal officials from all departments of LAE to study the current processes followed and aid in improvement of the same

ii.   Study of Best Practices across the country and outside in identification of Standardized practices of BhuSeva Services on Business Processes and Data Standards.

iii.   Enforcing inclusion of e-KYB service to authenticate Land and Ownership details in workflow of all land transactions as per the Application Integration Architecture

iv.   Contingency measures to handle cases through an established Customer Relationship Management (CRM) module

v.   Conducting high quality drives to capture the GIS data of land parcels

IX. **Benefits derived by BhuSeva from IndEA**

Value of Architecture: Value of Architecture is realized by implementing the Vision of an Enterprise. The BhuSeva KPIs inform the value derived due to Architecture implementation and convey the progress towards achievement of the Vision.

Guidance to Software Development: BhuSeva EA has created a solid foundation for the entire BhuSeva Enterprise and has paved way for a guided development of Software. It has resulted in a scalable, outcome-oriented platform, avoiding duplication and optimizing costs of development and implementation.

Enterprise Value-Chain: The API based architectural approach for software application development has made aware the Value-chain BhuSeva. i.e., data lying in the backend systems is made public through APIs, ensuring data security and privacy. It has stimulated innovation and evolved in extended customer reach. The approach also has extended benefits of reusability

of application snippets, better code maintainability, and managed complexity.

Business Process Re-imagination: The Application Integration layer has aided to identify the broken links across the line departments at the Business Process Level. It has helped in building application modules to reengineer those business processes for smoother exchange of data to aid in effective decision making.

BSIS Policy: The BSIS Policy has identified the Security Requirements across the Enterprise at various levels and advocated approaches to address them.

X.   **Numbers speak**

The pivot and one of the KPIs for BhuSeva project is Bhudhaar, which is the unique identifier assigned for every land parcel across the state of AP. Bhudhaar is assigned to a land parcel only on a pre-qualified set of conditions such as establishment of ownership on Land, Land or property not undergoing any transaction and so on.

BhuSeva project was launched by the Hon'ble CM of GoAP on 20th November, 2018. A snapshot of BhuSeva statistics is in Table 3 [5].

TABLE 3: BHUSEVA – STATISTICS ON BHUDHAAR ASSIGNMENT

Land Parcels in AP			
Target	No. Received at BhuSeva	No. allotted Bhudhaar	% allotment against received
3,56,00,652	2,37,17,768	2,33,80,398	98.58

XI. **Conclusion**

The emergence of Technology has changed the internal landscape of Government Enterprises. The entire foregoing exercise reveals that a holistic and comprehensive approach such as adoption of IndEA can help tackle inherent problems faced in Citizen Service delivery. Authors' experience suggests that IndEA approach to architect systems is relatively more insightful, especially in designing complex projects such as BhuSeva which deals with multiple Government departments. It is more helpful in handling future requirements and has greater validity and accountability in Citizen Servicing. As rightly quoted in the e-Pragati Vision document, "Enterprise Architecture is not about making a good Architecture, but is about making a good Enterprise". The key for Indian Government Enterprises lies in how they use IndEA approach for betterment of their processes, functions and services.

REFERENCES

[1]Pallab Saha, "Advances in Government Enterprise Architecture" by National University of Singapore, Singapore
[2]The Vision of Andhra Pradesh State, http://e-pragati.in/our-vision/ ace

Chapter 4

Digital Transformation in Fertiliser Sector: Implementation of DBT in Fertilizers

Dharampal, IAS Additional Secretary
Dr. Kavitha Gotru, Director (DBT)
Ritesh Sahu, OSD (DBT)
Department of Fertilizers, Shastri Bhawan,
New Delhi 110001
pald@gov.in, dirfa-fert@gov.in, dbtcell-fert@gov.in

Abstract

The Government of India had notified the Fertilizer Control Order (FCO) for regulating the sale, quality and price of the fertilizers in 1957. After 1977, Union Government introduced various fertilizer subsidies to ensure price stability and efficient distribution of fertilizers. In the Union budget 2016-17, Government of India announced to bring fertilizer subsidy under the Direct Benefit Transfer (DBT) System to improve transparency and promote balance nutrient usage in Agriculture Sector. Department of Fertilizers launched DBT in Fertilizers on a pilot basis in 17 select districts during 2016-17. On the basis of positive feedback received through an assessment carried out by Niti Aayog appointed agency 'Microsave' in 17 Pilot Districts, Pan India Roll out of DBT was carried out during 2017-18 in phased manner in a short span of one and a half year.

The project followed an inclusive approach in identifying the stakeholders, their roles and in planning and capacity building. Several preparatory activities were undertaken in advance to prepare for Pan India roll out of DBT. This included procurement of PoS devices and their deployment of after extensive training, development of PoS Software, creating IT infrastructure, training of master trainers, training of retailers blockwise, in-house preparation of manuals, video films, online tutorials etc.. Process Re-engineering was done for DBT payments and the modified procedure was notified in March, 2017 with the approval of M/o Finance. Software modules like PoS softwares, Release Order module, DBT Payment Module etc. were prepared and upgraded from time to time to accommodate specific needs of stakeholders. Two extensive evaluation studies conducted by Niti Aayog appointed agency M/s. Microsave provided valuable insights into the project performance and helped address the field challenges effectively.

The Pan India rollout of DBT commenced in 2017 and was completed on 1st March 2018 across all States and UTs excepts Sikkim, Meghalaya (organic state). MIS reports were developed keeping in view of the needs of various stakeholders like State Agriculture Departments, Fertilizer Companies, Wholesalers, Retailers. These reports are available at www.mfms.nic.in / www.urvarak.nic.in. The project was continuously monitored by Niti Aayog, Cabinet Secretariat and PMO.

Introduction

DBT in Fertilizers is a complex, IT driven initiative. It enables the department to monitor the availability of fertilisers across the country on a real time basis. It captures the sales transactions at retail point and creates the database of beneficiaries. It is an e-hub for a wide range of stakeholders viz.,173 Fertiliser manufacturing companies, 20,000 wholesalers, 2.2 lakh retailers and 14 crore farmers in addition to State Agriculture Departments, D/o fertilisers which perform a wide range of activities as elaborated in Figure 1.1 below:

Figure 1.1: Stakeholders Activities

Under the Re-engineered DBT framework, 100% subsidy on various fertilizers is released to the fertilizer manufacturers on the basis of actual sales made by the retailers to the farmers. Sale of all subsidised fertilizers to farmers/buyers is made through Point of Sale (PoS) devices installed at each retailer shop and the beneficiaries are identified on the basis of Aadhaar Card, KCC, Voter Identity Card etc. This is a paradigm shift from the earlier legacy system of 2 stage subsidy payment (on the basis of fertiliser receipt in the districts and its acknowledgement by the
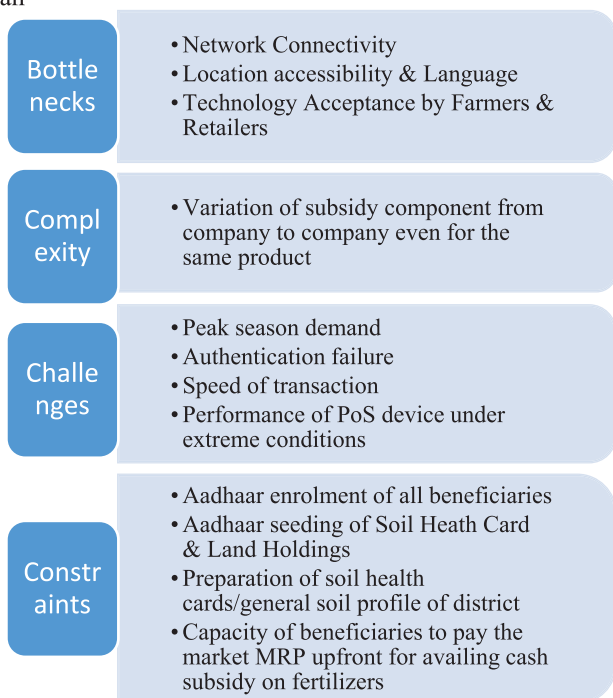
retailers) to 100% subsidy payment on the basis of PoS sales on weekly basis as described in Figure 1.2 below:

Figure1.2: DBT in Fertilizers (Re-engineered Process)

Given the large number of retailers involved at the service delivery points and the project timelines, the department had foreseen many operational difficulties in terms of vast geographical dimensions, the language- literacy- urban-rural barriers, network and connectivity issues etc. To overcome such challenges, a number of preparatory activities such as assessment of PoS Requirement, training of master trainers, procurement and deployment of PoS devices at retail points, extensive capacity building and IEC activities at wholesale dealers/ retail points, development of user friendly PoS software, continuous monitoring and continuous stakeholder engagement were undertaken on priority. The project has a strong foundation on Inclusion and capacity building, stakeholder engagement & Innovation and the paper mainly focuses on these sub themes.

Approximately 2.22 lakh PoS devices have been deployed Pan

Bottlenecks	• Network Connectivity • Location accessibility & Language • Technology Acceptance by Farmers & Retailers
Complexity	• Variation of subsidy component from company to company even for the same product
Challenges	• Peak season demand • Authentication failure • Speed of transaction • Performance of PoS device under extreme conditions
Constraints	• Aadhaar enrolment of all beneficiaries • Aadhaar seeding of Soil Heath Card & Land Holdings • Preparation of soil health cards/general soil profile of district • Capacity of beneficiaries to pay the market MRP upfront for availing cash subsidy on fertilizers

Stakeholder Analysis:
DBT initiative in Fertilizers has been successful primarily due to active engagement and involvement of its key

India. As of 31st December 2018, total of 535.47 Lakh MT of fertilizers have been sold and 7.71 Crore transaction have been recorded under DBT system.

Figure 1.3: DBT Pan India Rollout Timelines

Situation prior to DBT implementation:
Prior to implementation of DBT in fertilizers, the Government had no mechanism to identify or track the actual beneficiaries of the subsidized fertilizers and there was no way to check or enforce price at which fertilizers were being sold at retail points. Further, except physical inspections, there was no way to detect possible pilferage or diversion etc. Real-time monitoring of movement of fertilizers from plant/Port to District warehouse/ Wholesaler/ Retailers & fertilizer stock availability at Block Level/ District Level/ State Level and Pan India Level was not possible. Therefore the movement of fertilizers (to ensure availability to the farmers at right time &at the time of Season) was planned only on the basis of rough estimates. Complaints of farmers paying more than MRP due to artificial scarcity created by wholesalers/ retailers were wide spread. Subsidy was paid to Fertilizer manufacturers on the basis of fertilizers receipt at district level and payment of subsidy bills took 2 to 3 months, after submission. There was no provision for recommendation on use of fertilizer to farmers on the basis of soil health or cropping pattern.

Figure 2.1: Bottlenecks/ Complexity/ Challenges/ Constraints
stakeholders. Stakeholder analysis was done at the pilot stage itself and the Roles and Responsibilities were clearly defined. These are briefly described below:

Sr	Stakeholder	Role/ Responsibilities
1	Department of Fertilizers	i. Overall Co-ordination with States Govt. and Fertilizer Companies.

#	Entity	Responsibilities
		ii. Supervision of procurement and deployment of PoS devices by Fertilizer Companies. iii. Training of Master Trainers.
2	NIC	Development of DBT Software: Movement/Release Order Module PoS software, Payment module etc.
3	Fertilizer Companies	i. Procurement of PoS devices ii. Supply of PoS machines to each retailer. iii. Providing of training on the use of PoS devices. iv. Ensure sale of fertilizers through PoS devices installed at retailers v. Timely submission of subsidy claims for arranging payment by DOF.
4	State Agriculture Departments	i. Providing of assistance in deployment of PoS devices and training of retailers ii. Ensuring recording of opening physical stock of fertilizers in PoS devices before implementation of DBT.
5	Dept. of Agriculture & Farmers Welfare	Assisting DOF to plan fertilizer requirement of each state.
6	Fertilizer dealers	Ensuring movement and sale of fertilizers to the Retailer level as per iFMS / DBT module
7	Fertilizer Retailers	i. Sale of fertilizers only through PoS and identification of buyers through biometric/ Aadhaar number. ii. Providing of receipt for each fertilizer sale transaction. iii. Sale of fertilizers at MRP not above the printed price.
8	Beneficiaries (Farmers/buyers)	Purchase of fertilizers only with his/her biometric authentication and collection of receipt for each purchase.

This helped in better monitoring, setting timelines for deliverables and accomplishment of tasks within target dates.

Innovation and Re-engineering of DBT Payment Process

DBT Payment process Re-engineering was done in conformity with the DBT framework. The earlier system of 2 stage payment based on fertilizer receipts in districts and retailer acknowledgement was modified to a single stage 100% payment on the basis of sales through PoS at retail outlet. The modified procedure provides transaction visibility at retail points and offers the last mile link in fertilizer subsidy management. PoS Software was continuously improved based on feedback received from states and to overcome any difficulties reported by stakeholders. 13 versions of PoS software were developed with a focus on user-friendly approach. The farmer or buyer's identity is authenticated either through biometric, Aadhaar based, Unique Identification Number or Voter ID Card or Kisan Credit Card. However, preference is given to Aadhar based biometric authentication as this is linked to land records and the soil health card of the farmer. This would enable generation of recommendation of appropriate mix of fertilizers compatible to the soil health profile of the agricultural land. However, the recommendation is not binding on the beneficiary and fertilizers are presently sold on "no denial mode".

Figure 3.1: Sale of Fertilizers through PoS Device

The additional supporting systems of the DBT System are classified broadly as follows:

i. **Release Order Module:** This module was implemented w.e.f. 17.05.2017 for real time tracking of fertilizer movement and stock updation. This was an essential pre-requisite for the implementation of DBT. MIS reports are also developed for all stakeholders indicating real time availability of fertilizers state/district/wholesaler /retailer wise. Web services of iFMS Portal has been shared with many State Governments e.g. government of Tamilnadu which have developed their own a mobile app for farmers to check the status of stock availability at retail shops.
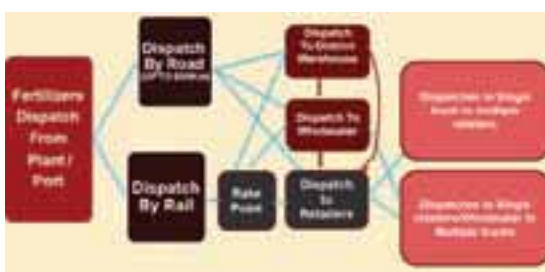

Figure 3.2: Movement of Fertilizers

ii. **DBT Bill Payment Module:** Under this mode, the claims are generated, submitted and processed electronically on a weekly basis and the amount of subsidy is remitted to the company's bank account through electronic mode. DBT Subsidy Payment system after initial software glitches have stabilized and is functions satisfactory. Till 15th December the Department has released subsidy amounting to Rs. 38,585 Cr under DBT in r/o all schemes. Companies have generated 12736 no of bills successfully through DBT. Integrated Fertilizer Management System (iFMS) has been integrated with Public Financial Management System (PFMS), the payment portal of Govt. of India. Parallel run is ongoing and bills are being submitted both electronically and physically to Pay & Accounts Office for release of subsidy. Fertilizer Department is the only department in GoI which has accomplished this feat.

> **Implementation Strategies:** Towards Inclusion, capacity building, stakeholder engagement and innovation

(i) Institutional Set-Up of DBT by DoF:
i. The project has a strong institutional setup headed by Additional Secretary (Fertilizers) with Director, DBT PMU comprising of 42 IT and 1 IEC Professionals and a 42 member NIC development team working full time. Central & State PMU along with State level DBT coordination Committee under Principal Secretary Agriculture and District level DBT coordination Committee under District Collectors have been setup.
ii. Multiple IT partners have been brought under a single umbrella to provide seamless e-services to all stakeholders (NIC- DBT Portal, UIDAI-Authentication Services, CSC -Authentication Services, CDAC- e- sign Services, PFMS-Payment of subsidy).

(ii) Preparatory activities for roll out of DBT:
As a precursor to the nation-wide rollout of DBT, following preparatory activities were taken up by the Department in consultation with lead fertilizer suppliers (LFS)/ State Government/ District Collectors:
i. Setup of PMU (DBT cell) at HQ
ii. Setting of State level DBT coordination Committee under Principal Secretary Agriculture.
iii. Setting of District level DBT coordination Committee under District Collectors
iv. Finalization of PoS Device Specification.
v. Assessment of Pan India PoS requirement.
vi. Procurement of PoS Devices
vii. Development of PoS Software & Release Order Module.
viii. Training of Master Trainers
ix. Training of Wholesalers/ Retailers Block wise
x. Deployment of PoS devices and Stock management at retail points.

(iii) Stakeholder Consultation, Engagement & Training:
Implementation of the DBT Scheme required deployment of PoS devices at every retailer shop after training of retailers & wholesalers for smooth operation of PoS devices. 3 Workshops were held with Fertilizer Companies/ District Collectors and State Agriculture Departments. In Total 7996 trainings of retailers/ wholesalers/ officers of agriculture departments/ fertilizers companies were conducted across all states. Letters were issued by Secretary and Additional Secretary to all States/UTs for the active participation of all stakeholders viz. State and District Administration, Wholesalers/Retailers and the farmers (letters dated 5.4.2017,

14.9.2017, 7.11.2017, etc.).   2.22 Lakh PoS devices have been deployed across all States. Regular Video conferences were conducted with Principal Secretaries (Agriculture) of states for reviewing the preparation of DBT Rollout in the state as per Rollout Schedule. It also involved close coordination and consultations with NIC, fertilizer companies and PoS vendors at every stage. Fully trained State DBT Coordinators and the District DBT Consultants were positioned across all States/UTs by May, 2017. State Governments also appointed State Nodal Officers for coordinating the DBT related activities as per the request of DoF. The DBT PMU is functioning as a back bone in day to day monitoring and interaction with all stakeholders i.e Lead Fertiliser suppliers, Agriculture Departments and retailers.

(iv) **IEC Activities; Capacity building:** Mammoth task of capacity building and training wholesalers/ retailers company officials was accomplished with close co-ordination and support of state government and Lead Fertilizer companies. Following is the snapshot of activities carried out under capacity building and IEC activities.

i. 2 Master Trainers training conducted by DoF for Companies (6.10.2016).
ii. In-house Training conducted by DoF for DBT District consultants (28th Sept.,'16 to 6th Oct'16).
iii. In-house Training conducted by DoF for DBT State Consultants (24th-28th Apr'17, 8th-12th May'17, 22nd -26th May'17).
iv. List of Do's and Don'ts were prepared and issued for all stakeholders viz., State Agriculture departments, companies, wholesalers, retailers and farmers.
v. Multilingual PoS and RO module training videos for retailers training were developed and made available on YouTube at https://www.youtube.com/watch?v=RypToOp QGHQ&feature=youtu.be
And
https://www.youtube.com/watch?v=o93Id-lVBIU&feature=youtu.be respectively.
vi. Multi-lingual PoS training booklets were developed and circulated to all stakeholders.
vii. 7993 functional trainings cum campaigns for DBT in fertilizers were conducted across the country, 2,20,883 retailers were trained and

92.9% of PoS devices were deployed across the retailer points.

(v) Social Networks& Grievance Redressal Mechanism

In this age of Digital India, communication has become multidimensional viz. Phone Call, email, SMS, Social Media like Twitter, YouTube, Whatsapp etc. DBT PMU has dedicated social media handles on Twitter and YouTube. WhatsApp is being used for Stakeholder interaction with Companies, Agriculture Dept., DBT consultants, DoF officials.

Figure 4.1: Grievance Redressal Mechanism Adopted by Organization

To cope with the diverse choices of users, a 15 member Information Centre cum Multi-lingual Help Desk has been set up with Toll Free Number (1800 11 5501) to provide quick response to the queries of wide range of stakeholders across the country. These channels help in updating the Users as well as for receiving grievances/suggestions from them, if any. Average resolution time for issues escalated to DoF is 24 Hrs.
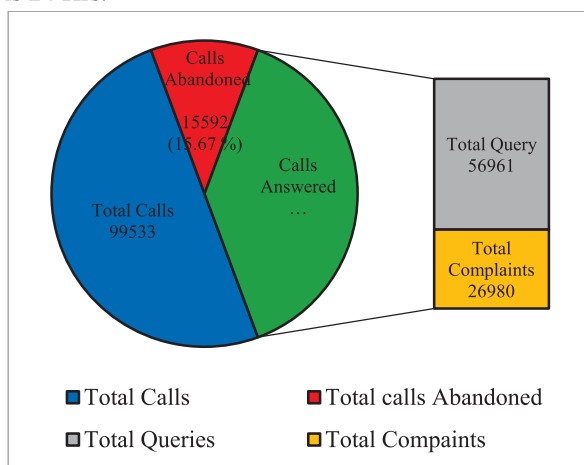

Figure 4.2: Complaints & Query Resolution through DBT Helpdesk

Besides the channels mentioned above, an in-built mechanism for receiving feedback is also exists which allows stakeholders to raise any issue related to DBT in Fertilizers System.

(vi) Tackling difficult states:

Extensive visits were made by Additional Secretary & DBT team to all difficult States (States with delay in PoS deployment, insensitive wholesalers/retailers, large states, non-responsive states/agriculture departments). Meetings and Video Conferences were held jointly with State Agriculture Departments and their stakeholders to bring them on-board. The States include North-East, J&K, Bihar, West Bengal, Odisha, Madhya Pradesh, Tamilnadu, Gujarat, Chhattisgarh, U.P, etc.

(vii) Evaluation & Feedback

Two extensive & independent evaluation studies were conducted by NITI Aayog appointed agency 'M/s. MicroSave'. The highlights of the assessment made by Microsave are as under:

i. Implementation of DBT System has streamlined the Fertilizer distribution. Retailers and farmers in all districts reported "Nil shortage" of urea owing to neem coating.

ii. There is improved tracking through mFMS Id i.e. Fertiliser companies have on-boarded untraceable retailers and co-operative depots on mFMS system to avoid delay in subsidy payments.

iii. Overcharging by retailers has reduced as each fertilizer purchase by farmers is supported by a receipt generated through PoS machines indicating both MRP paid by the farmers and the subsidy component paid by the Government on the quantity of fertilizer purchased by the farmers.

iv. Cross border sale has also reduced e.g. across border to Nepal and Bangladesh from Kishanganj.

v. The reports meant for relevant Stakeholders are available at https://www.fert.nic.inand www.urvarak.nic.in under Publications/Reports tab.
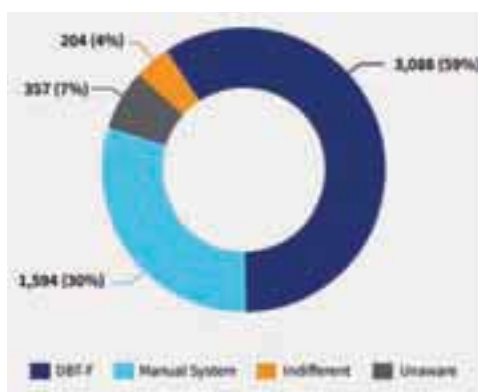
Figure 5.1: Farmers' preference for Fertilizer Distribution System (n=5243 Farmers)
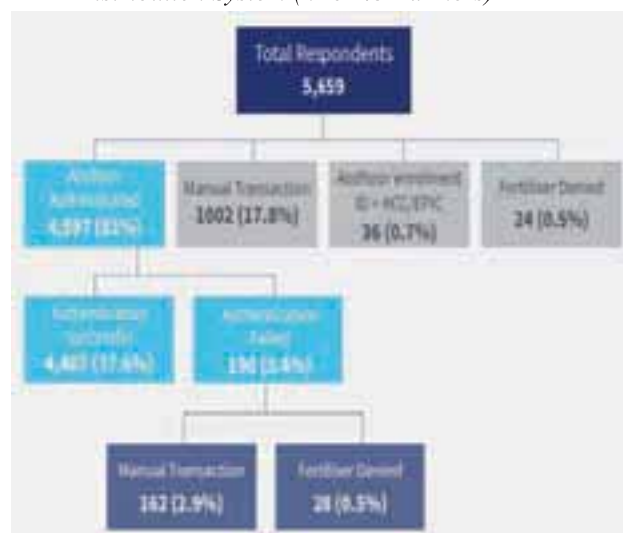
Figure5.2 :Sale of Fertilizers through PoS Device (Aadhaar Authentication n=5659)

vi. Multilingual helpdesk & WhatsApp groupshas been setup for capturing feedback from stakeholders. Feedbacks obtained through field visits by DoF officials which shows that, the ease of use and perceptional clarity drives the sustainability of the technology& System.

Lessons learnt and Best Practices Identified:

Challenges	Strategies followed to overcome Challenges
Fertilizer stock moving to the districts needs to be reconciled especially at wholesaler and retailer level	Release Order Module was designed and developed which facilitates real time movement of stock and its updation in the system along plant – port – rake point – district – wholesaler – retailer chain.
PoS Deployment and training	LFS have been mandated with the task of procurement of PoS devices and their deployment across the States.
Training	Workshops, training of master trainers, training of retailers through user friendly manuals, audio visual clips etc.
Network connectivity	i. To overcome various operational challenges pertaining to internet connectivity, the Department of

	Fertilizers has come up with various options as under: ii. Selection of Network Service provider carefully (with maximum Coverage in the area/ location). iii. Use of external antenna if connectivity still doesn't improve. iv. Asking Service Provider to realign antenna to improve signal availability at retail shop. v. Multiple connectivity (Wi-Fi, LAN, PSTN) options provided in PoS. vi. PoS Machines work better on Wi-Fi hotspot.
Peak season sales	To address the peak season sales, a single retailer can install more than one PoS device at the retail point. There is a provision to use maximum up to 5PoS devices at a single retail point under DBT system.
Authentication failures	DBT entails sale of all subsidized fertilizers to farmers/buyers through Point of Sale (PoS) devices installed at such retailer shop. The farmer or buyer's identity is authenticated either through biometric, Aadhar based Unique Identification Number or Voter ID Card or Kisan Credit Card.
Stakeholder engagement	Letters from Secretary, Addl. Secretary to States indicating the action Plan and Stragegies adopted for roll out of DBT, how to address Peak Season Challenges, authentication failures, network issues etc. Regular meetings with NIC,Fertiliser companies, PoS vendors etc. Daily review and Monitoring by DBT Division
Grievance redressal	A dedicated 15-member Multi-lingual Help Desk has been set up to provide quick response to the queries of wide range of stakeholders across the country as a preparatory to DBT implementation. The helpdesk will
	operate from 9.30 am to 6.00 pm on all working days including Saturdays. The toll free number of the helpdesk is 1800115501. Further, WhatsApp is being used extensively for quick response to grievances of various stake holders.

Benefits to Stakeholders

These are briefly summarized below:

(i) To citizen: The improvements in service delivery under DBT are as under:

i. Ready and timely availability of fertilizers at retail point.
ii. Sale of fertilizers through PoS devices at subsidized rates.
iii. No over pricing or over charging of subsidized fertilizers.
iv. Receipt generated through PoS device after every sale, displaying the rate of fertilizers.
v. Sale receipt indicates the subsidy borne by the Government on behalf of the farmer for the fertilizers purchased.

(ii) To DoF:
i. Identification of beneficiaries,
ii. Accurate and timely monitoring and reporting, Less paper work procedures.
iii. Reduction in the Department's dependency on companies and dealers for Reports.
iv. Sale of fertilizers in states has been substantially reduced as compared to Pre-DBT due to authentic sale and low diversion.

(iii) Other stakeholders: Release Order Module in DBT in Fertilizers facilitates companies to monitor and plan dispatches of fertilizers. This system also facilitates centralized control and monitoring of fertilizers availability across the country in one go. Various MIS repots supports better decision making & planning.
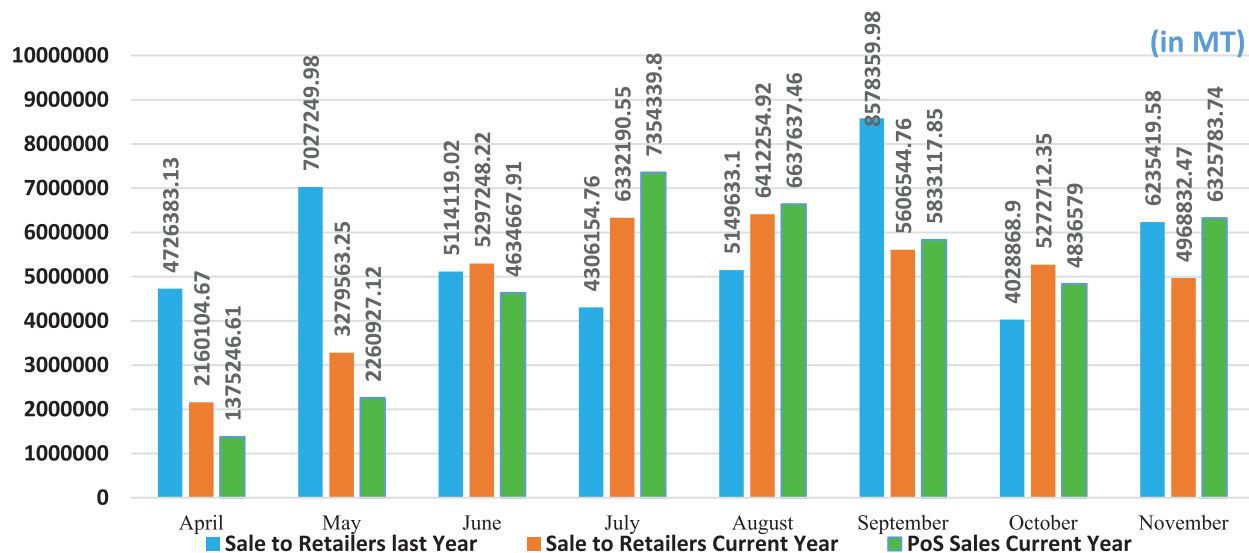
Figure 6.1: Sale Comparison in States (Pre DBT v/s After Go Live

Study Visits by Foreign Delegations:

Various Foreign Delegations visited different villages in India to study the implementation of DBT in Fertilizers. A list of such visits is as follows:

i. The Central Bank of Nigeria team visited Mumbai on 24.05.2018.
ii. The delegations from Tanzania visited Sonepat, Haryana on 1st July 2018.
iii. A team from United Nations consisting representatives from 8 countries visited Panipat, Haryana on 29th November, 2018

The Way Forward:

DBT in Fertilizer initiative is now becoming Decision Making Support System not only for the Department of Fertilizers but also for all other stakeholders such as Department of Agriculture and Farmers Welfare, State Governments, Collectors and Fertilizer Companies for their planning movement of fertilizers and monitoring of retails sales and to identify likely areas of shortage. Integration of the system with various other initiatives like land records etc. would make it more useful with single point of operation. Development of the desktop based software will make the system PoS device independent and more user friendly. Dashboards for states Administration/district Administration is providing a way forward towards an integration with various state level / District level initiatives Putting up a PoS device at 2 lakh retailers has also created a channel which will provide Unlimited Opportunities for the Government to reach Rural India. This can become service delivery channel to other ministries. Digitizing transactions will create purchase history of farmers, which can be used by Financial Institutions to provide credit to farmers based on transaction history at Fertilizer outlets. The successful completion of Phase-I of the DBT in fertilizer has laid a solid foundation over which Phase-II (direct transfer of subsidy to farmer's account) could be implemented.

References:

i. Microsave Second Study Report: Assessment of Direct Benefit Transfer in Fertilizer (http://www.microsave.net/wp-content/uploads/2018/10/Assessment_of_Direct_Benefit_Transfer_in_Fertiliser-1.pdf)
ii. Microsave Pilot Study Report:Assessment of Direct Benefit Transfer in Fertilizer (http://www.microsave.net/wp-content/uploads/2018/10/DBT_in_Fertilizer_Independent_Assessment_Report.pdf)

Chapter 5

Gram Samvaad: Empowerment through Information, An integrated platform for inherent social audit

Prashant Kumar Mittal

Sr. Tech. Director, NIC

Krishi Bhawan, N.Delhi

+91 9717868279

pk.mittal@nic.in

Ajay More

Scientist-B, NIC-DRD

Krishi Bhawan, N.Delhi

+91 8800938940

ajay.more@nic.in

Deepak Chand Misra

Deputy DG, NIC

CGO Complex, N.Delhi

+91 9868851055

dcmisra@nic.in

Bushra Ahmed

Krishi Bhawan, N.Delhi

+91 9773910171

bushraahmed2@gmail.com

Sub Category - One Nation – One Platform

ABSTRACT

Information and communication technology (ICT) a key element for India's economic growth tends to be 121st position in ICT Development Rankings out of total 157 countries. India's enormous growth fragment depends upon citizen centricity which is highly correlated with educating citizen about the Government initiatives for public transformation [1]. The government of India has large number of welfare schemes which constitutes approximately US$7.7 billion (Rs361.7 billion), which was 11.1 percent of total government expenditures and 1.7 percent of gross domestic product (GDP) but most of the schemes are implemented in silos. Recently McKinsey Center for Government published a report stating that citizens continue to feel frustrated by cumbersome or confusing websites and find it's necessary to speak with multiple parties before their question is answered or their request is completed [2]. Here the critical issue arises with accommodating all the scheme in one feasible platform which establishes Citizen centricity and makes citizen as the strongest stakeholder in development programs. Ministry of Rural Development initiated to develop such a platform to strengthen the citizen role in the country by providing information of eight welfare schemes in one platform titled as Gram Samvaad which establishes the accountability, transparency and two-way communication. The eight welfare schemes work for the development of rural people which constitutes 75 percent of the total population of India. This chronicle gives brief about Gram Samvaad, and the motive to develop this platform which unites the nation.

Introduction

In 2006, Government of India started an initiative called **National e-Governance Plan** (NeGP) with a vision to make all the government schemes available to the citizens of India with a foundation structure of transparency via electronic media and a holistic view of e-Governance to manifest accountability and transparency by massive countrywide infrastructure reaching down to the remotest of villages evolving, and large-scale digitization of records taken place to enable easy, reliable access over the internet. As per the UN report, the world leaders adopted the 2030 agenda for sustainable development will entail breaking down traditional silos for more cross-sectoral decision-making and solutions [3]. Recent studies state that the citizen loss of trust is a magnificent issue which results in the deterioration level of citizen participation.

The silos structure of platforms accounts for less communicable as everything is available but still, citizens are unaware of their access. Now as we move further we have seen India has a remarkable shift to M-Governance as a booming reposition has been seen in population interest. India's unique mobile services subscribers are 616 million which is half a population and with a margin of about 330 million new unique subscribers are expected with the end of 2020. The 3G coverage will be 90% of the total population and 4G to be 70% by the timeframe of the year 2020[4]. Ministry of Rural Development after vigorous analysis

and measures have re-engineered most the public welfare schemes which are accountable to the panchayat level with the digitized features.

After observing such prominent co-existing issues and statistics, Ministry of Rural Development came up with the implementation of the citizen-centric platform for rural schemes named as Gram Samvaad. It is a single m-Governance platform for providing information related to eight unique welfare schemes of Ministries of Rural Development and Panchayati Raj which are a source for live monitoring and accessible to every citizen of the country. The initiative has brought the entire country in one sheath.

One Platform for One Nation- Gram Samvaad

Gram Samvaad is a citizen-centric mobile app, created by Ministry of Rural Development in collaboration with NIC team of Department of Rural Development, to serve and empower the rural citizens of India, by facilitating single platform access by citizens to information at Gram Panchayat level on various Rural Development programs, covering inter-alia programme objectives, scope and performance. The App presently covers 8 programs of Ministry of Rural Development as also information on the Grants to Local Bodies recommended by the 14th Finance Commission. It is envisaged that this app will help in information dissemination, introduce greater transparency and promote accountability at various levels. All the Gram Panchayats, Districts and Development Blocks in India are enlisted under this program which marks geographically all 720 districts and 7067 Blocks.

Gram Samvaad - Only one of its kind

● Gram Samvaad provides a medium to disseminate and view information on the expenditure of more than 2.5 Lac Crore across all Gram Panchayats/Village councils in the country.
● Gram Samvaad facilitates single window access to citizens for comprehensive information at Gram Panchayat level about various Rural Development and Panchayati Raj programs.

● Gram Samvaad facilitates transparency of implementation of the Government programs integrated with the application by aggregating the related information within the application.

● Gram Samvaad provides the contact details of the concerned government officials enabling accountability of the administrative departments

● Gram Samvaad Covers inter-alia programme objectives, scope, and performance of various GoI schemes

● The Gram Samvaad App presently covers
· 7 programs of Ministry of Rural Development and information about the Grants to Local Bodies recommended by the 14th Finance Commission and releases there under
And newer version of it proposes to have
· Details of Gram panchayat Development Plan (GPDP),
· Ranking and details of performance parameters of Gram Panchayat as per Mission Antyodaya

● It is envisaged that this app will help in information dissemination and introduce greater transparency and promote accountability at various levels.

● Integration of information in closed geography through Gram Samvaad facilitates reduction in fake beneficiaries enabled through data aggregation across multiple Govt. of India schemes available at a common platform providing alternate effective avenues for beneficiary data verification.
● By providing area specific complete information on social welfare schemes including its performance and expenditure, Gram Samvaad acts as a complete Social audit tool in the palm of every person of the village.
● By providing village wise expenditure done in every scheme and links to actual MIS for beneficiary level benefits provided, Gram Samvaad ensures Evidence based profit dissemination for all welfare schemes it covers.

Overview

Gram Samvaad is an extremely user-friendly application with OTP based login, it allows any citizen of India to access information as per the location was chosen which has to be drilled from state level to Panchayat level. The location could be chosen with GPS locator for enhancing the ease of application usage. The application comes in three different languages specifically English, Hindi and Telugu as

the statistics show they are in the list of most spoken languages in the country where Hindi is accounted to be spoken by 53.6 percentage of the total population following English as 12.18% and Telugu marks to 8.86% mentioned in the Census 2001. Gram Samvaad redirects to the Rural Web Portal for further information on the welfare schemes of Ministry of Rural Development.
As per the location chosen the citizen can track Status of 7 ministry schemes (PMAY-G, MGNREGA, DAY-NRLM, PMGSY, NSAP, DDUGKY, Rurban) along with Status of physical, financial, performance, and 14th Finance Commission can be tracked through this mobile app.

Stakeholders

Deployment Implementation Teams Involved	· All concerned Joint Secretaries · Nodal Officers of States of respective schemes and other State-level stakeholders · All technical organization involved in respective e-governance schemes like CDAC, NIC etc. · Assistant Secretaries of Ministry of Rural Development 2016 batch.

	· Functional and content designed by PMU
Implementers:	Ministry of Rural Development State Rural Development Department District Program Coordinators Block Program Officers Gram Panchayats
System Implementers:	National Informatics Centre
Application Users:	Program Beneficiaries Rural Citizens NGOs Civil Society Activists

Cluster of Eight Applications
The policymakers decided to initially clustered all seven flagship programs of Ministry of Rural Development and information about the Grants to Local Bodies recommended by the 14th Finance Commission and releases there under with the agenda of providing information about each field from which citizen get the utmost benefit. Each scheme will showcase the statistics of the particular area chosen by the citizen along with the information of the contact person associated with the place. The application has FAQs for every scheme to cover basic aspect the respective program guidelines.

Fig 1. Diagram depicting Gram Samvaad as cluster of eight schemes

The **eight schemes** are in an order of:

MGNREGA (Mahatma Gandhi National Rural Employment Guarantee Act)
The mandate of the MGNREGA is to provide at least 100 days of guaranteed wage employment in a financial year to every rural household whose adult members volunteer to do unskilled manual work.

PMAY-G (Pradhan Mantri Awaas Yojana-Gramin)
In view of Government's commitment to providing "Housing for All'' by the scheme 2022
PMAY-G aims at providing a pucca house, with basic amenities, to all houseless householder and those households living in kutcha and dilapidated house.

NSAP (National Social Assistance Programme)
The programme introduced a National Policy for Social Assistance for the poor and aims at ensuring minimum national standard for social assistance. NSAP at present, comprises of Indira Gandhi National Old Age Pension Scheme (IGNOAPS), Indira Gandhi National Widow Pension Scheme (IGNWPS), Indira Gandhi National Disability Pension Scheme (IGNDPS), National Family Benefit Scheme (NFBS) and Annapurna.

DDUGKY (Deen Dayal Upadhyaya Grameen Kaushalya Yojana)
It is the placement linked skill development scheme, implemented in Public Private Partnership (PPP) mode. It targets rural youth from poor families in the age group of 15 to 35 years.

DAY-NRLM (Deen Dayal Antyodaya Yojana–National Rural Livelihood Mission)
The Mission aims at creating efficient and effective institutional platforms of the rural poor, enabling them to increase household income through sustainable livelihood enhancements and improved access to financial services.

NRuM (National Rurban Mission)
The Mission follows the vision of "Development of a cluster of villages that preserve and nurture the essence of rural community life with focus on equity and inclusiveness without compromising with the facilities perceived to be essentially urban in nature, thus creating a cluster of "Rurban Villages".

PMGSY (Pradhan Mantri Gram Sadak Yojana)
To provide connectivity to unconnected Habitations (having population of more than 500 persons) as part of a poverty reduction strategy.

14th Finance Commission
To provide information about the Grants to Local Bodies recommended by the 14th Finance Commission and releases there under.

Challenges

Heterogeneous Codification of villages in different eGov systems
Similar to unique identification of citizens of india, unique identification of villages and habitations has been a challenge for government since long.
Gram Samvaad uses Local Governance Directory to overcome this issue.
India has more than 250,000 Gram Panchayats and more than 6,50000 revenue villages, the smallest bifurcate unit of India, which are mapped in the project of Local Government Directory. The network facilitates generation of unique code for each local government body - each local government body is assigned with a unique code. It integrates with state specific standard codes - if any state is following standard codes for state level software applications, the same code can be linked to LGD code. LGD's implementation has been an arduous challenge as each public scheme generated their own domain specific codes to map India geographically and later when optimizing schemes and convergence for better reformation.

Fig 2. Table showing comparison of locations count as per LGD codes and as per three major schemes of Ministry of Rural Development

#	Unit Level	Unique count as per LGD[5]	Unique count as per MGNREGA[6]	Unique count as per DAY-NRLM[7]	Unique count as per PMAY-G[8]
1	District	720	691	692	702
2	Block	7064	6,918	6,874	6,822
3	Village	6,52,214	7,78,884	7,95,505	6,79,367

Heterogeneous levels of scheme implementation
As each rural development scheme caters to different basic needs of rural citizens of India, certain needs are of individuals specific, certain are household specific and certain are habitation specific. For example, schemes like MGNREGA, DDU-GKY, DAY-NRLM provide the employment, skill and livelihood which is for all individuals, whereas schemes like PMAY-G provide shelter which caters to need of a family as whole. Schemes like PMGSY and Rurban Mission cater to the need of the habitation.
Gram Samvaad allows multi-tenancy in its architecture to incorporate such a challenge. Like for example in case of PMGSY, Gram Samvaad user can get the information of the rural road connectivity not only in his/her Gram Panchayat/Village but also at level habitations (population of more than 500 persons) [9]. For this more than 10 Lac habitations were codified and mapped with LGD villages and are daily synchronized with PMGSY Database servers.

Poor or lack of connectivity at village level
Schemes of rural development aim to uplift the life of poorest of the poor who live in the remotest and underdeveloped parts of India. Internet connectivity is still a challenge and it hinders the penetration of most of the digital initiatives of the Government.
To overcome this issue, Gram Samvaad is designed in such a manner that all relevant information in downloaded in user's mobile phone from Gram Samvaad server at the time of installation of the App. User is asked about language preference, village level

location he/she is interested in, and complete data then resides in the phone. No internet connectivity is required to access this information, and when Internet connectivity is there user may update the information.

unavailability of few data points in real time
As more and more schemes onboard the Gram Samvaad Platform for information availability and dissemination, Availability of certain information for specific scheme and specific village will become a significant challenge. As data gets updated every second on respected eGov systems of schemes but same is synchronized with Gram Samvaad in scheduled manner. To overcome this issue, Gram Samvaad provides a feature where in registered user can opt for getting the unavailable information at later point of time through SMS/Email and Push notifications of the App.

Physical disability and illiteracy
India's population is a critical aspect for the policymakers as the majority of the population constitutes in rural sector where approximately 344 million people are considered illiterate and roughly a third of the world's total illiterate population is in India as stated in UNESCO [10] report whereas 950 million population of India are considered digitally illiterate. We observe the need for policies reformation and to increase the citizen participation programs which specifically educate them in digitalization field. Apart from literacy the government schemes implementation through MIS systems plays a vital role as they are a platform for monitoring and the outcome indicators to analyze the growth. We have seen that the vision of schemes is manifested but implementation still needs to cover a milestone to reach citizen expectation. The major challenges come with data validation and authentication to maintain the data protection along with user- friendly accessibility of the data. Gram Samvaad has tried to overcome this challenge by providing features like Screen reader, availability of information in three mostly used languages i.e. Hindi, English and Telugu.

Conclusion
One nation One platform is a road which has hurdles to cross many linguistic, mapping, diversity issues but has a firm direction to reach the apex to manifest the public welfare. India needs both reformation and transformation in the public welfare schemes and the meticulous decision for GDP expenditure. The schemes need rectification in the availability to the citizen. We believe more the visibility of the data would come in the country, the citizen will show more

participation and proliferate the trust factor in the government. Gram Samvaad is an immense step for e-governance as it has covered a large section of rural population welfare development. Gram Samvaad necessitates to cover many other sections of the country like education, health. Limited access to resources and many concluding aspects which are still a bane for India and intend to provide data to establish centricity for to the common citizen and a platform for Data scientist of the world to analyze and reform the intrinsic issues of the population and work as a boon for the public development. One nation needs a significant measure and performance system which means not just capturing top-line citizen satisfaction with each journey but also their satisfaction with individual factors that affect satisfaction along the way. In the epilogue of this paper we need to maintain the ultimate goal to promote continuous improvement by providing feasible platform to every stakeholder of the country.

References
1. http://www.journalcra.com/article/ict-development-india-current-scenario
2. https://www.mckinsey.com/industries/public-sector/our-insights/implementing-a-citizen-centric-approach-to-delivering-government-services
3. https://www.un.org/ecosoc/sites/www.un.org.ecosoc/files/files/en/2016doc/partnership-forum-issue-note1.pdf
4. https://www.gsma.com/mobileeconomy/wp-content/uploads/2018/02/The-Mobile-Economy-Global-2018.pdf
5. https://lgdirectory.gov.in/
6. http://mnregaweb4.nic.in/netnrega/states/pv_nt.aspx?lflag=eng&fin_year=2018-2019&digest=SD2sT2c+uTyx7O2%2fntpbpQ
7. https://nrlm.gov.in/LgdMappingReport.do?methodName=getLgdDetailAction&encd=n
8. https://rhreporting.nic.in/netiay/SECCReport/SeccVillagesMappedReport.aspx

9. http://pmgsy.nic.in/pmg61.asp
10. https://www.un.org/ecosoc/sites/www.un.org.ecosoc/files/files/en/2016doc/partnership-forum-issue-note1.pdf
11. https://www.timesnownews.com/education/article/international-literacy-day-comparing-indias-literacy-rate-with-the-world/87385
12. https://www.forbes.com/sites/realspin/2014/11/06/the-problem-with-the-english-language-in-india/#6fa7fd69403e

Chapter 6

Ensuring a robust and secure Digital Communication Infrastructure through automated traffic analysis for detecting frauds and end device user awareness

Authors: Naveen Jakhar ITS, ADET (Security), Email: adets.hr-dgt-dot@gov.in, Mob: 8010981097
Pranay Diwakar, JTO (Security),   Email: jtos.hr-dgt-dot@gov.in, Mob: 9766042662
Organization: Ministry of Communications, Department of Telecommunications,
O/o Senior Deputy Director General, Haryana LSA - 107 The Mall, Ambala Cantt, Haryana, Ph: 0171-2640551

Abstract:

Digital India is an Umbrella Programme with a Comprehensive vision for utilizing technology as a catalyst and aims to provide Broadband Highways and Universal Access to Mobile Connectivity to Citizens [1]. Our citizens are using digital ICT infrastructure for e-payments, e-education, e-health, Direct Benefit Transfer (DBT) schemes etc. But some malicious agents are misusing public communication networks, exploiting the vulnerabilities of ICT infrastructure & intermediate point of interconnects and limited digital literacy of our citizens for fraudulent purposes. India's 1.2 billion subscribers accessing ICT platforms are exposed to ever-increasing threats of fraud calls, SMSs, emails, Phishing, Vishing, SIM swapping etc.[2] Cyber space transcends geographic boundaries, so the point of origination of such threats may be located in India or outside. According to the Communications Fraud Control Association (CFCA), a premier International Association for fraud risk management and fraud prevention, the telecom frauds resulted in a loss of nearly $29 billion globally last year [3]. Identification and pro-active analysis of telecom traffic with spoofed calls, fraud calls and SMS is the initial step in this direction. The article discusses the initiatives taken by DoT Haryana LSA Field unit for designing an indigenous and automated tool for carrying out this analysis which helps in ensuring a secure and robust communication infrastructure for citizens.

Index Terms: digital communication infrastructure, frauds, e-governance, automated analysis, subscriber awareness

I. Introduction:

A secure and robust digital communication infrastructure adds significant value to the economy of any nation and it lays the foundation on which any information society flourishes. All the mission mode projects like Smart City, Smart Village, Intelligent Transport Systems, DBT etc. are using the underlying ICT infrastructure as their backbone. Secure and robustness are the key aspects for successful implementation of these projects. These two aspects will directly impact the end users i.e. citizens.

The misuse of public communication network may target banks, institutions and end users for financial frauds or maligning their societal image. As per RBI's report Indian banks have registered over 6,000 cases of fraud, leading to a total loss of more than Rs 30,000 crore in fiscal 2018 [4]. As per survey reports, around 70% of mobile device users said they were unaware of the security threats associated with any mobile device [2]. So, there is an urgent need for creating awareness amongst subscribers. Also, solutions must be put in place for designing robust and secure communication infrastructure for ensuring their hard-earned money is not siphoned by these malicious agents.

Working towards these goals, DoT Haryana LSA has designed an indigenous and automated tool for carrying out this pro-active analysis which helps in ensuring a secure and robust telecom network for citizens. The vulnerabilities found in the communication networks are fixed through feedback mechanism, thereby ensuring Sovereignty, Safety and Security of Digital Communications Networks. DoT Haryana LSA has formulated and implemented a PAN India awareness programme for telecom subscribers related to Spoofed calls and illegal telecom setups. DoT Haryana LSA has also successfully implemented a pilot project with Vodafone for safeguarding the telecom subscribers from International missed calls, premium rate missed calls and balance deduction issues arising thereof.

Telecom frauds have different facets, a malicious person may steal a subscriber's Personally Identifiable Information (PII) pretending as a service provider agent. A subscriber may receive a call with a spoofed number or a missed call from a premium rate International number. These fraudsters may misuse service providers' SMS Centers and send malicious traffic, soliciting consumers to make calls to premium

numbers. Such traffic often contains malware which infects the recipient's phone. In one way or another, these agents misuse public telecom network. The difference between legal and illegal telecom network is as follows:

1. Legal International Telecom Traffic Route

As shown in Fig.1, whenever any foreign subscriber dials any Indian number, the call is routed as follows: The foreign access service provider hands over the call to a foreign carrier in its territory and then the call is handed over to an International Long Distance Carrier Operator (ILDO) which delivers the call at India's International Gateway, then a National Long Distance Operator (NLDO) picks up the call and finally delivers the call to Access Service Provider (ASP) of the called party. The ILDO, NLDO and the ASP all work on revenue sharing mechanism for successfully delivering any call to the subscriber. Same is true whenever any Indian subscriber dials an ISD number. For ISD calls from India, tariff generally varies from Rs 6 to Rs 175 per minute, depending upon the destination country of the called party.
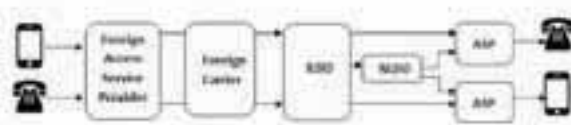

Fig 1. International legal telecom traffic route between two countries. Source: TRAI [5]

2. Illegal or Grey International Telecom Traffic Route

Malicious agents setup their private telephone exchanges for bypassing this legal route. This bypassing of legal telecom route works as follows:
As shown in Fig.2, the foreign pirate carrier routes the call over Internet as data packets. On the Indian end, this malicious agent in alliance with this foreign pirate carrier sets up an illegal Voice Over IP (VoIP) gateway, in general called as SIM box (it can host 4 to 256 SIMS simultaneously), which is connected to Internet for receiving these packets on one end and to the Indian telecom network through SIMs at the other end. The number shown to the called party in all such cases is the mobile number of these SIMs. In this way, an International call is made to appear as a domestic call. In the last 6 years, the losses incurred due to this type of fraud has increased by 600%, from $1.8 billion to $10.76 billion [3].
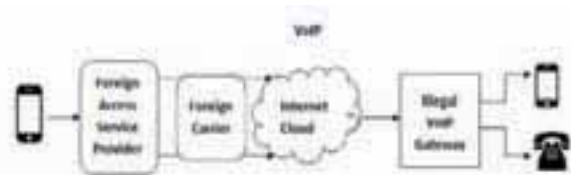

Fig 2. Grey telecom traffic route between two countries. Source: TRAI [5]

3. Consequences of these illegal grey routes and telecom frauds

i. The menace of grey route causes significant leakage in the revenue accruable to the country and its telecom service providers.

ii. The calls received through such routes have their Calling Line Identification (CLI) tampered and it is not the identity of the original caller. The original calling party's identity always remains hidden and the origination of such calls cannot be directly determined.

iii. The VoIP gateway devices used in such illegal setups are capable of changing their International Mobile Equipment Identity (IMEI) on the go, which further increases the security risks. Such rogue devices are threats to any communication network.

iv. Majority of Indian telecom subscribers receive International missed/prank calls from premium numbers and when they dial back on such numbers, huge balance, as high as Rs 175/min, gets deducted from their account. So, this nexus of illegal telecom traffic is siphoning subscribers balance in the name of dialing premium numbers.

v. The tracking of origination of such malicious traffic which transcends geographical boundaries of multiple countries is not possible. Also, even if Law Enforcement and Security Agencies try, the Lawful Interception of such communication events is not possible because they are bypassing the legal telecom nodes and changing their identities on regular basis, which makes it a very serious threat to national security.

4. Challenges in identifying these illegal grey routes and telecom frauds

i. The telecom traffic for call events and SMSs in the State of Haryana for a given day is approximately 32 Gigabytes in size and contains more than 28 crore call events. Analyzing such voluminous data and its correlation through mechanical means is beyond human capabilities.

ii. Different formats adopted by telecom service providers for generating telecom traffic reports also make this analysis difficult.

iii. Telecom traffic analysis tools are available in the market but they are suitable for carrying out analysis of a limited number of mobile/telephone numbers and the data size is limited to Megabytes (MB) only.

Table 1: Telecom traffic of Haryana LSA for 24 hours

S. No.	Name of Telecom Service Provider in Haryana LSA	Data Size (in Gigabytes) of file for 24 hours	Number of Communication events (in crores)
1	Airtel	6.5	5.5
2	BSNL	3	3.2
3	Idea	9	8
4	Reliance Jio	6.3	5.4
5	Vodafone	7	5.6
Total		31.8	27.7

II. Existing infrastructure for gathering information related to Grey Telecom Routes

i. DoT Call Centre is functional for this purpose since 2006 which is accessible through toll-free numbers 1800110420/1963. Telecom subscribers may provide vital information if they receive any International call with an Indian number being displayed on their device or no number is displayed.

III. Work done, Methodology Adopted by DoT Haryana LSA and Results

The third Mission under DoT's National Digital Communication Policy (NDCP) 2018 is *Secure India* which envisages developing and deploying robust digital communication network security frameworks and ensuring Sovereignty, Safety and Security of Digital Communications. As the guardian of Telecommunications, continuous monitoring of digital communication ecosystem & cyberspace and analysis of traffic flowing through it and a regular check on the devices which are accessing Indian telecom network becomes an integral function of DoT. Working towards this mission, DoT Haryana LSA has:

i. Developed an indigenous infrastructure for automated telecom traffic analysis of all telecom service providers operating in Haryana LSA.

ii. Redesigned information gathering system related to grey telecom routes at DoT Call Centre through citizen partnership model.

iii. Formulated and implemented a project for PAN India awareness to approx. 1.2 billion telecom subscribers on the subject of grey telecom routes.

iv. Security audits are being carried out for all telecom service providers for contemporary security features. By adopting and implementing the feedback of analysis, security audits, citizen centric innovative ideas and best practices followed by other countries, the digital communication infrastructure has been strengthened.

1. Automated Traffic Analysis system developed by Haryana LSA

Telecom frauds and illegal routes directly impact the communications network's security which is an integral component of homeland security. A specialized system must be designed for handling and analyzing such voluminous traffic leaving and entering telecom different nodes. As shown in Table 1, For Haryana LSA, the total size of files containing calls and SMS events for all telecom service providers for 24 hours is approximately 32 Gigabytes.

For finding any illegal or non-bonafide use of communication network and any suspected behavior, the analysis of such voluminous data is an essential step. Also, the telecom service providers do not provide this data in any standard format.

So, two parallel approaches were initiated:

i. Designing of a system for automated analysis of this voluminous telecom traffic.

ii. Harmonizing the data format provided by telecom service providers.

The Redhat Linux has been chosen as the Operating System (OS) considering the resilient nature of Linux OS against malwares & other threats and its ability to handle voluminous data files.

Table 2: Time taken by Tool for different analysis on a file of size 6.6 Gigabytes

S. No.	Description of type of analysis	Time taken for analysis
1.	Unearthing of illegal or clandestine telecom setups	45 minutes
2.	Discrepancies in data of CDRs	30 minutes
3.	Devices with Invalid IMEIs accessing telecom network	30 minutes
4.	IMEI Cloning	60 minutes
5.	SIM Cloning	60 minutes
6.	Incoming traffic analysis	15 minutes
7.	Cell ID based analysis	120 minutes

8.	Finding wireless network coverage at a given latitude/longitude	2 minutes

a. Output/Results Generated by Tool:

The tool provides following results in readable format:

i. The list of invalid/black listed IMEIs which are accessing Indian telecom network.

ii. The mobile numbers and SIMs which are being used for suspected purposes- for example if a mobile number is making 800 outgoing calls in a day, with more than 12000 seconds of total call duration, with more than 95% outgoing calls only and 90% distinct numbers, operating from fixed location, there are high chances that this SIM is being used for illegal grey telecom route. The tool provides list of all such numbers along with the cell tower details. This information is shared with Law Enforcement and Security Agencies for carrying out raids on such premises.

iii. The list of non-commercial numbers of Haryana which are receiving more than 500 calls from different numbers.

iv. The cases in which the details of calling party or called party or both are missing. These missing details create roadblocks for Law Enforcement Agencies during investigation.

v. LEAs find it very difficult to get the telecom coverage at a given location when their team is doing the reconnaissance. The tool developed by Haryana LSA has reduced the work of 6 hours to 2 minutes and it has been demonstrated to the LEAs. The tool has, thus, reduced the man hours in a very effective manner.

vi. The cases in which SIM Cloning has been done. SIM Cloning is being used for financial frauds. So, pro-active identification of such cloned SIMS can curb these frauds.

2. Redesigning of process of information gathering at DoT Call Centre and increasing subscriber awareness

The functioning of DoT Call Centre, the stored and live call records for around 24 hours across 3 days were analyzed and following weak links were found:

i. The DoT Call Centre was having support of Hindi language only. This was a barrier for subscribers who do not speak or understand Hindi.

ii. There were issues related to quality of service during handling of calls by DoT Call Centre executives.

iii. Telecom subscribers are not aware about the role of DoT Call Centre.

iv. Some of the valid complaints of the subscribers providing genuine information related to suspected grey market setups were not being lodged at DoT Call Centre.

v. The toll-free numbers of DoT Call Centre were not accessible from 2 States.

a. Actions taken for redesigning the process of information gathering:

i. The script for handling of subscriber's call at DoT Call Centre has been updated and the same has been added to their training curriculum.

ii. Bilingual (English and Hindi language) Interactive Voice Response System (IVRS) setup has been introduced for ensuring maximum participation of telecom subscribers.

iii. The subscriber awareness is a key aspect for unearthing illegal telecom setups because only informed subscribers can provide valuable information. So, a PAN India schedule has been prepared and implemented by Haryana LSA for subscriber awareness. 18 days period in every quarter has been given to each telecom service provider for broadcasting these SMSs to their subscribers. The schedule as shown in Table 3, has been implemented across all States and Union territories of India.

iv. The syntax of the awareness SMS has been formulated by DoT Haryana LSA and the same has been converted to all major regional languages so that maximum awareness can be created. The English version of syntax of the SMS is as follows:

"While receiving international call, if an Indian number or no number is displayed on your phone, please inform on toll free number 1800110420/1963"

v. All the State units of DoT have been directed to ensure strict compliance of this broadcasting activity on quarterly basis and the proforma for the same has been designed by DoT Haryana LSA.

vi. The other field units have been directed to ensure accessibility of DoT Call Centre toll-free numbers 1800110420/1963 from all telecom networks under their jurisdiction. The DoT LSA units seek compliance from all telecom service providers on quarterly basis in proforma present as Table 4.

vii. Once the awareness SMS is broadcast to the subscribers, due to lack of awareness or out of curiosity, they call at DoT call Centre. DoT Call Centre executives have been trained to handle such calls and they have been directed to explain

the purpose of this SMS to all subscribers so that next time if they receive any malicious call, they can provide valuable information to DoT Call Centre.

viii. The call records of DoT Call Centre are being regularly analyzed for quality of service, customer satisfaction and upgrading the training curriculum of executives.

ix. SMSs have also been broadcast to the subscribers stating the importance of IMEI and how to use Govt. of India's KYM [6] application for checking the genuineness of their mobile device and IMEI.

b. Results of this Process Re-designing:

i. ii) Through this redesigning, the number of cases generated for suspected grey market has increased from 17 cases per month to more than 170 cases per month which means an effective increase of 1000% as present in below mentioned Table 5.

ii. Through PAN India awareness programme in regional languages and effective mechanism of handling calls at DoT Call Centre, a strong citizens partnership model has been put in place for ensuring that if any telecom subscriber receives a call from other country with incomplete CLI or with Indian CLI, the same may be reported to DoT Call Centre so that the illegal and clandestine setups are busted.

Table 3: 1963/1800110420 Awareness SMS - Broadcast PAN India Scheduling Plan for TSPs

| 1963/1800110420 Awareness SMS -Broadcast PAN India Scheduling Plan for TSPs				
TSP Name	Quarter 1 (Jan - March)	Quarter 2 (April -June)	Quarter 3 (July - Sept)	Quarter 4 (Oct- Dec)
	Dates	Dates	Dates	Dates
RJiO	1st- 18th Jan	1st- 18th Apr	1st- 18th Jul	1st- 18th Oct
Tata	1st- 18th Jan	1st- 18th Apr	1st- 18th Jul	1st- 18th Oct
Airtel	1st-18th Feb	1st -18th May	1st- 18th Aug	1st- 18th Nov
BSNL	1st-18th Feb	1st -18th May	1st- 18th Aug	1st- 18th Nov
Vodafone-Idea	1st- 18th Mar	1st - 18th Jun	1st - 18th Sep	1st- 18th Dec
Any other TSP	1st- 18th Mar	1st- 18th Jun	1st - 18th Sep	1st- 18th Dec

Table 4: DoT Call Centre toll-free numbers Awareness SMS –Compliance sheet

DoT LSA Name/ State Unit	TSP Name	Quarter :1/2/3/4	Period/dates during which 1963 SMS broadcasting done in English Language in this quarter (Quarter 2)	Period/dates during which 1963 SMS broadcasting done in Regional Language in this quarter (Quarter 2)	Subscriber base count of TSP to which SMSs were sent in LSA
e.g. Haryana	Airtel		1-18 May 2018	1 -18 May 2018	5120000
	BSNL		1-18 May 2018	1 -18 May 2018	4540296
	Idea		1– 16 Jun 2018	Not Done	6589460
	RJiO		2nd April 18	11 -12 April 2018	4766057
	TTSL		7th April 18	Not Done	1659338
	Vodafone		1- 9 June 2018	01-Jun-18	8141762

3. Steps taken for Curbing the menace of Wangiri calls or International missed calls

i. Majority of Indian telecom subscribers receive missed calls from International numbers and when they dial back, a huge amount of balance is deducted from their account. These numbers are premium numbers. Such calls are often termed as Wangiri calls. Wangiri is a Japanese word which means "One (ring) and cut". The premium number fraud was first reported from Japan.

ii. A list of all ISD codes from India along with their tariff was prepared and it was shared with the telecom service providers of Haryana. An audio tone with message "*You are dialing an International number; high call rates may apply*" was synthesized in Hindi and English languages. **A pilot project was started with Vodafone Haryana in June 2018**. The logic has been successfully implemented in all nodes of Vodafone Haryana network. Whenever any Vodafone Haryana's telecom subscriber dials any ISD number, this audio tone is played as pre-call announcement so that the subscriber can disconnect such call if he/she wishes to do so. In this case, no balance is deducted if the subscriber disconnects the call during this pre-call announcement phase. This pre-call announcement initiative is benefitting approximately 63 lakh subscribers of Vodafone Haryana.

Table 5: Month-wise Number of illegal/grey setup cases generated by DoT Call Centre on monthly basis – PAN India
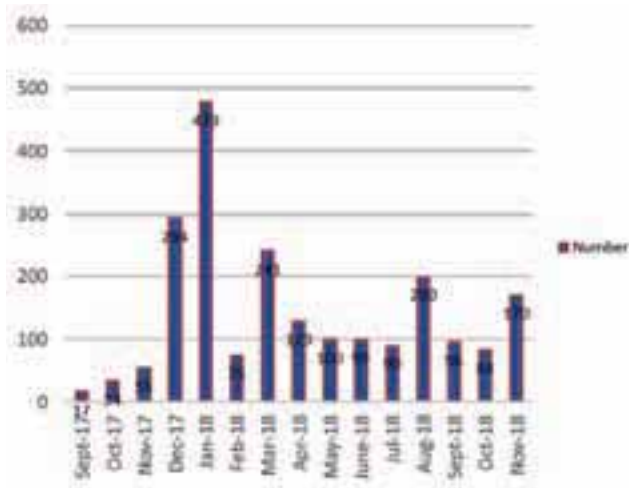
IV.   Conclusion

i.   This indigenous automated tool developed by Haryana LSA has saved precious man hours and provided an automated solution for traffic analysis. The project is benefitting 2.75 crore telecom subscribers of Haryana.

ii.   The tool has been shared with other State units of DoT and it is operational in 5 states as on date.

iii.   The tool is acting as an instrument to create a secure and robust telecommunication network where the bonafide users can use the services with ease, the rogue devices are not allowed to access the network and suspected users are filtered out and action is taken against them for misuse of telecommunication network.

Table 6: Comparative analysis of one year of work

S. No	Description	Sep-17	Nov-18
1.	DoT Call Centre Welcome note - IVRS and Script	Only in Hindi Language	Bilingual support available in -English and Hindi Language
2.	DoT Call Ccentre related awareness SMS broadcast and number of citizens benefitted	No fixed schedule, beneficiary data not available	PAN India schedule implemented – benefitting 1.2 billion telecom subscribers
3.	Total (PAN India) Cases generated by Call Centre for suspected grey market operations/illegal telecom setups	Approx. 20 -25 cases per month	Approx. 200 cases per month
4.	Analysis of telecom network traffic	No system present	Automated system has been designed for analyzing the traffic of one day in less than 2 hours
5.	Curbing menace of premium rate missed calls or Wangiri calls	No exercise ever happened	A pilot project has been successfully implemented with the help of Vodafone Haryana, benefitting 63 lakh subscribers.

V.   Way Forward:

i.   A proposal has been submitted to DoT Hq. for broadening the present scope of DoT Call Centre and convert it into a fully automated and centralized IVRS based DoT Call Centre with support of all regional languages, which will handle calls related to all type of grievances where the public telecommunication network is involved and mobile device/telephone has been used as a tool or victim or both.

REFERENCES
1.   Government of India, Digital India website- http://digitalindia.gov.in/content/programme-pillars - Online reference
2.   Cyber Defense Magazine, November 2018 Page 75-78, Edition, Naveen Jakhar, http://www.cyberdefensemagazine.com/newsletters/november-2018/CDM-CYBER-DEFENSE-eMAGAZINE-November-2018.pdf - Online reference
3.   Telecom Engine.com, Katia Gonzales, 4th April,2018, - https://www.telecomengine.com/article/telecom-fraud-29-billion-and-counting-why-it-matters-more-than-ever-in-the-digital-era/ - Online reference
4.   Reserve Bank of India- Financial Stability Report 2018, 26th June 2018 https://www.rbi.org.in/Scripts/BS_PressRelease Display.aspx?prid=44305 - Online reference
5.   Telecom Regulatory Authority of India- The Telecommunication Interconnection Usage Charges (Fourteenth Amendment) Regulations, 2018 – 12th January, 2018.
6.   Department of Telecommunications, Centre for Development of Telematics, September 2018, https://play.google.com/store/apps/details?id=com.app.cdot.KYM&hl=en_US – Online reference

Chapter 7

Geospatial Data Infrastructure in Geological Survey of India

Asit Saha[1], Debkumar Bhattacharyya[2], Basab Mukhopadhyay[3]

[1]Geological Survey of India, Mission IIIA, Chq, 27, J. L. Nehru Road, Kolkata -700016, 9432012109 [2]Geological Survey of India, Mission IIIA, Chq, 27, J. L. Nehru Road, Kolkata -700016, 9830031059 [3]Geological Survey of India, Mission IIIC, Chq, 29, J. L. Nehru Road, Kolkata - 700016, 9836230594 **Email:** asit.saha@gsi.gov.in, debkumar@gsi.gov.in, basab.mukhopadhay@gsi.gov.in

1. Abstract:

Geological Survey of India (GSI) has implemented a Geospatial Data Infrastructure (GDI) which has enabled end-to-end comprehensive geoscience data lifecycle management, right from the stage of collection, storage, analysis, archival, retrieval, to dissemination and presentation. The GDI also ensures data content standardization, prevention of data loss, multi-thematic data integration and knowledge management. Two main functional building blocks of this infrastructure are namely, multi-thematic field applications and Bhukosh, a Geospatial Data Portal which are integrated through a Geospatial Server Platform. This initiative has helped to align GSI's core business processes with IT so that all stakeholders can be served better qualitatively as well as quantitatively. Being the primary source of geoscience data within the country, this initiative of GSI directly benefits its employees as well as the industry, government, common public, students and academia by providing access to plethora of multi- thematic geoinformation spanning almost every branch of Earth Sciences relevant to the mineral resource sector, sustainability of the socio-economic environment, fundamental geoscience, natural hazard management, etc.

Keywords: Geospatial Data Infrastructure, field application, Bhukosh, knowledge management, OGC

2. Introduction:

Core activity of GSI is to undertake field activities through Field Season Project (FSP) for gathering geoscientific data of various themes. These field data or 'raw data' are the prime source of further analysis leading to creation of information and knowledge and disseminating those using various channels. Since, location information is an essential component of geoscience data, organization-level geospatial data infrastructure (GDI) plays the vital role in managing the data. The GDI should be capable of digital data capture from field, archival, processing data and sharing following global standards. Apart from GIS data, a geoscience organization also deals with relevant non-GIS data. Thus any data management solution must address this requirement of a hybrid system.

This article delves into the insight of data management infrastructure that has been developed in GSI and how that has helped in transforming GSI through introduction of online mode of operation, centralized management and standardization of core scientific process, prevention of data loss and efficiency enhancement. The infrastructure has been developed as a part of Online Core Business Integrated System (OCBIS) Project.

3. Solution goals:

The very first attempt of deploying Enterprise GIS in GSI [1] was done in 2007 using a relational database, a spatial database engine tool, an Internet Map server tool, and integrating the existing ArcGIS desktop GIS clients to import data from distributed data sources into the centralized repository using a customized extraction-transformation-loading (ETL) tool, thereby making appropriate structural changes to ensure homogeneity at various levels, and load into the main Geodatabase. The current data management infrastructure initiative is an augmentation designed to address the following challenges that GSI has faced in the last decade:

- Data Collection Process: Perfecting multi-thematic field data collection in digital mode through imposition of standard procedures across organization following global best practices

- Data Content Standardization: Field workers must collect data based on expert defined format as per the theme of work, so as to eliminate data gaps encountered during later analysis and to maintain standard raw data content for different themes across the organization.

- Data Loss Prevention: Prevention of any data loss and preserving the raw data securely for any future need of reanalysis.

- Delivery of Data in Standard Format: Visualization, exploration and download of data through a spatial data portal following OGC specifications [2].

- Integration of various Data Stores: Backend

integration of spatial data repository, Geophysical data repository, Raw field data repository, Laboratory generated analytical data repository, Content Management System (CMS)and Data processing infrastructure.

- Knowledge Management: Aiming at comprehensive knowledge management which should encompass significant functions such as acquisition and capture, storage, retrieval, dissemination and presentation of data as the basic features [3]. The system should holistically manage field data, laboratory generated data, native geophysical instrument generated data, processed data and finished products viz. maps, reports; structured and unstructured data with varied formats kept as GIS data, RDBMS tables, file systems, integrated together for discovery and sharing from a single interface.

4. Solution overview:

The above goal is achieved by deploying a spatial data monitoring and management solution based on Enterprise geospatial technologies. The solution includes capture, storage, cataloguing, management and serving of all available spatial datasets through an enterprise server layer which in turn allows users to visualize, compare, query, retrieve, filter and even edit the data over a simple web browser. All the data is published as OGC compliant Web services (OGC WMS, WFS, WCS, CSW, etc.)[2], and can be used by any OGC compliant Client. Two integral components of this spatial data infrastructure are:

- A Dedicated Spatial Data Portal named as '*Bhukosh*' as the Gateway to all geoscientific information of GSI to visualize, search and download various data sets through unified browse and download.
- Field Applications developed over GIS platform: Theme based specialized applications developed to enable users to capture the location and relevant information directly into the system, in online as well as in offline mode in remote areas where there is no connectivity and later synchronize the data once connectivity is available.

Central to this infrastructure is the integrated Geospatial Server Platform (Figure 1) that manages and delivers all spatial data of GSI across all missions and domains over a secured Data Model. This integrated platform acts as the overall Data Repository Management System for all geospatial entities and is used to create, update, an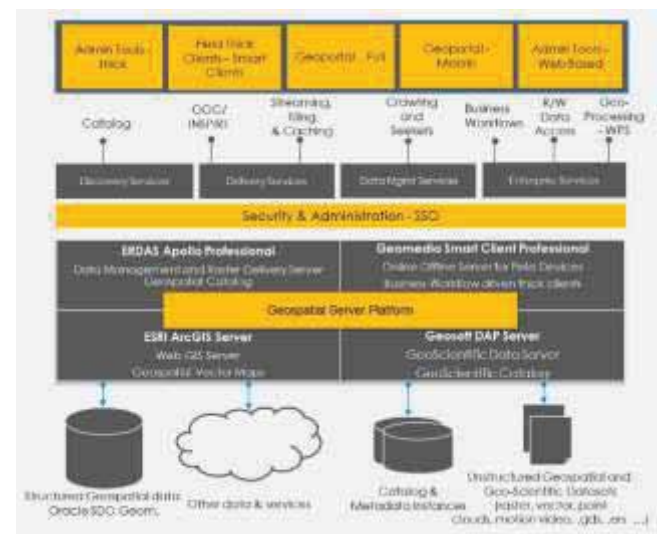d maintain all spatial data in a standardized environment across the organization. In this respect it is an overarching knowledge management system which manages the data generated by all Missions of GSI.

Figure 1: Geospatial Server Platform

Both the Bhukosh and Field Application work in integration with various other Geospatial and Non-Geospatial systems such as Field Season Project Management Information System (FSPMIS), Laboratory Management System (LMS), Content management System (CMS) [4], Geophysical (DAP Server) [5], Single Sign On (SSO), etc. Users can perform both Pre-Field Study and Field Study using this platform.

4.1. Bhukosh - The Spatial Data Portal:

Bhukosh is the web application that acts as a client for Geospatial Data Infrastructure (GDI) services. It is installed and configured on a Web application server so that multiple users can access the site using Web browsers. It is used to find, view, and query geospatial data published with standard SDI Web services and to integrate multiple sources into a single map view that can be easily navigated. Bhukosh simplifies the process of finding, connecting to, and displaying spatial data published through Web services. It ensures smooth browsing through intuitive navigation, controls and technical advances such as asynchronous communication, which ensures that panning and zooming are not interrupted by having to wait for servers to respond. The utility is enhanced by additional tools such as measuring area and distance, controlling the appearance of individual map layers, and saving and recalling the current map context. Bhukosh supports all

the Web services and open standards that a modern GDI client requires. It also has all standard navigational tools, tools for finding Data, printing maps etc. Menus that are worth mentioning are the Unified Search and Download. Unified search allows user to search for GSI data (Table 1) stored in different data management systems viz. GIS data, Content (CMS) data like GSI reports, Geophysical data from the DAP server, laboratory analytical data etc.

The following are key features of Bhukosh:

- Single Sign-On(SSO) integration with

  FSPMIS, LMS, Geophysical (DAP Server) and CMS
- View maps from WMS services 1.1.1, 1.3.0. and WMTS service 1.0.0.
- Simultaneously display maps from different services, using the transparency adjustment for a single layer.
- Retrieve information from the Catalogue services (CSW 2.0.2 ISO AP 1.0).
- Query for services.
- Query for datasets and dataset series (compliant with INSPIRE requirements).
- Search for geographic names using the Gazetteer Service (WFSG).
- Provide intuitive mouse control for simple map navigation and better user experience.
- Perform queries against WFS services working both with WFS 1.1 and WFS 2.0 (ISO 19142).
- Support ISO 19142, ISO 19143 for filter encoding.
- Use WCTS for online coordinate transformation.
- Create and Edit Personal Storage Service.
- Save and restore current map context (OGC WMC).

- Monitor connected services with Quality Monitor Service.
- Process data from Bhukosh Catalogue with Geoprocessing and Unified Download functionality.
- Search and browse data (raster, vectors, services, and business data) available with GSI data repositories.

4.2. Field Application

Field application facilitates the authorized user to carry out Pre-Field Study in Bhukosh where based on the approved FSP parameters, geoscientists can select relevant spatial layers and create a field package for the specific theme (Table 2). Once field package is created, users go to field and collect data as **Observation** and/or **Sample** apart from the mandatory location data obtained from the integrated GPS. This data can be uploaded into CMS. Uploaded samples may be submitted to Laboratory using LMS module.

Field Application built on Geomedia Smart Client [6] is a Java-based application which runs on the client machine in a separate application window (Figure 2). It supports both online and offline functionalities.

Figure 2: Field application Implementation

In Online mode of data collection, there is an established connection to the application server over the VPN on which application-relevant data is exchanged. The application itself is downloaded, which corresponds to a JNLP (Java Network Launching Protocol) file. This is an XML document containing information on the requisite Smart Client components and the current version number and diverse settings. For example, for user login, project selection, and bookmarks, the JNLP files are created and is administered specific to the user. After downloading the file, it is executed, and the application will automatically be installed on the client machine.

Offline functionality is achieved through caching of raster and vector data in the field device. The user can then read this data directly from the cache, taking the load of the map servers and network. This provides a huge boost to performance levels in terms of access time, and reduces the volume of data transferred from the server to a minimum. The client caches are kept current through a fully automated process using time stamps, without any need for user intervention.

4.3. Integration Architectures

Key to the data management requirement of GSI is to

integrate various unique components and seamlessly integrate those and make it accesible to users. The Spatial Data Portal i.e. Bhukosh has back end integration with the modules like FSPMIS, LMS, Spatial data procerssing infrastructure, Geophysical data repository and the Field application platform. Figure 4 below depicts the data capture flow and integration of FSPMIS, LMS, Field Applications and Data processing infrastructure with the Bhukosh.

Figure 3: Field Application-LMS-Data Processing- Infrastructure-Bhukosh Data Flow Diagram

During a Field Season Program, Geoscientist captures FSP sample data and observations from the field, along with various physical samples. Each sample is tagged with a unique sample ID which is fed into the field application along with the location (x, y and z coordinates) and other attributes into the field application either in Online or offline mode. These details along with observations are synchronized back to the server onto an Oracle Spatial (SDO_Geom) repository (OCBIS RAW data store) whenever the respective user syncs the field tablet with the server. The physical samples are sent to

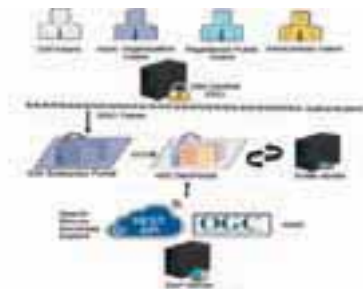respective laboratories for further analysis. The laboratories complete analysis and updates the data

Figure 6: Geoportal - DAPServer Integration

against each sample. Users can extract the raw data from the RAW data store in either of
.shp, .gml or .csv format via FSPMIS. The sample data and corresponding analysis information can be accessed by the project scientist through LMS and Bhukosh.

Geoscientist uses these information to process and finalize the spatial datasets as per the GSI Target Schema Data Model. The final data is put in to the central GSI Geospatial repository which is an ArcGIS Server [7] Basic schema with a native Oracle Spatial [8] SDO_Geom configuration in multi user environment using a customized ArcObjects based ETL tool built on ArcGIS Desktop environment. Server for ArcGIS is used to publish OGC compliant WMS services which in turn is registered into the GSI Metadata Catalogue [9] using ERDAS Apollo. Once registered these final datasets becomes available on Bhukosh for search and display. Additionally, any other OGC compliant services can also be integrated into the central GSI Metadata Catalogue for search and display.

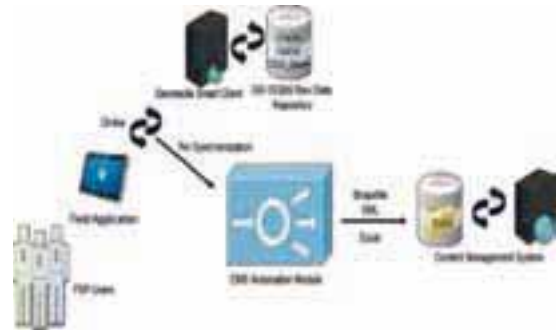Highlights of the important integration deployment architectures are shown below in figure 4 to 7:

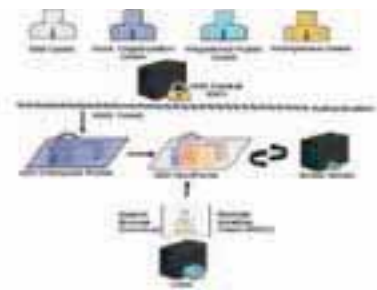Figure 4: Field Application CMS Integration

Figure 5: Bhukosh - CMS Integration

Table 1: Geospatial Data available through Bhukosh

Database management Systems	Map service / content	Information
Geological Data Management System (GDMS)	Geology 50 K	Litho boundary, Dyke, Fault, Fold, Fossil Occurrence, Lithology, Mine Quarry, Mineralisation, Morphostratigraphic Landform, Surface, Non oriented Point, Oriented Structure, Paleo Channel, Shear zone, Surface Secondary, Trend Line, Zonal Structure, Drainage Morphometry,
	Geology 2M	Geology
	Tectonics 250K	Tectonic Framework, Basement Depth, Volcano, Trench, Thrust, Fault, Suture Zone, Spreading Ridge, Shear Zone, Bathymetry, Fold, Lineament Bouger's Gravity Anomaly
Geophysical Data Management System (GPDMS)	National Geophysical Mapping (NGPM)	Gravity, Magnetic anomalies
Geochemical Data Management System (GCDMS)	National Geochemical Mapping (NGCM)	Stream Sediment locations with 64 element analytical data
RSAS Data Management System (RSASDMS)	Aerogeophysics	Electromagnetic anomalies
	National Geomorphological And Lineame	Geomorphology, Lineament (1: 50000)
	OneGeology - Geomorphology And Lineament	Geomorphology, Lineament (1:250000)
Marine Data Management System (MDMS)	Marine TW	Bathymetry Contour, Sea Bed Sediment Distribution
	Marine EEZ	Bathymetry India, Coast, EEZ Map Boundary, NHO Chart, Sea Bed Sediment Distribution, Magnetic Anomaly
	Marine Geophysics	Magnetic TW, Magnetic EEZ
Non Energy Mineral Management system (NEMMS)	One Geology Mineral	Geology, Deposit, Thrust, Fault
Energy Mineral Management system (EMMS)	Coal	Coal Field: Borehole, Major Town, Village, Seam, Ultra Basic line, Fault, Basic Intrusive, Bedding, Streams, Road Network, Stratigraphy, Seam, Ultra Basic Polygon, Outcrop, Basic Intrusive Polygon, State Boundary, River, Block: River, Current Direction, Bedding, Village, Seam Line, Fault, Streams, Road Network, Railway Network, Stratigraphy, Seam Poly,
	Geothermal	Geothermal, Geology
Landslide and Hazard Data Management System (LHDMS)	National Landslide Susceptibility	Region Wise Susceptibility Raster, Toposheet Boundary
	Landslide Inventory	Landslide Point, Lineament Landslide
Earthquake Data Management System (EDMS)	Seismotectonic Atlas	Fault Plane Solution (MW>=5.5), Fault Plane Solution (MW<=5.4), Earthquake (Mb>=4), Hot spring, Town, Volcano, Basement Depth (km), Bathymetry (Meter), Bougers Gravity Anomaly (mgal), Fault, Mohos depth, Rivers, Water Body, Tectonic Unit
Climate Change Impact and Fragile Ecosystem Data Management System (CEDMS)	Glacier Inventory	Glacial Retreat, Geology 2M
Fundamental Geosciences Data Management System (FGDMS)	Meteorites	Meteorite, State Boundary
Compiled data / unstructured data	Content data from CMS, DAP and	GSI Progress Reports along with Maps, images, datafiles; Airborne, Marine and Ground Geophysical Survey data; laboratory analytical data

Table 2: List of Geoscientific field applications built for various themes

S.no	Theme-wise Field Applications	Corresponding Database
1.	Specialised Thematic Mapping	GDMS
2.	Geochemical Mapping	GCDMS
3.	Geophysical Mapping	GPMDRS
4.	Hyperspectral Mapping	RSASDMS
5.	Landslide Study	LHDMS
6.	Petrological Study	FGDMS
7.	Paleontological Study	
8.	Geochronological Study	
9.	Meteorites & Planetary Studies	
10.	Quaternary Geology Mapping	
11.	Earthquake Study	EDMS
12.	Active Fault Mapping	
13.	Seismic Hazard Microzonation	
14.	Marine Studies	MDMS
15.	Glaciology & Polar Studies	CEDMS
16.	Desert Geology Study	
17.	Exploration & Survey	Exploration Database (EMMS & NEMMS)
18.	Pitting	
19.	Trenching	
20.	Subsurface (Borehole)	
21.	Surface Sampling	
22.	Geothermal Study	

5. Conclusion:

This initiative of GSI is aligned with the recent IT policy initiatives of GoI and the National Mineral Exploration Policy (NMEP). In this Information Age, where information is power, GSI has been able to put in place standard-based, device independent Mission-specific data management systems to capture, store, and disseminate data using a spatial technology platform. GSI have leveraged mobile technology for field data collection, automated and integrated business processes with Field Season Program as the pivotal process, facilitating comprehensive data management. This has ensured improved management of resources and enhanced GSI's core competence to function as a 'Repository' and 'Provider' of geo-scientific information of the country. For

the common public, industry, academia, students and everyone interested, Bhukosh is the one stop shop for accessing authentic, standardized geoscientific information encompassing domains like Geology, Geophysics, Geochemistry, Geochronology, Geomorphology, Geothermal, Marine Geology, Seismotectonics, Meteorites, Landslide hazards, etc. 1000+ digitalized paper maps, 1000+ digitalized in-house publications and 22000+ project reports are also accessible to the common public. An entrepreneur can now take an informed investment decision, common public can satiate his quest for geoscience knowledge, and an academician can plan his research goals based on GSI data. The biggest beneficiary is the large scientific workforce of GSI who now has ready access to the vast volume of geo-

scientific data gathered by GSI over the past 167 years. This facility alone greatly augments their efficiency, productivity and quality.

References:

[1] Saha A., Mukhopadhyay B., Bhattacharyya A. "Enterprise GIS at GSI" *Proceedings of the International Conference on 'Geology: Indian Scenario and Global Context'* at ISI, Kolkata - 7-

11th January 2008, Ch 4

[2] OGC ® Standards and supporting documents http://www.opengeospatial.org/standards "n.d" (last accessed on 26.12.2018)

[3] Payakpate J., Fung Chun C., Nathakaranakule S., Marinova D. "An integrated web GIS knowledge management system to enhance and promote knowledge on sustainable energy technologies" *Proceedings of the WSEAS International Conference on Energy Planning, France*, October 14-16, 2007, pp 90-96.

[4] Oracle Universal Content Management 11g http://www.oracle.com/us/products/middleware/conten t-management/026076.pdf Data Sheet 2010 (last accessed on 26.12.2018)

[5] Ian N. M., Roger A., Nicholas V., DAP – Large volume spatial data discovery and distribution over networks, https://www.geosoft.com/media/uploads/resources/white-papers/dap_white_paper_021103.pdf Geosoft Inc. White Paper 2003 (last accessed on 26.12.2018)

[6] Geomedia® Smart Client - A smarter way to enable your World, https://www.hexagongeospatial.com/white-papers/geomedia-smart-client-a-smarter-way-to-enable-your-world White Paper, November 26, 2014 (last accessed on 26.12.2018)

[7] ArcGIS® Server: ESRI's Complete Server GIS, https://support.esri.com/en/white-paper/1233 An ESRI ® White Paper • December 2006 (last accessed on 26.12.2018)

[8] Advanced Spatial Data Management for Enterprise Applications, https://download.oracle.com/otndocs/products/spatial/pdf/spatial11gr2wp.pdf An Oracle ® White Paper • August 2010 (last accessed on 26.12.2018)

[9] Erdas Apollo Vector Data Management: Vector Data Cataloging And Display, https://www.geospatial-insight.com/wp-content/uploads/HexGeo_ERDAS_APOLLO_VDM_Whitepaper_Final.pdf White Paper, October 02, 2014 (last accessed on 26.12.2018)

Chapter 8

Journey of Haryana State towards Less Cash Economy

Munish Chandan, Head State e Gov Mission Team/
Chief Information Security Officer, ISMO,
E&IT Department, Government of Haryana, ciso.haryana@nciipc.gov.in

1: The Need for a Less Cash Economy

India is experiencing a rapid and increasing use of digital methods of recording, managing, and exchanging money in commerce, investment and daily life. The efforts of Government of India (GOI) to drive Prime Minister's vision of shift to Digital transaction is timely and much needed to promote both economic growth and financial inclusion. The reasons for moving towards a Digital economy are many, few of which are mentioned below:

a) **Cash economy has costs:** Cash operations cost the Reserve Bank of India (RBI) and commercial banks comes to Rs 21,046 crore annually[1].

b) **Inflationary risks**: If an injection of cash causes prices for key goods to rise, then recipients will get less for their money and non-recipients will be worse off

c) **Security risks**: Moving cash from bank vaults has a risk

d) **Tax Evasion**: Since cash-based transactions are not easily traceable, Merchants prefer cash transactions in order to avoid paying taxes leading to lower collection of taxes for the Government

e) **Anti-social use**: Cash can be used to buy anything. Some may be used for anti-social purposes as well

f) **More prone to diversion**: Cash may be more attractive than alternatives and so particularly prone to being captured by elites, to diversion particularly where corruption is high and to seizure by armed groups in conflicts.

g) **The Informal Economy**: Nearly 90% of India's labor market and firms, account collectively for some 40% of GDP. Bringing in the informal economy out of the shadows would thus have enormous impacts on India's fiscal position due to low compliance on personal income tax.
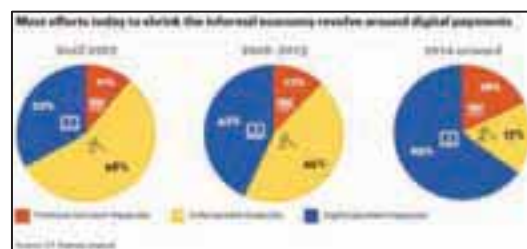
h) Following graph represents results of sample survey done by BCG & Google to find reasons for using Digital Payments by Indian consumers [10]:
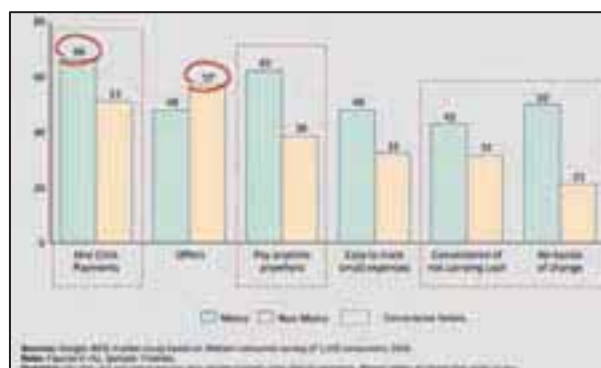
The Haryana State Perspective

Haryana Government identified that the State needs to reduce its unusually high dependence on cash to bring in much needed transparency and efficiency in the system, which necessarily does not mean advocating a cashless society, however a less-cash society would be a fairer and safer place. Today, Haryana along with India is moving persistently towards a less cash economy or digital economy since encouraging cashless transactions has the potential to curb tax evasion, corruption and the use of hard

cash in crime. This is being achieved by having all the G2C services using online mode & accepting / disbursing any kind of payment in digital way; this shall be explained in detail in further sections.

District-wise map of Haryana State (not to scale)

2: Challenges in adoption of Digital Payments in State of Haryana

2.1 Problem Description

Haryana State has the population of approximately 2.75 crores[1] and majority of this population, nearly 65% live in Haryana's rural part and 35% live in the Haryana's urban part which mainly comprises of Urban Gurgaon, Faridabad & Urban Rohtak which are in close proximity of the National Capital Region (NCR).

The Rural areas face infrastructure challenges such as:

a) *Absence of Payments acceptance infrastructure by small business in State:* In absence of any digital acceptance mode at citizen touch points, consumers have to pay in cash. Daily wage labour have to stand in queue for hours to make cash withdrawal.

Identified Causes:

Small business do not have the compulsion of deploying a digital payments acceptance mode in their shops. Reasons being:

- **Lack of appropriate policy measures** provisioning that mandates deployment of digital payments made by small merchants lead to acceptance of cash payments from consumers by small business.

- Small business find it **difficult to deploy expensive POS machines** that costs in range of 8,000 INR to 25,000 INR.

ii) *In-adequate digital payment touch points in departments:* Departments are not able to provide service to citizen in a seamless and real time manner. Departments have to invest upfront on maintaining physical touch points for payment collection (at least one of the cashless mode) however they can save a lot with digital payments acceptance points (Web/ Apps, etc.)

Identified Causes:

- Lack of coherent strategy in identification of relevant digital payment touch points in high citizen footfall touch points. Most departments do not have the right technical capabilities and face infrastructure constraints to promote digital

payments in their ecosystem. These factors have hampered the growth of digital payments in State.

b) *Source: Haryanastat.com*

iii) *Low awareness level of citizen on digital literacy:* Citizens are not able to avail benefits of cashless payments due to lack of knowledge, awareness about presence of digital payment modes. Citizen have to depend on cash based payment methods and usually have apprehensions for becoming victims of fraudulent transaction due to inadequate awareness about digital payments modes, features and fee structure.

Identified Causes:

- Low education level of customers and lesser focus on consumer awareness campaign by service providers lead to lower levels of financial and digital literacy.

- Most financial institutions / Public departments do not have dedicated agendas and accordingly budgets for promoting digital literacy and sensitization campaigns.

2.2 Existing policies in the State

One of the major reasons identified for lack of digital payment infrastructure development in Haryana State is absence of policy level guidelines that mandates businesses to provide digital payments options to consumers and vendors. A brief about the existing policies in the State is mentioned below:

c) *Payments acceptance infrastructure by small business in State*

- The present Shops and Commercial Establishment Act [3] that requires all shops to register themselves to operate does not have any provisioning that mandates shop owners to accept payments through digital mode. Shop owners can accept cash payments from customers for sale of

- Govt. of India, NABARD and DFS (Department of Financial Services) have provision of subsidizing, financing deployment of POS machines, RuPay card issuance and BHIM Aadhaar deployment. But small merchants are not able to avail benefits of existing schemes to an effective level on account of low awareness and dedicated IEC campaign.

- Financial literacy center curriculum does not specifically focus on how small merchants can accept payments digitally from customers. Dedicated content on BHIM App, BHIM QR and POS deployment benefits are not present in the curriculum.

ii) *Digital payment touch points in departments*

Many departments still do not have dedicated IT teams to take the digital payments implementation forward. Deployment of payment modes would also depend on segment of client being catered to and kind of services being offered.

iii) *Awareness level of citizen on digital literacy*

Reserve Bank of India mandates to have Financial Literacy Centers to create customer education and awareness generation of basic Banking concepts. But there does not exist any dedicated regulation and policy guideline on digital literacy around digital payments. While PSPs and Financial Institution conduct regular financial literacy camps to spread awareness on cashless payments and product related knowledge, dedicated Policy on digital literacy is absent.

2.3 Key Barriers to Adoption by Citizens

While consumers have exhibited an enthusiastic response toward digital payments, they have also voiced several concerns that act as impediments preventing their shift to and belief in digital payments methods as listed in following infographic [10]:

good/services without any obligation to deploy digital payments acceptance mode; BHIM Aadhaar, POS, BHIM QR etc.

- The present act does not have any provisioning for incentivization of shop owners/merchants on digital payments acceptance. Banks/Fis does not allow any lending rate rebates to shop owners based on digital cash flow

2.4 No Single View of Digital Transactions for monitoring progress across the State

The biggest challenge that was faced by the Government was the absence of any single view of all digital transactions taking place in the State. The need was felt to create a Consolidated Portal to summarise the various transactions and their modes taking place throughout the State so as to ascertain the Progress vis-à-vis Target of Digital Transactions being assigned to the State by the Government of India.

Any such consolidation portal would entail following challenges:
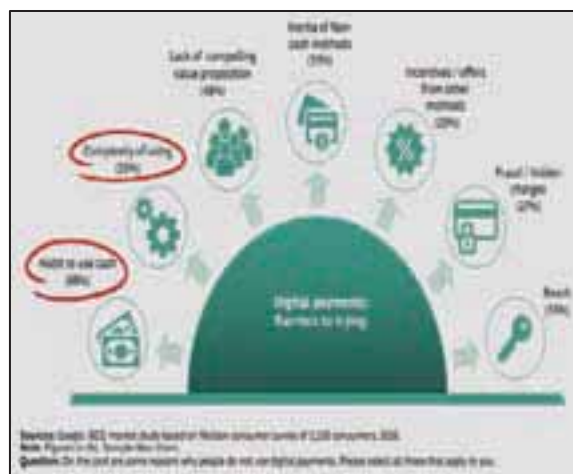
a) Following up with the various departments, banks and wallets for collection of information need to be consistent and diligent.

b) Often times the data would have to be collected manually through e-mails

c) Some departments would require hand-holding when doing the API integration

d) Technical Specifications would need to be catered to the dynamic requirements of the portal

e) Use of technologies that allow for seamless data updation and permit for changes in portal functionalities, look and feel so customization is possible, if and when required.

3: Journey of Haryana from Cash-based to Less Cash Economy

This section describes how Haryana government is overcoming all the problems & challenges to revolutionize the digital payment landscape in the State across all departments, businesses and institutions in order to move towards a less cash economy.

3.1 **Launch of Haryana Cashless Consolidation Portal**

To further the goals of the 'Less Cash' economy in Haryana, a 'Cashless Consolidation Portal' has been developed indigenously by the State's Department of Electronics and Information Technology. The main aim of this portal is to track and manage the count of digital transactions in the State. The URL of the portal is https://cashlessharyana.gov.in:

Image: Haryana Cashless Consolidation Portal

The portal is an **innovative effort of the State where all stakeholders share the data on digital payments through APIs**. This portal has been appreciated at the level of Government of India. Even States such as Tripura, Uttarakhand, Daman & Diu have agreed to replicate the same portal in their respective States.

i. **Tracking the Consumption of Digital Payments** – This feature permits the citizens to track and measure the progress of Digital Payments in Haryana.

ii. **API Integration** – This permits for convenient and real time capturing of data from stakeholders.

iii. **Safe, Secure and Ease of Access** – Permits safe storage of data and ease of access permits easy contact to the Digital Transaction data in the State.

iv. All data is displayed **segregated by the mode and channel employed for the transaction**, eg – BHIM, BharatQR, Wallet (PayTM, Airtel Money, Vodafone Mpesa Wallet, etc.), Credit/Debit Card, etc.

v. Dedicated sections have been created on the portal whereby stakeholders can promote their incentivisation and promotion schemes to the users of the portal

vi. All transactions are updated monthly, so the users are always informed on the transaction count and other details. Constant monitoring of transactions ensures that no transaction information is always accurate.

3.2 **E-Governance Initiatives**

The State has undertaken many e-Governance projects such as e-Bhoomi, e-Registration, e-Payment, e-Filling, e-Tendering, e-Refund, e-Disha, E-Tourism, e-Ticketing etc. for reforming G2C and G2G services through technology; the details of few initiatives are mentioned in Table 1 :

Initiative	Description
e-Bhoomi	For sale of land directly to government.
Online Taxation	Following services have been launched by the State for Traders at www.haryanatax.gov.in : e-Registration, e-Payment, e-Filling, e-Tendering, e-Refund
e-District Haryana (e-Disha)	IT-driven electronic interface between the Haryana government and the citizens that facilitates the general public to receive effective and timely services.
e-PDS	An End-to-End Computerization of Targeted Public Distribution System has been implemented across the State covering Online Ration Cards Management, Allocation, Supply Chain Management, Ration distribution through PoS devices at FPS using Aadhaar based authentication system.
Web Portal for HTC	A Web portal for Haryana Tourism Corporation (HTC) has been launched which is integrated with Online Rooms Booking System and Online e-Ticketing for Surajkund International Crafts Mela.

Table 1: E-Governance Projects undertaken by Haryana Government

3.3 Integrated Finance Management System

For online communication, release, allocation, revision, re-appropriation of budget by the Finance Department. The budget preparation now takes only two months as compared to eight months earlier which exemplifies responsive and responsible governance through Implementation of Online Budget Allocation and Monitoring Application), Centralized Pay Processing System for all Haryana Govt Employees), Online Treasury Information, e-Pension and **e-GRAS (Government Receipts Accounting System)** across the State for:

a) Budget estimates from DDO level

b) Online distribution of Budget up to DDO Level

c) Online preparation and passing of Bills

d) Online checking of ways and means position

e) Maintaining Evenly Spread of Expenditure across the Year

f) Reducing expenditure rush in the month of March leading to better finance management

With its implementation, Haryana has become the first State:

i. To implement its own On-line e-stamping solution on anytime anywhere basis and its integration with property registration.

ii. To implement e-TDS system for filing income tax returns by the DDOs/Tos.

iii. To issue Aadhaar enabled Digital Life Certificate for pensioners

3.4 Resolving Internet Connectivity Issues

To strengthen wired and wireless infrastructure, the State has laid optical fiber reaching 5620[4] villages under National Optic Fiber Network program (now known as Bharatnet). It has been envisaged that this network shall provision 100 mbps internet connectivity to all Gram Panchayats.

3.5 Direct Benefit Transfer (DBT)

DBT system has been launched for Account based transfer of government benefits to more than 24.04 lacs[4]

beneficiaries. As of Nov 2018, a total of 133 schemes[3] have been on-boarded from 22 Departments[3] (like Old Age Samman Allowance, Widow Pension, Disability Pension, Ladli Allowance, and Financial Assistance to Destitute Children (FADC), Non School Going Disabled Children (NSGDC) and Allowances to Dwarfs & Eunuchs etc.)

Image: Direct Benefit Transfer Portal launched by Govt. of Haryana

3.6 Establishing network of Atal Seva Kendra

To bring government services to the doorstep of citizens, Haryana Govt. has set up 10,480 Atal Seva Kendras (or **Common Service Centers**) as of Nov 2018 out of which 4000 are in rural areas.

This has made the process of obtaining citizen services simple and convenient for both citizens and State departments. A village-level entrepreneur (VLE) is

selected as Atal Seva Kendra operator-cum-manager and is authorized to act as a citizen delivery point.

Moreover, CSC e-Governance Services India Limited has collaborated with the National Payments Corporation of India (NPCI) to launch Aadhaar Enabled Payment System (AePS) at locations where CSC has been acting as Business Correspondent. This payment system is

called as DIGIPAY. This system facilitates disbursement of government entitlements like NREGA, social security pension, Handicapped, Old Age Pension etc of any Central or State Government institution/entity, using Aadhaar authentication service of UIDAI.

---

3. http://dbtharyana.gov.in
4. http://haryanait.gov.in/en/e-governance-in-haryana

3.7 Launch of Single Roof Clearance Mechanism

To attract investors to Haryana, the State has set up Single Roof Clearance Mechanism (Haryana Enterprise Promotion Portal i.e. https://investharyana.in/) in Feb 2017. All industrial approvals are being given online in a time-bound manner through this portal.

Image: Single Roof Clearance Portal launched by Govt. of Haryana for attracting investment opportunities in the State. In a short span of time, more than 1,500 applications were received on this portal. Haryana has been promoted from rank 14th to rank 3 in 2018 on the ease of doing business ratings.

3.8 Making Regional Transport Services Online

Keeping pace with National efforts, VAHAN and Sarthi, the e-Governance applications under National Transport Project, been successfully implemented in all 94

RLA and RTA offices of the State. Moreover, the State has made many transport related services online:

Source: https://haryanatransport.gov.in

3.9 Launch of Mobile App – UMANG

- Haryana State is working in coordination with MeitY, Govt. of India to launch e-Services over mobile platform under Unified Mobile Application for New Age Governance (UMANG) scheme.

- Through these applications, the citizens can access pan India e-Govt. services of his/her choice, from any locations.

- This will be a platform to host the schemes of central and State government departments, local bodies and other departments.

3.10 Skill Development Initiatives

Realizing the importance of skill development in promoting digital payments implementation across the State, Skill Development Policy was notified to make all citizens digitally literate.

- Currently, HARTRON is training youth in IT Skills through its 80 e-education Centres throughout the State. Annually 30,000 candidates are being trained by HARTRON.

- Haryana Knowledge Corporation Limited (HKCL) has established about 245 franchise Centres already and many more are targeted to be setup during the year 2018-19

- Establishment of Multi Skill Development Centres at Gurgaon and Ambala

- MOUs have been signed with various Placement Agencies / Pvt. Players, etc. and Bulk SMS App/ Call Centre Started.

**4: The Current Status of Implementation of Less Cash economy**

Haryana has created a robust infrastructure and taken several initiatives for digital payments acceptance in the State to provide seamless and convenient experience for citizens. These initiatives are aligned with Govt. of India's vision of achieving 30 billion digital transaction in FY 18-19. The State achieved 134% of target in FY 17-18[11] allocated to the State by GOI which is indeed a remarkable feat and result of focused planning and on the ground initiatives by all stakeholders.

For FY 18-19 Haryana is well poised and confident in achieving target of 75 Crores allocated to the State. As a half yearly measure, Haryana has already achieved 55+ Crores i.e. achievement of more than 70% [11].

a) A **State Level committee** had been constituted under the chairmanship of Chief Secretary Haryana for the **proliferation and promotion of digital payments in the State of Haryana**. Substantial progress has been made on the proliferation and promotion of digital payments in the State of Haryana and is as under:

   i. IEC campaign in Mass media conducted in leading newspapers

   ii. Promotion plans (SOP) for 6 MeitY identified departments have been published on the portal

   iii. BBPS – 2 BBPOUs ICICI and Yes Bank are empaneled for the State.

   iv. MOU between PayGov and HARTRON is finalized. Integration testing for PayGov is initiated.

   v. Yes bank and PayTM has shared proposal note for developing State wallet.

   vi. Moreover, Haryana is one of the first few States to launch Incentive scheme to promote digital payments; 65 Cash Awards were announced and cashback for every first cashless transaction was also given till the Government of India announced the "Lucky Grahak Yojana and Digi-Dhan Vyapar Yojana" during Digidhan Melas.

   vii. E Gras accounting system for accepting online payments for citizen services

   viii. Instruction issued to departments for deployment of BHIM, BHIM QR codes in State.

   ix. Boards and corporations being integrated with PayGov

   x. DigiLocker being implemented in State for faster acceptance of documents by departments

   xi. 5 Digidhan Melas have been conducted in Haryana along with a series of Besant Melas at District/ Block level.

   xii. Unique program launched by the State in coordination with NIELIT, Chandigarh to train more than 900 Government officers for Digital Payments & Information Security.

   xiii. IEC State plan being developed for departments to promote cashless payments

b) Further, a **Digital Payments Committee** has been constituted under the chairmanship of Worthy Principal Secretary IT **to periodically monitor and evaluate the merits/ demerits of various digital transaction platforms**. The above Committee has the following mandates:

   i. To finalize/negotiate with banks and other service providers on the different aspects such as set up cost, O&M cost, transaction charges, settlement period etc. which shall be followed throughout the State/across departments for speedy replication.

   ii. To popularize and evaluate printing of QR code on bills for facilitating the cashless collection of payments for utilities such as electricity bill/water bill etc.

   iii. To evaluate shifting of un-utilized POS Machines to the Departments where they can be better utilized.

c) **Capacity Building on Digital Literacy**

   i. HARTRON is training youth in IT Skills through its 80 e-education Centers throughout the State. Annually approx. 30,000 candidates are being trained by HARTRON.

   ii. Haryana Knowledge Corporation Limited (HKCL) has already established 245 franchise centers and many more are targeted to be setup during the year 2017-18

   iii. Establishment of Multi Skill Development Centers at Gurgaon and Ambala

   iv. MOUs signed with various Placement Agencies / Pvt Players, etc. and Bulk SMS App/ Call Centre Started.

   v. The Dept. of Higher Education is working towards Digitizing Universities of Haryana

d) <u>Current Modes of Digital Payments in the State</u>

The various modes of Digital Payments being used in the State are listed below:
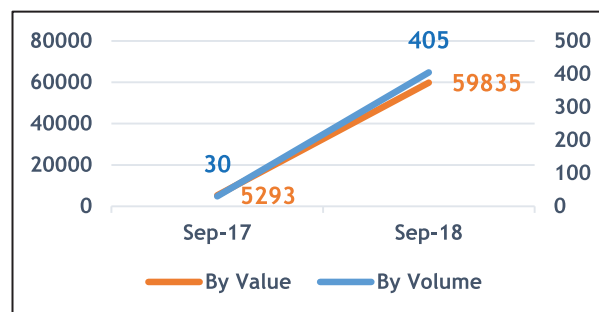
i. **Banking Cards**: Cards are among the most widely used payment methods and come with various features and benefits such as security of payments, convenience, etc. Banking cards can be used for online purchases, in digital payment apps, PoS machines, online transactions, etc [8].

> *From April-Nov 2018, more than 11.8 crore digital transactions have taken place in Haryana State using Debit and Credit cards mode.[11]*

ii. **USSD**: Another type of digital payment method, *99#, can be used to carry out mobile transactions without downloading any app. These types of payments can also be made with no mobile data (or internet) facility. The main aim of this type of digital payment service is to create an environment of inclusion among the underserved sections of society and integrate them into mainstream banking [8].

> *From April-Nov 2018, about 57,740 digital transactions have taken place in Haryana State using USSD mode. [11]*

iii. **AEPS:** Expanded as Aadhaar Enabled Payment System, AEPS, can be used for all banking transactions such as balance enquiry, cash withdrawal, cash deposit, payment transactions, Aadhaar to Aadhaar fund transfers, etc. All transactions are carried out through a banking correspondent based on Aadhaar verification [8].

> *From April-Nov 2018, more than 25 Lakhs digital transactions have taken place in Common Service Centers in Haryana State using AePS mode.[11]*

iv. **UPI:** An interoperable payment system through which any customer holding any bank account can send and receive money through a UPI-based app. The service allows a user to link more than one bank account on a UPI app on their smartphone to seamlessly initiate fund transfers and make collect requests on a 24/7 basis and on all 365 days a year [8].

> *d) Source: https://www.npci.org.in/bhim-analytics*

As per Economic Times (4th Oct Edition), the number of UPI transactions in India have increased from 30 million in Sept 2017 to 405 million in Sept 2018.

In value terms, this increase in UPI transactions is from modest Rs 5293 crores in Sept 2017 to Rs 59,835 crores in Sept 2018.

BHIM App: Based on UPI, Bharat Interface for Money (BHIM) app has been launched by NPCI. The BHIM app allows users to make payments using the UPI application. The BHIM app can be used by anyone who has a mobile number, debit card and a valid bank account. Using BHIM App, money can be sent to different bank accounts, virtual addresses or to an Aadhaar number. As of Sept 2018, the total number of downloads of BHIM App have crossed 35.5 million (Android) and 1.7 million (IOS)[5]. A total of 128 banks have been on-boarded on BHIM App as of Nov 2018[5].

> *From April-Nov 2018, more than 11.7 crore digital transactions have taken place in Haryana State using BHIM App. [11]*

v. **Mobile Wallets:** A mobile wallet is a type of virtual wallet service that can be used by downloading an app. E.g. PayTM, Mobikwik, Freecharge, etc. The various services offered by mobile wallets include sending and receiving money, making payments to merchants, online purchases, etc.

> *From April-Nov 2018 more than 21.59 crore digital transactions have taken place in Haryana using different mobile wallets such as PayTM, Ola Money, Vodafone M-Pesa, PayU money, Airtel Money and Aditya Birla Wallet. [11]*

vi. **Bank pre-paid cards:** A prepaid card is a type of payment instrument on to which you load money to make purchases. The type of card may not be linked to the bank account of the customer. [8].

vii. **Mobile Banking:** The process of carrying out financial transactions/banking transactions through a smartphone. The scope of mobile banking is only expanding with the introduction of many mobile wallets, digital payment apps and other services like the UPI [8].

viii. **Internet Banking:** Internet banking refers to the process of carrying out banking transactions online. These may include many services such as transferring funds, opening a new fixed or recurring deposit, closing an account, etc. Internet banking is usually used to make online fund transfers via NEFT, RTGS or IMPS [8].

ix. **PoS terminal:** It is a hand held device that reads banking cards. However, with digitization the scope of PoS is expanding and this service is also available on mobile platforms and through internet browsers.

There are different types of PoS terminals such as Physical PoS, Mobile PoS and Virtual PoS. Physical PoS terminals are the ones that are kept at shops and stores. On the other hand, mobile PoS terminals work through a tablet or smartphone. This is advantageous for small time business owners as they do not have to invest in expensive electronic registers. Virtual PoS systems use web-based applications to process payments.

x. **Micro ATMs**: Micro ATMs are card swipe machines through which banks can remotely connect to their core banking system. This machine comes with a fingerprint scanner attached to it. In other words, micro ATMs are handheld point of sale terminals used to disburse cash in remote locations where bank branches cannot reach.

5: Benefits to Haryana by moving towards a Digital Economy

a) **Reduced Maintenance Costs**: The logistics and supply chain of cash is a costly affair. The amount of money required in printing cash, its storage, transportation, distribution and detecting counterfeit currency is huge.

b) **Transparency in Transactions**: Needless to say, electronic transactions or plastic money always leaves a digital proof beneficial for both the taxpayer (consumer) and the tax collector (government) encouraging a corruption-free economy. Cash transactions are found in money laundering and terrorism financing cashless economy will stop it.

> *After computerization of Targeted PDS (Public Distribution System), about 15 Lakh duplicate beneficiaries were found; the State has saved about 250 Crores of rupees annually and Wheat allocation is down by about 10000 MT (15%) every month. [9]*

c) **Higher Revenue**: A direct advantage of transparent transactions is collection of tax will increase. Thus generating higher revenue for the government, which in turn can be used for citizen welfare.

> *The implementation of e-GRAS has facilitated collection of tax/non tax revenue in both the mode, online as well as manual; Till Nov 2018, more than 75 lakhs transactions have taken place digitally in Haryana State using e-GRAS. [9]*

d) **Financial Inclusion**: The strong will to have a cashless economy will promote financial inclusion of the people of Haryana by connecting all the households with a bank and plastic economy.

> *After implementation of Social Security Pension Schemes through DBT, about 5 Lakh beneficiaries have been found bogus and the State has saved about 114 Cr of rupees annually. [9]*

e) **Lower Transaction Costs**: Digital transaction is a boon in terms of processing costs and waiting time which will increase the consumption and production rates, thereby improving the economy.

f) Cashless or digital transaction option reduces the chances to forfeit currency. Also, Middleman, Agent and intermediaries will be removed transactions will be done directly to account.

g) For consumers, there is no need to accumulate money and that cannot be stolen. People also need not to carry ATM cards with them. Moreover, Digital transactions allow people to view history and manage their budget as well.

6: Way Forward & Conclusion

The Govt. of Haryana has already taken several initiatives to ensure outreach of digital payments services for last mile availability of seamless citizen centric services. The State has put concerted efforts towards deployment of digital payments products like; BHIM, BHIM QR Code, UPI, Bharat Bill Pay, RuPay.

The Time bound implementation and roll out plan has to be well supported by dedicated local level digital literacy activities. State will have to work hand in hand with all stakeholders towards complete digitization of payments in the ecosystem. Policy level interventions aligned with local level State demographic contours need to be fine-tuned.

To take the momentum of implementation further, following are the few steps which the Haryana Government. is considering to overcome major challenges as described in earlier:

6.1 Problem 1: Payments acceptance infrastructure by small business in State

Way Forward to overcome:

i. Amendment of Shops and Commercial Establishment Act mandating deployment of at least one digital payment mode by all shop owners registered under shops and establishment act. The daily sales/monthly turnover cap may be put to segment applicability of such an amendment. Eg- A shop owner having monthly turnover of at least 10 lacs INR may be mapped under such an amendment. Petty daily traders (ex- push cart vendors, tea vendors, etc.) may be kept out of such a policy as felt appropriate by Competent Authority.

ii. Tax incentives for small business in form of tax rebates. Merchants accepting payments digitally may be allowed some tax rebates while filing ITR.

iii. Tax sops may be given to manufacturers of biometric devices that works with BHIM Aadhaar and MPOS (mobile POS machines). This will encourage low cost production of such devices. The biometric device attached to BHIM Aadhaar cost approx.. 1000 INR which is being given free of cost by some Banks to small merchants. If cost of such devices can be brought down significantly then scalability can be facilitated

iv. Notification on allowing lending rate rebates for small merchants accepting digital payments. This would encourage show owners to start accepting digital payments. Eg – A flat .5 to 1% rebate on lending rates (typically 10-12% for SMEs) for small merchants who make at least 50% of transactions through digital modes (except-cheque /DD)

v. Policy can be developed to mandate giving special tax incentives for WOEs **(women owned enterprises)** accepting digital payments. Women owned shops may be given tax rebates and special preference for availing government services

6.2 Problem 2: Low awareness level of citizen on digital literacy
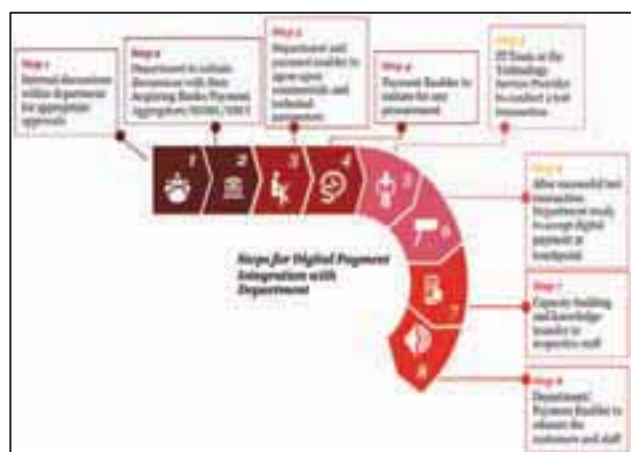
Way Forward to overcome:

i. A dedicated grievance redressal forum/body for consumer protection on cashless payments in the State. This will ensure protection of consumer interest and increase confidence/trust of consumers on cashless payments

ii. SLBC s (State Level Bankers Committee)to mandate all FLCs (Financial Literacy Centers) to revise curriculum that would include sections on digital payments awareness, product features, fees and pricing and acceptance channel and service availability steps

iii. IEC plan on digital payments for citizen awareness generation

iv. Dedicated helpline (toll free) on IVR mode for customer education to be developed for knowledge dissemination on digital payments

v. Promotion budgets pool to be created by State for IEC campaign on cashless payments. DCCBs (District Central Cooperative Banks) and SCBs(State Cooperative Banks) including RRBs to be given special budgets to create last mile sensitization among citizen on cashless payments

vi. Promotion material to be deployed and displayed at all CSC (Common Services Centers)

vii. NABARD to leverage SHG network for village level last mile awareness generation on cashless payments

viii. District Administration to set up awards for best Gram Panchayat and Municipal Corporations on promoting cashless payments in delivering Government Services.

6.3 Problem 3: Lack of digital payment touch points in departments

Way Forward to overcome

i.   Policy mandating all departments to deploy at least 1 mode of digital payments in high footfall citizen touch points

ii.   State to allocate dedicated budgets for promoting cashless payments initiatives and meeting infrastructure requirements to support all departments driven by Finance & E&IT Department.

iii.   Departments to be mandated to run their own promotion campaign & enhance IT infrastructure in consultation with Finance & E&IT Department.

iv.   State to issue formal guidelines based on Govt. of India/NPCI/RBI notifications for departments to deploy BHIM, BHIM QR, BBPS, RuPay, BHIM Aadhaar, Bharat QR

Below infographic gives an overview of the Standard Operating Procedures that various departments in the State may follow for adopting and enabling digital payments products, promotion and the measures that they need to take in order to ensure high satisfaction level during the on-boarding of customers under the digital payment ecosystem.

Detailed Steps, Applicable Solutions & Expected Timelines

Source: PwC Study,
http://cashlessharyana.gov.in/PromotionDocs

Conclusion

Haryana State is overcoming all challenges and moving smoothly towards Digital Economy. The State has to ensure measures like creating awareness of digital / electronics payment, IEC campaigns, Sensitization workshops, technological developments in order to make cashless economy a success. Haryana Government is already working on ensuring first availability and quality of telecom network in all parts of the State which will act as a base for building digital infrastructure.

Financial institutes or intermediaries like banks and related service providers will have to constantly invest in technology in order to improve security and ease of transaction. People as a customer will only shift when it's easier, certain and safe to make cashless transactions. The Government may plan to implement strategy of incentivizing cashless transactions to promote less cash society.

As Haryana State has set ambitious target of achieving high economic growth this year, cashless payments will surely play a pivotal role in catalyzing efforts towards fulfilment of such a vision.

References

[1]
http://fletcher.tufts.edu/~/media/Fletcher/Microsites/Cost%20of%20Cash/COC-India-lowres.pdf

[2]
https://www.trai.gov.in/sites/default/files/PRNo114Eng28112018_0.pdf

[3] https://hrylabour.gov.in/shops/front/shop_terms

[4] http://haryanait.gov.in/en/digital-haryana/e-governance-in-haryana

[5]
https://www.pwc.in/assets/pdfs/publications/2015/making-haryana-smart.pdf

[6]http://economictimes.indiatimes.com/articleshow/55908649.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

[7] https://indikosh.com/st/58995/haryana

[8] https://www.bankbazaar.com/ifsc/digital-payment.html?ck=Y%2BziX71XnZjIM9ZwEflsyDYlRL7gaN4W0xhuJSr9Iq7aMYwRm2IPACTQB2XBBtGG&rc=1

[9]
https://cdn.s3waas.gov.in/s3b6d767d2f8ed5d21a44b0e5886680cb9/uploads/2018/07/2018072323.pdf

[10] Google-BCG Market Study based on 1516 consumers in 2016: http://image-src.bcg.com/BCG_COM/BCG-Google%20Digital%20Payments%202020-July%202016_tcm21-39245.pdf

[11] https://cashlessharyana.gov.in/dashboard89. *Please note that the data on this portal is strictly based on the data shared by the various stakeholders to Cashless Portal team till the time mentioned therein.*

For any further information please contact Shri. Munish Chandan, Head State e Gov Mission Team/ Chief Information Security Officer, ISMO, E&IT Department, Government of Haryana. Contact Email ID: ciso.haryana@nciipc.gov.in , munish.chandan@semt.gov.in; Phone Number: 0172-2703479.

CHAPTER 9

'SAMADHAN EK-DIN' – A STEP TOWARDS PROACTIVE GOVERNANCE
(Sub Theme: Inclusion and Capacity Building)

Hariranjan Rao, Principal Secretary, Department of Public Service Management, GoMP

B Chandrasekhar, Executive Director SAPS, GoMP

4th floor, MP Text Book Corporation, Arera Hills, Bhopal (MP)

Email: raohr@gov.in, edsaps@mp.gov.in

ABSTRACT

Public services are not a matter of privilege but a rightful expectation and rights of citizens and calls for a "Citizen First" approach to governance. Madhya Pradesh enacted the Public Service Guarantee Act in 2010 and has been delivering about 200 services online through various service centers i.e. Lok Sewa Kendra (LSK), MPOnline kiosk and Citizen Service Center (CSC). In an endeavour to increase the efficiency in public service delivery, a novel concept 'Samadhan Ek- Din' project was initiated in the state with strong support from the political and bureaucratic front. This paper highlights this project, rolled out in beginning of this year, 2018 to ensure delivery of identified high volume services from across the department, to citizens through LSKs within the same day of application. This project was executed by institutionalising a new framework wherein officials from cross-functional department has been included and authorised for disposal of application belonging to other departments. One dedicated officials from a department is available at every LSK on roster basis for approval/disposal of application. The project demanded extensive capacity building initiatives of the new officials included in the service delivery, enhancement of currently in use e-District platform and drive the awareness campaigns for citizens. Currently 34 services of 9 departments are being delivered under this initiative.

Keywords: Samadhan, Same day delivery, Lok Sewa Kendra, Public Service Guarantee Act, Designated officer, Viability Gap Funding

BACKGROUND OF CITIZEN SERVICE IN MP

The Department of Public Service Management (PSM) Government of Madhya Pradesh (GoMP) enacted the Public Services Guarantee Act, (PSGA) 2010, which was the first of its kind legislation in India to ensure guaranteed delivery of notified public services in defined timelines. This created a formal structure for service delivery and grievance redressal mechanism for the citizens. The services are being delivered through various delivery centers i.e. LSK, MPOnline kiosk and CSC by integrating the e-District web application of NIC on which department services are being offered. The institutional arrangement is shown in Figure 1.

This Act ensured service as a right, service within stipulated time, and service through a standard operating protocol with accountability. It also included a provision for penalty in case of non-delivery of services. NIC was tasked with application development, hardware/ software maintenance, back up, restoration, and an integrated
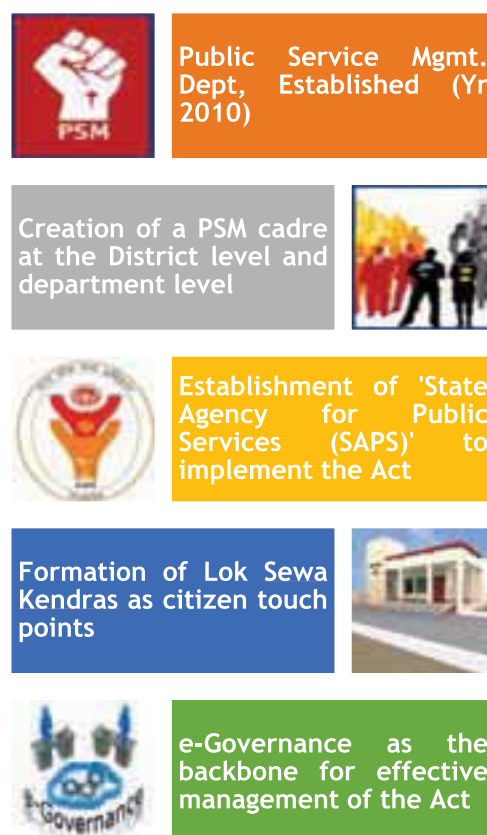

Figure 1- Institutional Arrangements for PSGA 2010

Management Information System (MIS) for monitoring and tracking.

Currently, 446 services of 44 departments have been included under PSGA 2010.

GENESIS OF 'SAMADHAN EK-DIN'

The Public services were being effectively delivered under PSGA through various service centers effectively. In an endeavour to improve the service level, it was felt that reducing the time for processing the citizen application will be most effective. In the present scenario, a citizen visits a service delivery centre to apply for the desired service, say Income certificate. Thereafter, he visits the centre again after specified number of days (three days for Income certificate) to collect his certificate. Hence for any service, a citizen needs to visit the service centre twice.

On our field visits to monitor the operations of LSK, the poor farmers and labourers especially from remote rural areas had also brought out the difficulties in service delivery. They tend to lose income of two days apart from the physical hardships due to long distance travel amid limited transportation arrangements.

In addition, interactions with higher officials from various departments at different forums hinted that there was possibility to decrease the processing time of few services. However, reducing this time to 'just one day' could be far fetching as it would require major GPR and may even call enhancement of technical infrastructure.

Considering the above as trigger points and with strong support of top level political and bureaucratic front, SAPS planned to initiate the 'Samadhan Ek - Din' (meaning 'Solution in One day') project to provide public services to citizen in one day. To roll out his project extensive planning and coordination with various stake holders was critical.

ARCHITECTING THE SOLUTION

1. **Identification of Services under 'Samadhan – Ek Din'**
   Few important and high volume public services from few departments were identified, which could be included in this project.

2. **Consultation with department**
   Extensive consultation meeting under the chairmanship of Chief Secretary along with Principal Secretary and other high-level officials from the selected departments were held to brainstorm and identify way ahead to reduce the service processing and disposal time to one day/ same day.

3. **Technology platform**
   It was decided to build additional modules / capabilities on the existing web application 'MPedistrict' developed by NIC to process the application for 'Samadhan –Ek Din' project. (Refer Figure 2)

4. **GPR of identified Public services**
   GPR were undertaken on the service procedure, process flow, attachments and integration with other department services to make it compliant for one-day delivery. New government orders were drafted and issued notifying the new procedure for these services delivery.

5. **Garnering support of top leadership**
   Support of top political and bureaucratic leadership was very crucial to lay the strong foundation and make progress on the project.
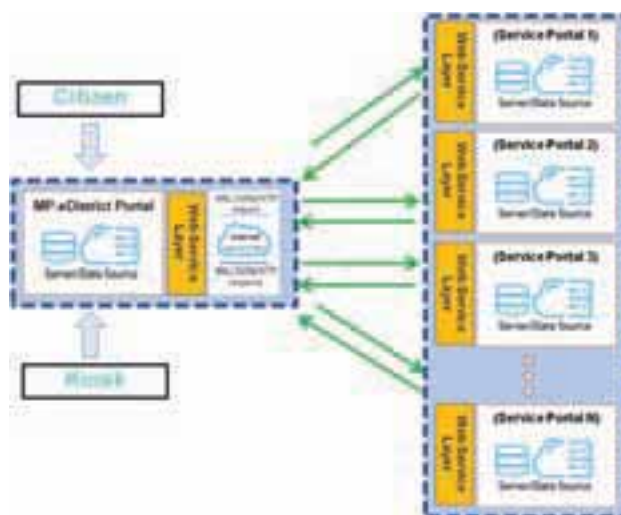
Figure 2- Technology arrangement architecture for Service Delivery

6. **Administrative framework – Inclusion of Cross functional department Official**
   In order to ensure same day delivery of service, a novel methodology was envisaged, wherein officials from cross functional department were included in service delivery system. This inclusion made one officer at Block level (Tehsildar/ Janpad Panchayat CEOs/ Municipal CMOs/ Block Education Officers etc.) available at every LSK on roster basis during the working hours, to approve/dispose the application received.

7. **Administrative approval for new framework**

The envisaged framework had to have formal approvals in place such that officials from cross functional department were authorised to process and approve service application belonging to other department e.g. CDPO approving application for 'domicile certificate' belonging to 'General Administration department'. The 'Samadhan –Ek Din' project was to be provided only through LSK.

CAPACITY BUILDING

Upon finalisation of the formal functional structure, identification of few services, conduct of GPR for simplification and development of online platform for services delivery, there was a need of structured capacity building program. Train the Trainer concept were employed, wherein training program were held at Bhopal for all District Public Service Managers (DPSM), who were to subsequently train the newly 'Included' officials from cross functional departments and also the operators at LSK. DPSM were trained on the service application procedure, the eligibility criteria and approval process for all services under the project. These DPSM, in-turn conducted extensive hands on training for officials at Block level and all LSK operators. Change management strategy was employed to ensure effective knowledge transfer and sensitising of the service providers.
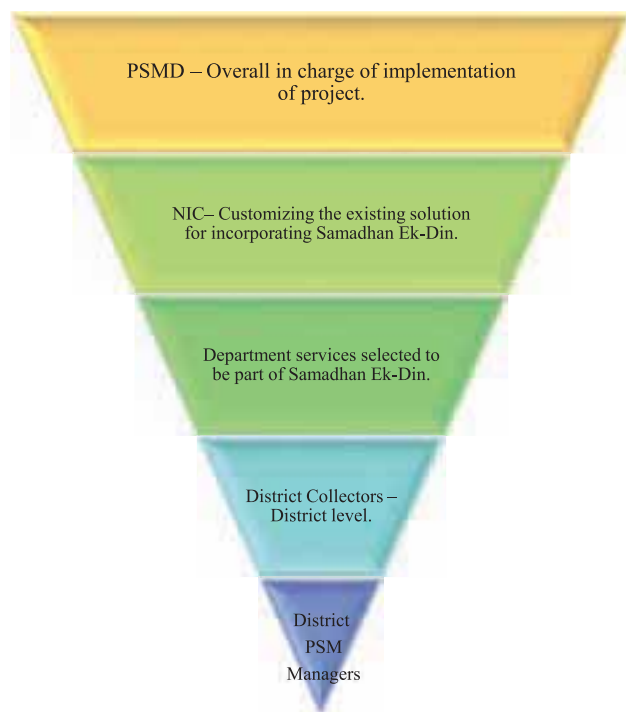
Figure 3- Stakeholder's hierarchy for Samadhan-Ek Din

The capacity building measures undertaken is shown in Table 1.

Table 1- Capacity Building exercises

Audience	Month /Year	Objectives
PSM, DeGM, AeGMs	Dec 2017	• Sensitization on Samadhan Ek-Din. • Training on new method of service delivery.
Designated officers	Feb 2018	• Feedbacks on challenges faced as DOs w.r.t. disposal of service request • Training on application disposal process

CITIZEN AWARENESS

For the successful implementation of the project, the end beneficiaries or citizens had to be made aware on the various services that are available under 'Samadhan Ek-Din' project and the procedure associated with its delivery. Various IEC channels as depicted in Table 2 were used for conduct of awareness campaigns in urban and rural areas to reach out to major cross section of people.

Table 2- Awareness activities through different mediums

Activities	Description
Radio	• Coverage through Radios
Digital Cards	• Digital cards of various services
Audio/Video	• Creation of audio & Video content
CM Helpline	• Information dissemination about Samadhan Ek-Din. • Logging grievances
Conventional media	• Print media coverage, • Placing of posters/hoardings/ panels on Lok Sewa Kendras. • Brochures, Standee etc. • Newsletters, leaflets/ Brochures etc.
Others	• Wall paintings, mid media, street plays, rally and Yatra activities • Street play (Nukkad Natak)

Some examples of information campaign are as under:

Samadhan Hoardings   Samadhan Brochures

Street Play   **Awareness activities at LSK's**

Figure 4- Awareness Campaign Activities

PROJECT EXECUTION

'Samadhan Ek-Din' was initially rolled out as a pilot project in Bhopal district to assess the technical and operational process and ensure that activities are happening as per planned approach. Upon successful result in pilot stage, the project was implemented in five districts for few weeks to further streamline the process and also mobilise the citizen to visit the LSK to apply for services. Subsequently the project had successful launch in the state in March 2018.

Day to day monitoring of the project were undertaken to assess the number of application received for various services, its disposal rate, pendency ratios etc. for each LSK. The result has been very encouraging.

RESULTS OF 'SAMADHAN EK-DIN'

This novel Public Service model 'Samadhan Ek-Din' has been a great success and following has been achieved:

1. **Increase in number of application**. Since inception, about 40,06,712 applications were received for the 34 identified services till 30 Nov 18, out of this, 39,93,970 applications have been disposed within same day, thus achieving a disposal rate of 99.68 %. If we consider the same set of services, the total applications in year 2017 (prior Samadhan) were only 34,67,335. The details are shown in Table 3 and 4.

2. **Decrease in Viability Gap Fund (VGF).** VGF is the amount that is provided by the government to each LSK per month to compensate them, if they do not receive the agreed level of applications. VGF has also come down after project implementation. The details are provided in Figure 5.

Figure 5- Month on Month VGF trend after 'Samadhan- Ek Din'

Table 3- Top-5 Services application received under 'Samadhan- Ek Din'

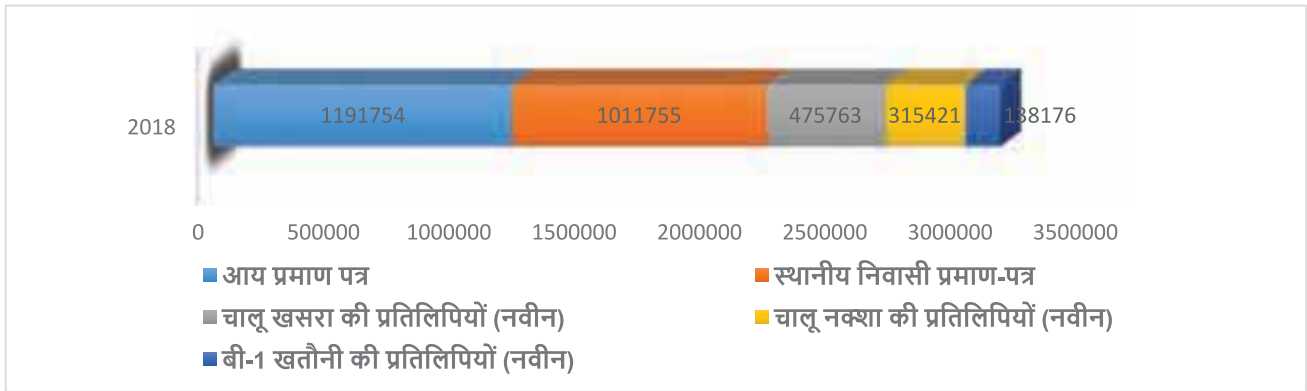Table 4- Growth in disposal rate before and after 'Samadhan- Ek Din'
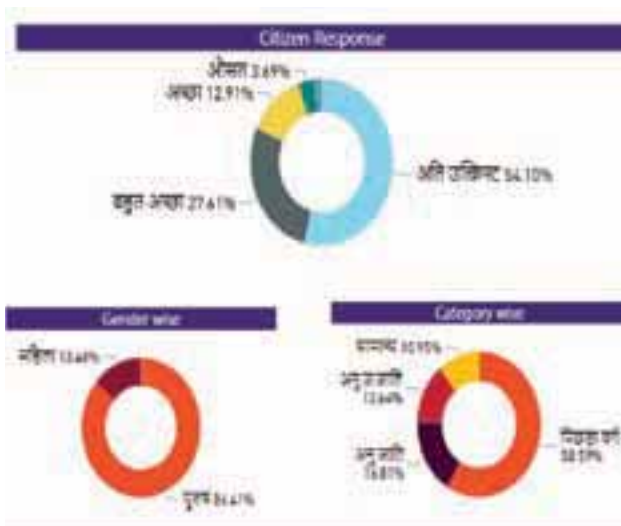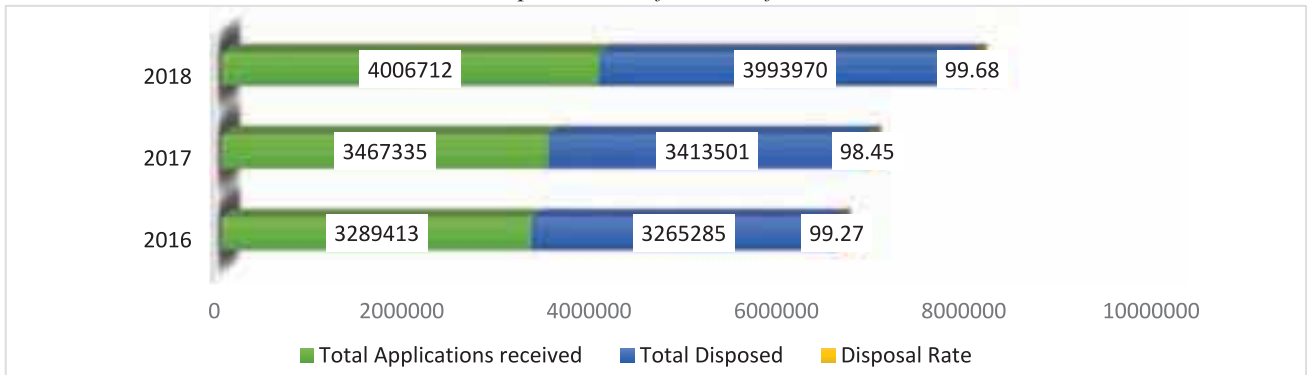

Figure 6- Citizen Satisfaction Survey analysis 1
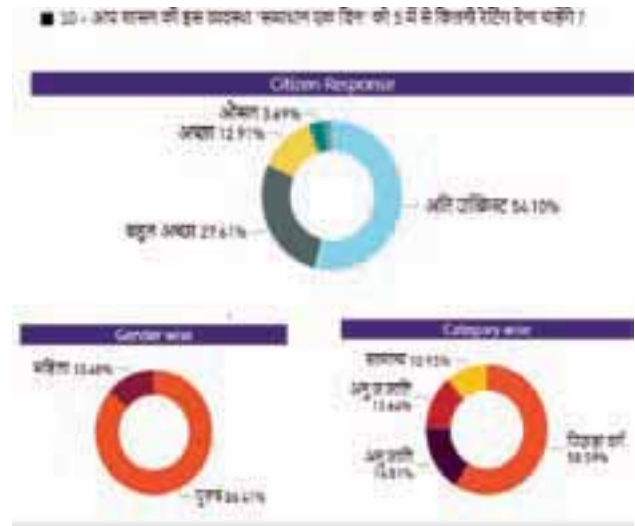
Figure 7- Citizen Satisfaction Survey analysis 2

3. **Higher Citizen Satisfaction level.** The citizen satisfaction survey shows higher level of satisfaction towards service delivery in the state. (Refer figure 6 & 7)

CHALLENGES ENCOUNTERED

1. **Buy –in of government departments**

Initial resistance from the departments were observed in agreeing to the idea to process the citizen application service and dispose it on the same day. The department was of the opinion that it will be a big challenge to reduce the processing time to just one day from the present timeline with the limited manpower of the department. Information on roster based duties of officials at each LSK is available in MPedistrict portal for reference by all stakeholders (Refer Figure 8).

2. **Accessibility of government records**
The available records in some department had to be digitised to ensure these records could be accessed and related services could be processed in one day. Also web services were developed for fetching digitized records of few departments.

3. **Motivating LSK's**
LSK had inhibition on the whole process of providing the services in one day, which currently takes more than three days. Capacity building initiatives, sensitisation measures towards service delivery, support to enhance the facilities in LSK and recognising their contributions through awards, certificates of excellence at periodic intervals were used effectively to motivate them and garner their support.

4. **Adequate Internet and Power connectivity**
A major challenge that could impede 'Samadhan Ek- Din' execution, especially in rural areas was unavailability of power and internet connectivity as service application are applied, processed and delivered online. Hence, arrangement for power backup and alternate internet connection were made at all LSK.

5. **Generating awareness to beneficiaries**
Conduct of large scale awareness campaigns using different channels to reach various cross section was a challenging task especially in rural areas.

Figure 8- District Wise Roster Creation – Designated and Link Officer

WAY AHEAD

1. **New Services Inclusion**

Considering the success of the project, other important citizen centric services in high demand are being identified in consultation with departments.

2. **Citizen Awareness.** In addition to the conventional medium, plans are underway to utilize the digital and social medium to reach out to target audience especially in urban areas.

3. **Capacity Building.** For robust service delivery, identification of suitable agency is under planning, to equip the stakeholders with necessary skills for effective operation.

4. **Advanced Analytics.** The transaction details related to services are being analyzed using the Business Intelligence and advanced analytics to get the insights for effective monitoring and enhancement of the project.

5. **Facility Enhancement at LSK's.** The LSK are being revamped in terms of basic facilities like seating arrangement, washrooms, power backup, information boards, LED TV etc.

REFERENCES

- http://cmhelpline.mp.gov.in/
- http://www.mpedistrict.gov.in/Public/index.aspx
- http://www.cmdashboard.mp.gov.in/

Chapter 10

ServicePlus – A metadata based platform for eService Delivery across nation

Sub-Theme: One Nation – One Platform

Deepak Chandra Misra, Rama Hariharan, Manie Khaneja

National Informatics Centre,

A-Block, CGO Complex, Lodhi Road, New Delhi - 110 003 India

dcmisra@gov.in, rama.h@nic.in, manie@nic.in

Abstract

Information & Communication Technology (ICT) is a critical pillar in delivering Government services to all the stakeholders in an efficient and cost-effective manner, and even more so to the citizens. ICT based system for delivering government services involves exchange of information, integration of various stand-alone backend systems and services between Government and Citizen (G2C), Government and Business (G2B), Government and Government (G2G), Government and Employees (G2E), as well as interactions within the entire Government framework. To realize full potential of e-Governance focus must shift to creation and utilization of platforms instead of point solutions.

Advantages of this approach are highlighted by ServicePlus – a low-code, metadata based, configurable e-Service delivery platform. Identified in 2012 as one of the core component under the project to introduce and institutionalize e-Governance for local Government bodies in India, ServicePlus has evolved into a comprehensive framework and technology platform for e-Service design, development & delivery that is suitable for use by government agencies at union, provincial and local levels.

This paper describes evolution of ServicePlus into a robust and scalable platform for e-Service delivery in India's e-Government scenario. It also attempts to highlight the success of ServicePlus through a case study of SARAL Haryana.

Index terms – ServicePlus, Metadata base Service Delivery Framework, eService Delivery, Low-Code Platform, Local Government.

Introduction

e-Governance in India has steadily evolved from computerization of Government Departments to initiatives that encapsulate the finer points of Governance, such as citizen centricity, service orientation and transparency. Efficient and cost-effective delivery of e-Services, however, entails overcoming many challenges, such as lack of ICT infrastructure, non-standard and/or undocumented processes etc. But in addition to these challenges, many technical challenges also plague the rapid rollout of e-services to citizens.

Firstly, for each service that needs to be automated, one software needs to be built. This is both costly as well as time consuming. This is further compounded by the fact that the number of services that government provides to citizens is large. Thus, effectively, e-enabling all the services is elongated into a long duration mega project.

Secondly, even if attempts are made to build separate software solutions, there is invariably a gap between the information service (which provides information about the service) and the actual service. While the new rules and policies would have been incorporated in the software, the information about the service is not updated to reflect the new rules policies. This results in a new kind of harassment of citizens.

Thirdly, similar capabilities such as integration with payment gateway, digital signature etc. are required in many services but if the software for each service is separate, then the capability needs to be built for each service in the service-specific software. This again is an additional effort in terms of manpower and cost which could have been avoided.

Lastly, many services require information from other services. When each service is e-enabled through

separate software, this sharing of information is hindered by the differences in the standards adopted by the two softwares. Thus, the citizen does not get the advantage of an integrated service delivery.

When Ministry of Panchayati Raj (MoPR), Government of India resolved to build a software solution for Panchayats to e-enable Panchayat level services, it was decided by MoPR and National Informatics Centre (NIC), as the software solution provider, to build a configurable, metadata-based software solution framework for e-enabling services. ServicePlus was conceptualized to address the above technical challenges so that Central & State Governments could rapidly e-enable their services. As more & more services were onboarded on to the ServicePlus, new features were added which reduced the time taken to e-enable public services. The promise and capability of ServicePlus can be gauged by the fact that it now takes as little as half an hour to configure & launch a new e-service.

Several Government Departments across the States as well as Central Ministries have recognized the potential of ServicePlus (https://serviceonline.gov.in). It is being used by 22 States and 5 Central Line Departments delivering 572 services. As depicted in Figure 1, in 2018 total e-Services on ServicePlus more than tripled, and total e-Service requests processed increased from 10 million to more than 15 million.
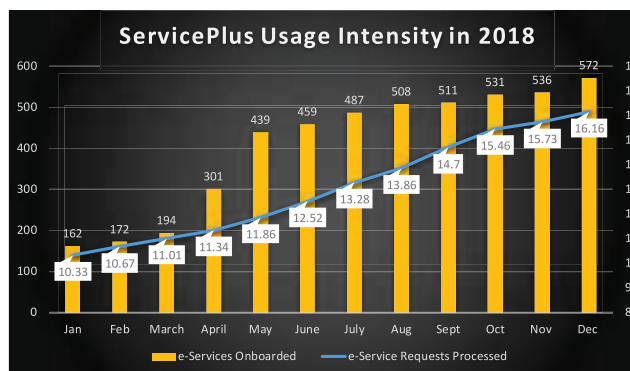
Data as of 30 Dec 2018

Figure 1: Service Plus Usage Intensity in 2018

As depicted in Figures 2 & 3, the services provided by the States using ServicePlus are mainly Regulatory and Consumer Utility in nature, and focused on Citizens (G2C).
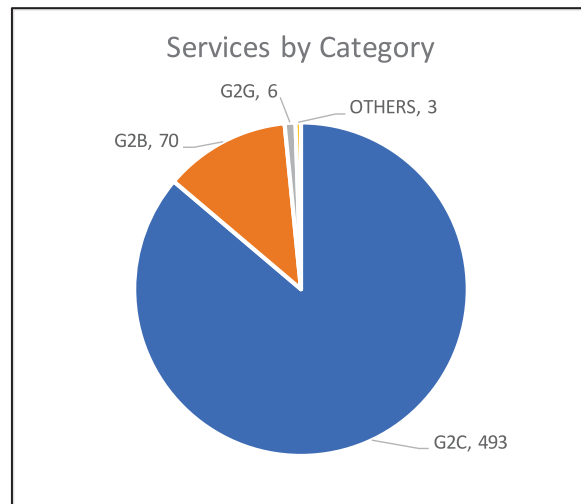
Data as of 30 Dec 2018

Figure 2: Services by Category
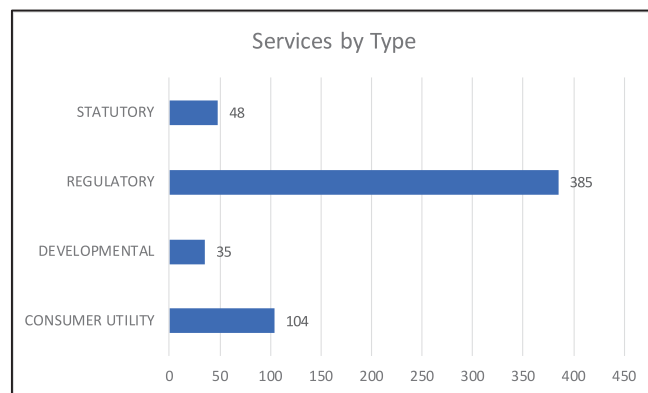
Data as of 30 Dec 2018

Figure 3: Services by Type

While the states of Maharashtra & Chhattisgarh are using ServicePlus under e-Panchayat MMP; Bihar, Jharkhand, Tripura, Meghalaya and Sikkim are using it under e-District MMP. Uttar Pradesh, Himachal Pradesh, Mizoram, Odisha, Kerala, Assam etc are using this framework and platform for services beyond those identified under e-District. ServicePlus is implemented in Haryana under the brand name SARAL whereas in Karnataka it is called SevaSindhu 2.0

The paper describe describes the journey of ServicePlus, starting with initial development of core components to validate the concept to its evolution into a robust platform that has witnessed rapid adoption in recent years. It also highlights key lessons for development and use of technology platforms in e-Government initiatives with focused Study on SARAL

Haryana with an aim to serve as an important starting point for other similar initiatives globally.

Challenge of Enabling E-Service Delivery at Local Government Level

India is a federal republic with three-tier Government system: union, state and local (Figure 4). Government at each of these levels function autonomously for the subjects under their jurisdiction as per the provisions of the Constitution of India. As of October 05, 2018, there are over 270,000 urban and rural local bodies in India [1].
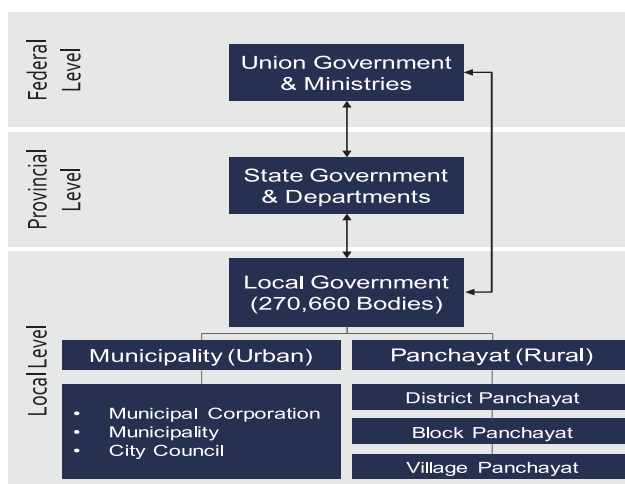
Figure 4: Three-Tiered System of Government in India

While some computerization efforts had been made by some States before the National e-Governance Plan (NeGP) introduced by Government of India in 2006, these attempts were limited and driven by short term goals. Therefore, one of the key facet of NeGP was to introduce and institutionalize e-Governance at various levels of government across India, including the local levels, and delivery of public service through electronic channels was recognized as an important area which needed urgent intervention [2].

However, the diversity at the level of local Government across the States, made extreme by the fact that States had the discretion over devolution of powers and authorities to local Government bodies of the State, posed a unique problem in the context of building e-Governance solution(s) for service delivery:

- Both the number, as well as nature, of services delivered varied from state to state

- Even when same services were delivered, they varied in terms of information required, language, workflows, rules & enclosures etc.

NIC decided to build a single software platform that could address the needs of different services, irrespective of variations in their details. The software needed to behave as a platform that provided the toolkits from which individual service specific solutions could be rapidly built, and allowed government officials and IT experts to collaborate in rapidly developing and iterating through e-Services. Although technically challenging, this was the most efficient approach.

Other strategies were also explored to address the challenge, but found unsuitable. Two of the prominent ones analyzed and discarded were:

1) Develop separate software solutions for each kind of service delivered by government bodies. However, this would have resulted in proliferation of applications, and created challenges of maintainability and integration, along with large wastage of resources.

2) Standardize the processes for service delivery. However, not only would this have impinged upon autonomy of government bodies, it would have taken away the possibility of local innovation to address local challenges. Moreover, such standardization efforts may have taken months, and sometimes years, as some of them may have required Cabinet approvals.

ENTERPRISE ARCHITECTURE OF SERVICE DELIVERY ENTERPRISE

Conceptually, ServicePlus platform needed to enable the logical segment of the Government that interfaces with citizens and is involved in public service delivery. This logical service delivery enterprise could exist as part of any Government body. Enterprise Architecture was adopted as a methodology to understand and analyze the structure and behavior of this logical service delivery enterprise.

The Open Group Architecture Framework (TOGAF) considers the term "enterprise" to be any collection of organizations that have common goals [3]. As noted in TOGAF, the term could be applied to either an entire enterprise, as it physically exists, or to a more specific area of interest within the enterprise. TOGAF in turn defines the term Architecture as the

structure of components, their inter-relationships, and the principles and guidelines governing their design and evolution over time [3]. Enterprise Architecture is thus a discipline thus enables one to understand, analyses and reason about an enterprise's structure, behavior & motivation – be it a physical enterprise or just a logical enterprise.

The analysis conducted through EA approach revealed that the logical enterprise needed to fulfill the requests of the citizens in the most efficient manner, while ensuring a high level of satisfaction for the services delivered. The satisfaction was in turn dependent on responsiveness and timeliness, and the quality and accessibility of services. Minimization of errors and effective handling of complaints and grievances was also critical.

The core of the enterprise was the value stream across which the service consumer and service provider interacted to create value in terms of service delivery. As depicted in Figure 5, the Service Consumer and Service Provider engaged in the service delivery value stream with well-defined stages: Application Submission, Verification, Processing, and Delivery.

The detailed analysis of the value stream stages for different service highlighted that while details in terms of the information asked, supporting documents and enclosures needed and internal workflow steps differed across services, every service was composed of the few basic elements. Common elements that need to be supported by the ServicePlus platform were:

1) Details of the consumer
2) Hierarchy and actors of service provider
3) Application form and attributes of application
4) Mechanism and channel of application submission
5) Payment details and payment modes
6) Service outputs, and delivery mechanism and channel
7) Workflow in terms steps involved in service delivery
8) Escalation mechanisms
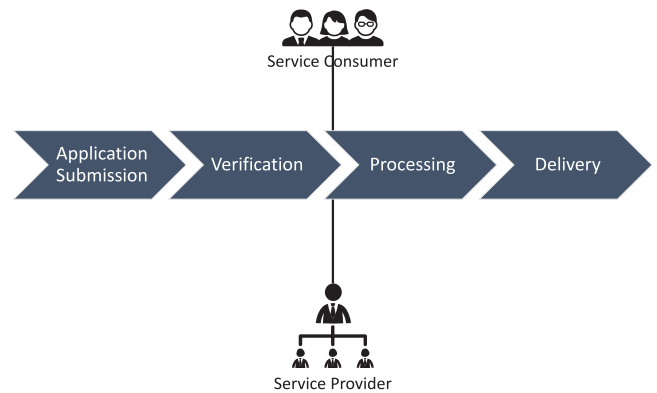
Figure 5: Value Stream for Service Delivery

A service delivery domain model, depicted in Figure 6, was thus constructed in terms of the elements, sub-elements and their attributes, and their inter-relationships.
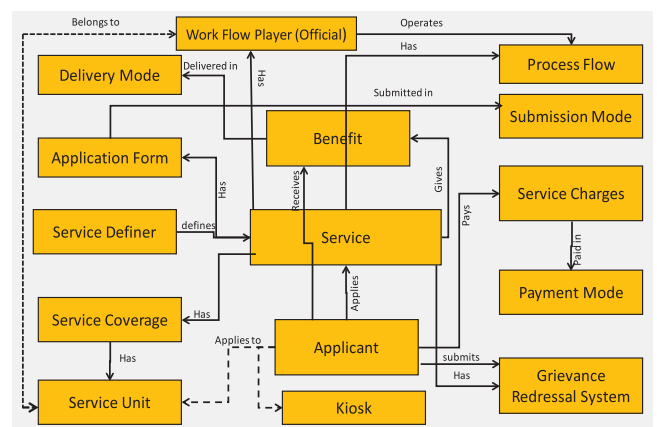
Figure 6: Service Delivery Domain Model

In addition to the domain model, the Enterprise Architecture analysis identified the service delivery framework comprised of various reusable application components providing the capabilities needed to configure, instantiate and manage the domain model for any specific service.

ServicePlus Platform

ServicePlus platform was envisioned as a metadata based enterprise platform to realize the service delivery domain model and the service delivery framework. Platform needed to realize the key abstractions identified during earlier analysis. Rapid definition and development of e-Services in partnership of the service owners would be realized by

configuration and reuse of the components provided by the platform.

Conceptual Architecture

As an enterprise level platform enabling e-Service design, development and delivery the requirements to be fulfilled by ServicePlus were manifold. The platform needed to provide the capability to:
- Define and manage the business artefacts of the services, including the inputs, workflows, steps, decision points, actors and outputs
- Enable management of service performance through definition of key performance indicators and dashboards
- Manage the processing of service requests and handle the data generated during their processing

Conceptually, the architecture of ServicePlus Platform consisted for four layers as depicted in Figure 7.
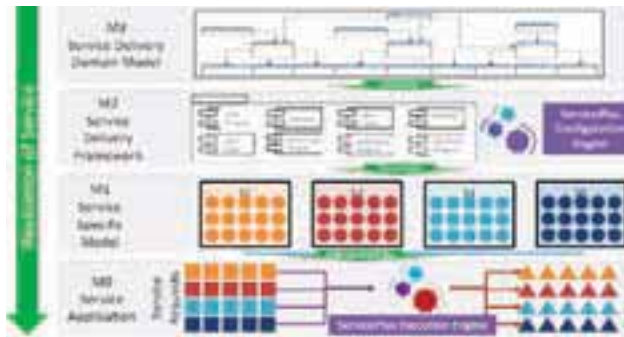
Figure 7: ServicePlus Conceptual Architecture

Service Delivery Domain Model (M3) layer realized the service delivery domain model constructed through Enterprise Architecture analysis in a database system. The Service Delivery Framework (M2) was to be developed as a set of application components forming the ServicePlus Configuration Engine that provided the toolkit for designing and developing an e-Service and configuring the domain model for it.

The domain model configured for a specific e-Service using the service delivery framework constituted Service Specific Model (M1). This model represented the eService as defined on the ServicePlus and utilized cohesive set of reusable application components to implement a e-Service application. The execution and processing of specific service requests by the ServicePlus Execution Engine then would happened as per the defined service specific model,

and is represented as Service Application (M0) in Figure 7.

The conceptual architecture of ServicePlus maps to the layers of Enterprise Architecture as depicted in the following table.

Table 1: Mapping of ServicePlus Elements to EA Layer

EA LAYER	SERVICEPLUS ARCHITECTURE ELEMENT
Business	Service Delivery Domain Model (M3); and Service Delivery Framework (M2)
Data	Service Delivery Domain Model (M3); and Service Specific Model (M1)
Application	Service Delivery Framework (M2); and Service Application (M0)

Low Code Capabilities

To ensure rapid and iterative design and development of e-Services and enable wider adoption, ServicePlus was designed as a low code development platform. Coined in 2014, the term "low-code development platforms" is defined by Forrester Research as products and/or cloud services for application development that employ visual, declarative techniques instead of programming and are available to customers at low- or no-cost in money and training time to begin, with costs rising in proportion of the business value of the platforms [4]. The Service Delivery Framework (M2), as represented in Figure 7, was key to build ServicePlus as a low code platform. Service Delivery Framework provides an integrated set of tools – such as Form Designer, Process Flow Designer, Document Designer and Pre-build Integrations – that enabled the service providers to design and define the e-Services, their workflows and attributes by themselves, without having to write any code. ServicePlus, a low-code/no-code (LCNC) development platform is a visual integrated development environment (IDE) which augments the service definer to customize and organize the application components, connect them together and create a web/mobile application. This modular approach allows the stakeholders who are not software developers to build, test and launch applications

quickly. It can be categorized as a generic, configurable, metadata-based framework. Being a multi-tenant application, each tenant (the department or local government) can configure their services as per their requirement. ServicePlus ensures the highest degrees of scalability, reliability and flexibility. It is a powerful tool that strengthens good governance and empowers the citizen to avail services online. It reduces the gap between service provider and service seeker by facilitating information exchange wherever required. ServicePlus promotes transparency and accountability in the working of service providers.
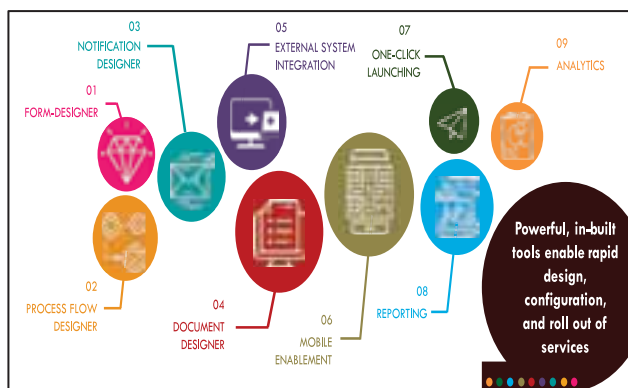
Figure 8: Components of ServicePlus

ServicePlus offers the following wizard like interface for Service Configuration and has following inbuild tools:

- Form Designer – To design Application Form for service seeker
- Process Flow Designer – For Work flow player to process the application
- Notification Designer – To alert the service seeker through SMS / Email
- Document Designer – To Generate the final outcome of the service in form of document
- Service Charge Templates (through Payment Gateways, e-Treasuries and CSC Wallet)
- Activating, Testing and Launching a service
- Integration with external systems (RAS, Digilocker, eTaal, DMDashboard, eSign, Aadhaar, UMANG)
- Configurable Web Service Integration (Synchronous & Asynchronous) with any external application
- Major and Minor versions of Services

Apart from this, it provides the following functionalities

- Unique URL for each Service/Output Documents
- Server Signed QR Code
- Tracking the application status
- Application Callback Functionality
- State wise Pages generated by ServicePlus

Offline application is available for collecting application forms. Any kiosk/data entry operator can download the same and install locally, and the filled-in applications can be uploaded as and when connectivity is available. If the location is totally disconnected, the submitted data can be exported to detachable storage units which can be uploaded from a location where connectivity exists.

Compatibility with UTF-8 also enabled multi lingual support for application forms, output certificates, action forms of workflow players, and ensured that even the menu options and descriptions may be switched between different languages.

Stages of Evolution

As depicted in Figure 9, the evolution of platform, is spread over several years. This can broadly be viewed in terms of three stages:

- Initial development and validation of the concept
- Increased refinement of various components and elaboration of the feature set
- Rapid adoption
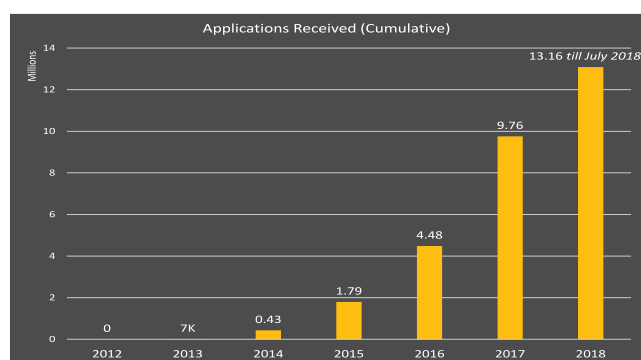
Figure 9: Cumulative Applications Received by ServicePlus

Initial Validation (2012-2014)
The first three years of ServicePlus were characterized by the development of core elements and validation of

the concept. In this stage platform provided the following essential capabilities:

- Form designer to designing application forms
- Process flow designer to create the workflows
- Document designer to define templates for outputs
- Notification designer to provide notifications to consumers and providers
- Payment processing for accepting payments online

This period witnessed technical challenges for creating a platform as against the prevalent practice of developing point solutions. Adoption of the platform was limited during this period, as highlighted in Figure 9.Refinement & Elaboration (2015-2016) Next two years were characterized by introduction of additional capabilities to make the platform more flexible and user friendly. Additional capabilities included the following:

- Tenancy extensions to allow service specific code to be plugged to meet dynamic requirements of a service
- Reporting to identify outstanding requests and tasks
- Mobile enablement through development of mobile app with dynamic rollout of new services on the mobile app
- Enabling one-click launching after completion of user acceptance testing
- Checking application status tracking application
- Establishment of standard interfaces with other external systems for rapid integration as needed

Buoyed by a stabilized core and innovative features, in this stage of evolution, ServicePlus witnessed increased adoption as the cumulative applications processed closed upon a figure of 4.5 million.

Rapid adoption (2017-2018)
Next two years were characterized by rapid adoption of the platform, introduction of basic service analytics and changes to deployment architecture.

- Analytics was introduced to enable management of service delivery performance
- Deployment architecture was changed to make the platform more scalable by separating the deployment of configuration engine from

execution engine. Figure 10 illustrates revised deployment of ServicePlus

In this stage of evolution ServicePlus witnessed rapid adoption in terms of more number of services with cumulative applications processed moving beyond 13 million by end of July 2018.
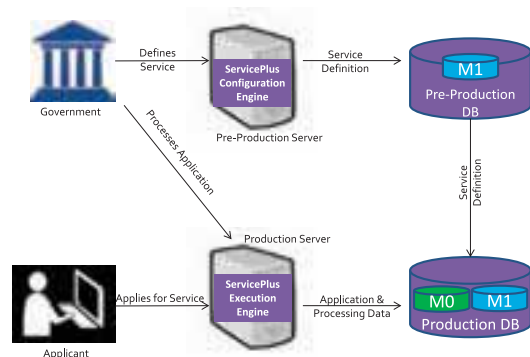
Figure 10: ServicePlus Deployment Model

Benefits Generated

The benefits that adoption of ServicePlus has generated for the e-Services developed and delivered using the platform are a testament to the decision to conceptualize and develop ServicePlus as a technology platform. Enterprise Architecture analysis facilitated development of reusable components from which individual service specific solutions could be rapidly built. This is illustrated in Figure 1 by the accelerated increase in the number of e-Services that have been onboarded on ServicePlus. The benefits generated by ServicePlus include:

- Shorter time to roll-out new e-Services, accessible through multiple channels, due to reuse of application components readily available in the platform;
- Greater flexibility to manage dynamic changes to processes through explicit modelling of workflow steps and decision points;
- Better communication and collaboration between e-Services enabled by a common database
- Lower risks of error introduced in the e-Services due to increased collaboration between service owners and their technology partners facilitated by toolkits provided by the service delivery framework; and

- Faster introduction of innovative capabilities that benefit increasingly larger number of services
- Lower cost for the adopter of the platform enabled by reuse of components

SARAL Haryana

SARAL (Simple, All Inclusive, Real Time, Action Oriented, Long lasting portal) is the service delivery platform of Haryana Government that facilitates in aligning with Digital India's vision of faceless, paperless and cashless service delivery model. SARAL has been developed on Service Plus Framework and aims to transform citizen service delivery in Haryana through complete digitization of public services delivered by Haryana Government. The vision for SARAL is a unified platform to deliver and track Government-to-Citizen (G2C) services across the state.

Hon'ble Chief Minister of Haryana Shri Manohar Lal Khattar launched 106 services of 12 departments on the Good Governance day in 2017 for the citizens of Haryana. He further launched 181 Schemes of 14 departments on the Ambedekar Jayanti available to the citizens of Haryana on 14th April 2018.

On 94th birth anniversary of former prime minister Atal Bihari Vajpayee, 'Good Governance' programmes were organised in the state and the Chief Minister inaugurated 22 'Antyodya Saral Kendras' for all district headquarters from Karnal. With this, Haryana became the first state in the country, where 4,000 Atal Seva Kendras in rural areas, 22 at district headquarters, 51 at sub-divisional level and 20 Antyodya Saral Kendras at Tehsil level, have been launched simultaneously at such a large scale [5]. In total, 485 schemes and services (including those mentioned earlier) of 37 departments were launched under the 'Digital Haryana' on the occasion of Good Governance Day on 25th December 2018.

As on 27 December 2018, 490 services and schemes were available on the SARAL Haryana across 22 districts and 37 departments [6]. Features and facilities available to the citizens on SARAL are as follows:
- Citizens can apply for 490 services and schemes on a single platform.
- Facility to track status of the application on web portal
- Facility to track status of the application through SMS

- Fully integrated with National systems like RAS (Rapid Assessment System)
- Track the performance of departments based on Service Delivery Index

Three teams, CM Digital Cell of Haryana, NIC Haryana State Unit, and ServicePlus team of NIC Headquarters, Delhi coordinated to rapidly launch all these services. The robust set of features and functionalities provided by ServicePlus has enabled phased launch of these services, with an average of 100 services launched within a short span of a month under each phase.

Way Forward

While ServicePlus has come a long way in its journey, it must now focus on applying advanced analytics, big data and machine learning techniques to generate insights for increasing the consumption of e-Services as well enhancing the performance of service delivery.

As the number of applications processed by ServicePlus increase, a vast trove of data is being generated that could be analyzed to provide contextual suggestions for next best action and service suitable for the citizens accessing e-Services on the platform.

At the same time, ServicePlus can enable benchmarking and comparative analytics to provide performance diagnostics and identify opportunities to reengineer service delivery workflows, and guide the actions of service providers to ensure SLA breaches are avoided.

Another aspect of evolution involves enhancing the platform into a cloud native system by adopting microservices, containers and continuous delivery practices. While this may involve rearchitecting the software base on the platform, the adoption of these technologies would increase the flexibility and scalability of the platform manifold.

Key Learnings

Each country must chart its own course on its journey of e-Governance. However, once a certain level of maturity is reached, new techniques and ways of working must be adopted to take the next leap. The approach for designing and developing ServicePlus was unlike others being taken in India at the time, and the experience has generated three valuable lessons.
1) Firstly, Enterprise Architecture approach promotes whole-of-government thinking. The approach is as valid to understand, analyze and reason about the structure and

behavior of a logical enterprise as it is for a physical enterprise. Deeper analysis thus facilitated can highlight non-obvious solutions and help identify common solutions to meet the ICT needs of otherwise distinct organizations.

2) Secondly, it is important to expose technical capabilities in a manner that is friendly to non-technical users. This enables better collaboration between government officials and their technical partners, leading to more robust, innovative and stable solutions.

3) Finally, technology platforms create greater value in long-run than point solutions. While the point solutions may be quicker to develop, platforms enable efficient use of resources by providing capabilities that can be leveraged by multiples government organizations. Moreover, the agility and flexibility provided by the platforms makes it possible to evolve the solutions developed using them as the needs their users evolve.

Conclusion

Going beyond the established practices of e-Governance solutions developed for limited scope and point-in-time requirements, National Informatics Centre of Government of India chose to adopt an Enterprise Architecture approach for ServicePlus – a low-code, metadata based, configurable e-Service delivery platform. Not only has ServicePlus established itself as a comprehensive framework and technology platform for e-Service design, development & delivery that is suitable for use by government agencies at union, provincial and local levels, the benefits produced in term of reduced time, greater agility, increased collaboration, and faster dissemination of innovation, are a testament to greater long-term value creation potential of approaches that promote whole-of-government thinking.

References

[1] Local Government Directory
https://lgdirectory.gov.in

[2] e-Panchayat Mission Mode Project
http://www.panchayat.gov.in/ep-backgound

[3] The Open Group Architecture Framework
http://pubs.opengroup.org/architecture/togaf9-doc/arch

[4] The Forrester Wave™: Low-Code Development Platforms, Q4 2017
https://www.forrester.com/report/The+Forrester+Wave+LowCode+Development+Platforms+For+ADD+Pros+Q4+2017/-/E-RES137262

[5] News Coverage for Digital Haryana Launch
https://www.dailypioneer.com/2018/state-editions/hry-cm-launches-485-schemes-under-----digital-haryana--initiative.html

[6] SARAL Haryana Performance Dashboard
http://dashboard.saralharyana.nic.in/

Chapter 11
"UMANG"
(Unified Mobile Application for New Age Governance)
One Nation – One Platform

First Author

Anil Agarwal, (Principal Consultant & Head, UMANG PMU)

National e-Governance Division (NeGD), Digital India Corporation (DIC),
Ministry of Electronics and Information Technology (MeitY), Govt. of India,
4th Floor, Electronics Niketan, 6 CGO Complex, Lodhi Rd., N. Delhi – 110003

anil.agarwal@digitalindia.gov.in | +91 99870 26343

ABSTRACT

'One Nation - One Platform', seems to be the need of the hour for our country. Even though India follows federal system of governance, wherein there is distribution of power and responsibilities between the Centre and States but technologies, today, do make it possible to have a unified platform for citizens to access and avail services from different departments of the Centre and States while maintaining the federal structure. Unified 'One Platform' can help stakeholders in fulfilling their respective objectives while accruing benefits to the nation. Some of the key responsibilities/ objectives of governments towards citizens are social inclusion, transparency, easy access to government services, citizen engagement/ participation in governance, information dissemination, equity etc. Citizens objective/ dream is for hassle-free access to government services anytime, anywhere. And the national objective is to optimally use tax-payers' money, country's precious resources, plug leakage/ wastage etc. In this paper, relevance and benefits of the concept of 'One Nation - One Platform' has been discussed and substantiated with the help of UMANG as the live case of this concept.

UMANG is positioned and has potential to become a "One Platform" for the "One Nation", India, for delivering major citizen centric services of Central and State Governments.

INDEX TERMS/ KEYWORDS

a) Unified Access, Anytime Anywhere
b) Transparency, Equity, Inclusion, User Engagement & Participation
c) Savings to Departments, States and Nation

Second Author

Neeraj Kumar, (Director – Project Appraisal & Finance)

National e-Governance Division (NeGD), Digital India Corporation (DIC),
Ministry of Electronics and Information Technology (MeitY), Govt. of India,
4th Floor, Electronics Niketan, 6 CGO Complex, Lodhi Rd., N. Delhi – 110003

neeraj@digitalindia.gov.in | +91 98682 1806

d) Government to Citizen (G2C) Services
e) UMANG

1.0 INTRODUCTION

In this Paper, nation is assumed to be aligned with the country boundaries, meaning there is only one nation within the country and that is Indians. The fundamental objective of the nation or for that matter the country or the society is to ensure welfare of its members. This is achieved by leveraging the talent, skills, interests and knack of individuals and/or group of individuals in specific areas/ domains, thus complementing and supplementing one another. In a large population of people, the variety of interests and talents, covers almost all aspects of human needs for products and services that are essential for survival as well as the ones for making living comfortable. The delivery of such services and products by specialized groups are organized across geographies depending on the nature of services/ products, demand (users)/ supply (expertise or the raw material availability), shelf life, infrastructure (transport, communication etc.). With the advancements in technology, infrastructure, spread of skills/ talent, evolution of products/ services and change in demographics the delivery models keep changing/ adapting to achieve the resource optimization requirements/ compulsions.

There are requirements, that are common or shared and which are sort of prerequisite for smooth exchange of services and products amongst the people or within the society/ nation, for maintaining the social fabric i.e. the balance among different aspects of the social set-up and to promote equity and transparency. Examples of such requirements are infrastructure (road, railways,

telecommunications, port, electricity, water etc.), internal and external security, set of laws & regulations, people identity, taxation (to generate fund to address the need for shared requirements) and so on. To deal with all such requirements, a representative body was needed, which over a period, evolved and now known as Government.

Post-independence, democracy was the natural choice for our country and India opted for federal system of government with structured distribution/ demarcation of domains, duties and responsibilities. Accordingly, Central and all State Governments are responsible for delivery of many services to citizen that may be broadly categorized into individual/ personal and business related.

In this paper, context for 'One Nation – One Platform' shall be delivery of government services to the citizens of India. Here, 'One Platform' has been considered from users' perspective at the services access layer (i.e. unified front end), whereas back-ends could be many, distinct for every department and distributed across geography as is the case in UMANG, shown in [1], having a single mobile app, on each platform i.e. Android, iOS, Windows and Web.

2.0 MEANING, DOMAINS AND SEGMENTS

The interpretation of the subject, 'One Nation – One Platform', in this paper has been taken as – relevance and possibility of one (single or unified) platform for delivery of government services across the nation or country or India. Even the 'Platform' considered is online, website or mobile application. In current context, in majority of the domains/ scenarios, mobile platform is preferred channel because of the ease, convenience, reach/ penetration and anytime, anywhere possibility.

Before proceeding further, there is a need for logically setting the context and scope of the 'One Platform'. Geographically, the subject clearly defines the scope/ context as the entire country. There are potentially two more contexts possible; first, demographics and the second, services domain. Unified or 'One Platform' across demographics and services domains for a country of our size and population doesn't seem to be feasible in near terms, primarily, because of the huge transaction volumes, volumes of time & effort that shall be needed to integrate such large numbers of diverse systems spread across the country, technical limitations, administrative bottlenecks and against all these challenges/ issues the value proposition, particularly, contrasting with midway option of having couple of unified 'One Platforms', segregated logically on the basis of either demographics or the services domains or any combination thereof, does not appear to be significantly compelling.

Potential domains for consolidation of government services to have couple of unified 'One Platforms' at national level are – a) government to business (G2B), b) government to citizen (G2C), c) government to employees (G2E), d) financial/ payments, e) documents repository (primarily, issued documents), f) user feedback system, g) authentication and authorization etc. Some of these unified 'One Platforms' can be interconnected to provide direct access to users (such as documents repository for user to see and retrieve the user specific documents) and to invoke services of some specialized platforms indirectly by user while availing services from another platform, e.g. invoking authentication/ authorization services or invoking documents repository to provide required documents or to feedback systems to seek user feedback post service delivery.

The concept of 'One Nation – One Platform' though sounds interesting, but like any other innovation, invention or possibility, this too comes with its share of issues/ challenges and a set of pros & cons. It is important to first work out the context and scope based on the technical feasibility, administrative readiness, financial viability and benefits to the citizens, departments and the nation. Also, the issues and challenges need to be compiled with their mitigation plans.

3.0 RELEVANCE & BENEFITS

The concept of 'One Nation – One Platform' need to be viewed from the end-users/ citizens' perspective. This means that this concept need to be considered, primarily, at the access layer form the end-user/ citizens' perspective, wherein the corresponding back-end systems/ set-up could potentially be disparate and distributed with the ownerships at the concerned department/ State levels.

There are many potential benefits to all the stakeholders such as end-users/ citizens, departments and the nation. Some of the benefits are listed below for major stakeholders:

3.1 USERS/ CITIZENS

a) Easy, straightforward and unified access to all government services in a specific domain or demographics

b) If it is a mobile platform, need to download single mobile application by the user rather than requiring downloading many different applications; savings on mobile memory, download cost and efforts

c) 'One Platform' significantly reduces (or even removes) the user struggle with fake mobile applications and websites

d) Easy discovery of services, as all services in specific domain are at one place

e) Citizens feel empowered because of the anytime, anywhere access, enhanced transparency, reduced hassles and ability to avail services with dignity

f) Consistent user interface (UI) and user experience (UX) across all services on unified 'One Platform'

g) Shortened learning curve, leading to higher adoption rate for the online services

h) Easy to maintain & retrieve the record/ history of past transactions

i) Ability to pin the relevant or frequently used services by marking them favourites (very basic feature that is invariably present in any online platform) and even having them on the personalized home page

j) Quick and timely awareness for lesser known services or new services or new government schemes through online notices and notifications as well as just by searching/ surfing the common platform

3.2 DEPARTMENTS/ STATES

a) Some Central Government agency can take the initiative of building a unified 'One Platform' (user access layer/ channel) for the country in some specific service domain/s or demographics

b) Individual departments and States gets relieved of the administrative and technical hassles of creating DPR (detailed project report), contract/ RFP (request for proposal), bidding process, evaluation of bids, signing contracts and so on

c) Results into huge cost and efforts savings for individual departments and States on accounts of development, hosting, O&M, awareness & promotion because of the consolidation and economies of scale

d) Departments/ States can achieve relatively quick online presence, on website or mobile or both

e) Departments/ States can just focus on their service delivery performance and maintaining the corresponding backend systems at optimal level in terms of configuration and performance

f) Easy & quick to communicate with, provide important information to and engage with end-users/ citizens as & when needed

3.3 NATION

a) Accelerates mobile governance in the country and hence social/ financial inclusion, transparency, equity

b) Reaching out to deserving beneficiaries is eased out

c) Can potentially be transformed (with requisite reliability & robustness) into an effective communication platform during any kind of emergency; can be designed/ configured for two-way communication

d) Potentially a powerful citizen engagement platform for seeking opinion on major issues or for tapping talent for support in governance

e) Huge savings on resources and cost because of optimization at multiple levels such as development, hosting, O&M, awareness & promotions and potentially at customer support levels

4.0 ISSUES & CHALLENGES

Vision of 'One Platform' for 'One Nation' of the size and complexity like ours cannot be realized without facing challenges and addressing host of issues coming in its way. Roots to many challenges lie in the federal structure of our democracy that otherwise provides flexibility and robustness to the nation and its citizens. Our federal set-up provides for division of duties & responsibilities between Centre and States, with concurrency on many subjects. As a result, different services, even in a specific domain or for a specific demographics is delivered by different departments and/or different States with different ownerships. Hence, the user complaints and concerns regarding core service delivery need to be resolved by the concerned owner departments, though the consolidated 'One Platform' can persuade the concerned departments for faster resolutions by prompt presentation, timely escalations and publishing comparative performances of the departments, thereby motivating better performing departments and pushing others to catch-up. It is reiterated that 'One Platform' or consolidation is at the access layer only for easy service discovery & consumption/ use from one point.

Technologically, even the backend systems, processes, service delivery flows and the digital readiness varies across services, departments and States. The Backend IT systems within departments have also evolved over a period that resulted in the presence of variety of technology and protocols in the working systems. Because of restrictive commercials and contractual agreements with outsourced technical partners, adaptation and/or upgrades become challenging.

At administrative levels also, the challenges are significant because of the departments working in silos for years, are struggling to come out of this and unable to appreciate the benefits of the consolidation/ unifications even at the access layer. Many see this as an intrusion into

their domain and authority. Some see this as a threat to their systems and get concerned about the liability that it may potentially create in their area of responsibility and accountability. Invariably, in majority of the departments and States, for most of the services, the service process flows and the services application forms have not been reviewed and updated for many years. Many such processes, application forms and/or requirements to avail services are not suited and/or not optimal for online services delivery.

Behaviourally, there are even possibilities of trivial and insignificant concerns related to others getting recognition for their efforts and stealing the show. In certain cases, technical teams and leaders managing the platforms exhibit rigidity in terms of their readiness to adapt the existing implementation in favour of better user interface and user experience because of unfounded feelings/ perceptions that their long-established expertise is getting questioned or challenged. Many even exhibit resistance and reluctance towards review and reengineer the processes, optimize the service flows and requirements to avail the services just because of the pain and efforts that may be required in getting these approved at the required levels. In some other cases, the challenges come because of the requirements of adapting the regulations to align with the technological advances.

Further sets of issues and challenges come from the lack of knowledge and skills in the upcoming advanced technologies that are enabling such consolidations and unifications.

5.0 REMEDIES AND SOLUTIONS

The issues and challenges discussed in above para can broadly be summarized in three major categories, viz., a) technological & technical, b) administrative and c) behavioural. In our opinion, the relevance and benefits of 'One Nation – One Platform' concept grossly scores over the potential issues and challenges in its realization. We also believe, most of the issues & challenges discussed in above para need to be addressed and overcome, anyways, to derive the benefits of the technological advancements and the changing needs and demographics. In fact, concept of 'One Nation – One Platform' has the potential of steering the governance towards efficiency, transparency and empowerment of citizens. The ways and means to manage the challenges and address the potential issues in the three categories are discussed below.

5.1 TECHNOLOGICAL & TECHNICAL

The evolution of back-end IT systems is quite aligned with the technological advancements and to our federal structure. Among the lot, this is the easiest challenge to manage. Obsolete and outdated technical systems shall anyway require replacement irrespective of the 'One Nation – One Platform' vision, which is very well achievable with reasonable resources. For the rest of the systems, there are technological solutions available wherein disparate systems and solution stacks can be interfaced without much challenge to get to the common front-end access platform. This activity can be managed centrally by the team setting-up common unified 'One Platform' with some technical inputs and support by the department/ State level technical teams.

5.2 ADMINISTRATIVE – GOVERNMENT PROCESS REENGINEERING (GPR)

This is a combination of political/ administrative will/ vision, individual will at the working level and fear of losing identity of department/ State or the need/ wish to retain the independent identity. This requires efforts to get a buy-in at the political and top administrative levels. Concurrent efforts are required for mental on-boarding of concerned officers and officials down the administrative and technical hierarchy. This requires putting-up concrete value propositions for the service delivery departments in terms of easing out the administration/ management and reduction in user/ citizen complaints. Efforts must first be put on the departments/ States where the HOD (Head of the Department) and/or officers/ officials at relevant positions are tech savvy and sensitive/ motivated towards improvements. Success stories, then, shall create peer-pressure among the laggard departments as well as pull-effect from the citizens/ users. The time can potentially be cut down if the central team, driving the consolidation initiative, is passionate and able to propose the GPR and/or optimization in service flow and/or service application forms and/or user requirements. In nut shell, there is no shortcut but can be managed through persuasion and passion. Requirement of retaining independent identity at department or State levels can be fulfilled technically/ architecturally, though with certain limitations.

5.3 BEHAVIOURAL – CHANGE MANAGEMENT

Reluctance due to behavioural and variety of contrary personal interests/ motivation is more challenging to manage. Depending on the level at which reluctance is faced different strategies may be adopted. To manage challenges at mid/ lower levels, push need to be arranged from top levels while at top levels political intervention may be explored wherever

possible or needed. Non-financial interests at different levels need to be managed with sensitivity, passion & empathy by involving them in decision making/ implementation, acknowledging their authority, recognizing their contribution, reemphasizing their control over the services and playing down the initiative as just another access channel. This is finally about managing the individual ego, personality and the self-actualization needs.

5.4 CAPACITY BUILDING

Relevant stakeholders in the service delivery/ management chain need to be introduced to the advancements in the technology as these get relevant for their department and the service deliveries. Depending upon the levels of the officials/ officers and their roles, training modules/ sessions need to be designed/ developed and executed in a structured manner aligned with the deployment plans. Such training and knowledge/ skills may be linked with their promotion, postings and transfers. This can even be supplemented/ complemented with appropriate financial assistance to acquire needed skill and/or financial incentives on its acquisition. For new recruitments, all such knowledge and skill sets should be made mandatory. For existing key roles, such training and certification may be made mandatory.

6.0 UMANG – ONE PLATFORM FOR ONE NATION (INDIA)

UMANG, the unified 'One Platform' for the entire country, India (One Nation) for G2C services, is well aligned and a perfect fit to the concept & the subject of this paper i.e. 'One Nation – One Platform'. The context and scope of UMANG is major citizen centric services (G2C) of Government, Central, State and local bodies and the scope is the entire country and all segments such as education, agriculture, health, employment etc. UMANG, again, is at access layer presenting a single unified interface to the end users. UMANG is available on all mobile platforms i.e. Android, iOS and Windows as well as on Web (all major browsers).

UMANG, a MeitY (Ministry of Electronics and Information Technology) initiative, has been conceptualized to address many challenges faced by citizens in accessing and availing government services through a myriad of mobile apps, each having a different UI/UX and offering just one service. UMANG is empowering citizens with anytime, anywhere access to hundreds of government services on just one mobile app (15-18 MB) having consistent UI/UX, intuitive service discovery through easy search and host of convenience features such as marking favourite and pinning to home page, permanent searchable transaction logs, multi-lingual (13 languages), offline support etc.

UMANG supports federal structure through Central & State tabs; any of these can be made default home page by the citizens/ users. Departments/ States, for their services, can use common services such as authentication/ authorization, documents pull/ push, payments, user feedback through the centralized integration of UMANG with Aadhaar, DigiLocker, PayGov (Payment Gateway) and RAS (Rapid Assessment System), shown in [2] - [5]. User furnished data, while availing services, are all sent to the database of the respective department and UMANG does not store any such data. UMANG extends 24x7 O&M support to all on-boarded departments.

UMANG enables departments to readily provision their services on mobile, through API based integration of their backend systems with itself. States and departments get dedicated home page that can be customized by themselves, whenever necessary. Integration with UMANG is at no cost (integration/ development or operational) to the departments/ States, as all cost is borne by MeitY. Even no extra resource or efforts are required at their end. Departments/ States can manage their services and related aspects through UMANG 'Self-Care Portal' such as user feedback/ complaint, MIS/ service statistics dashboard, API performance, keyword management, service promotions, in-app notifications etc.

UMANG has so far integrated 325 services from 72 applications/ departments of Central Govt. and 17 States, covering almost all major user segments such as education, agriculture, health, employment etc. Over a period of three years, UMANG is expected to integrate ~1200+ high impact services of ~200 departments/ application of the Central & all States Governments and local bodies. UMANG has the potential to become a single stop mobile app to intuitively access and avail major government services.

Within a year of dedication to the Nation by Hon'ble Prime Minister on November 23, 2017, UMANG bagged two prestigious awards, first, 'Best M Government Service' award from UAE Government during 6th World Government Summit held at Dubai, UAE in February 2018 and second, 'IDC Digital Transformation Awards 2018' under the category 'Omni-Experience Innovator' in August 2018; and UMANG, has acquired 1+ crore users and maintaining Play Store rating of ~4.4 (on ~50K reviews). These can be taken as the testimony of the success of UMANG and acceptance of the model, 'One Nation – One Platform' by the users, by the country and by the thought leaders globally.

UMANG saves time, effort & money for government departments towards application integration/ development, 24x7 operations and promotions for awareness creation. This, potentially, can result into huge national savings. UMANG is a powerful and effective platform for governments for user engagement and user participation in governance and potentially also for communications during any urgency.

To enhance the accessibility for specially-abled users, illiterate or less-educated ones and from normal feature phones (non-smart mobile phones) through toll-free number, UMANG is considering 'AI-enabled Voice Access' System as another interface to access and avail services. For the purpose, a workshop had been conducted with all potential solution providers and 'Proof of Concept' (POC) with them is being worked out. Post successful POC, RFP shall be floated to select partner for commercial deployment. For rest of the users also, such voice assistant based access shall be a convenience feature.

In the beginning, simple 'Query Services' shall be enabled, in Hindi and English only; more complex services and regional languages shall be gradually explored. This shall be deployed as a standalone solution/ platform that potentially can serve other departments as well across country.

7.0 SUSTAINABILITY

Any initiative or program must factor the ongoing operations, incremental ongoing developments/ enhancements and periodic upgrades from the funding or sustenance perspective. No initiative or program can be externally funded perpetually. Ways and means of perpetual self-sustenance must be envisaged and implemented in the initiative/ solution, to be triggered at an appropriate stage of adoption. Potential sustenance measures in the context of UMANG are discussed below, which can be considered for similar initiative of 'One Nation – One Platform'.

a) States/ departments to share from the budget/ funds allocated to the delivery of services on-boarded on UMANG in the ratio of the transaction volume
b) Exposing APIs of such unified One Platform to private e-commerce platforms for delivering the integrated services (all or part) through their platform for a fee - one-time, periodic fixed fee, transaction based or combination of these. Partnerships with e-commerce platforms provide more options to users with additional private/ commercial services on the same access platform.
c) Assisted mode of service delivery through agents may be implemented in the unified platform; based on pre-

defined guidelines agent may be appointed on revenue share model
d) Exploiting the unified platform for paid promotions/ advertisements in a variety of ways such as banners, pop-ups while availing services, notifications etc.
e) Taking share from the users as convenience fee against the potential savings of time & money because of the avoidance of travel

8.0 LEARNINGS AND RECOMMENDATIONS

Based on the detailed discussions in the paper on different aspects of the 'One Nation - One Platform' concept and with the experience of implementing UMANG, which is well aligned with the concept and the subject of this paper, following are general recommendations:

a) We believe 'One Nation – One Platform' is the need of the hour rather than a luxury
b) Unified One Platforms for the entire Nation should be planned in different logical domains and concrete steps to be taken for their implementation
c) Though issues and challenges are there in its realization but the benefits outweigh them hugely
d) Issues & challenges can be overcome with concerted and focused efforts; further the intensity and gravity of such issues and challenges shall diminish significantly with each consolidation
e) Compulsive reasons for 'One Nation – One Platform' are high number of services in any domain or demographics, posing challenges of discovery and finding genuine apps, menace of fake apps/ sites, disparate UI/UX causing longer learning curve, sporadic use of majority of government services etc.
Recommendations on 'One Platform' architecture is as below:

a) To cater to the vast geography, variety of demographics and to integrate with many departments/ States, unified 'One Platform' should go for open source stack, cloud based, modular, loosely coupled, configurable, API based integration, ready for single sign-on, central integration of common functionality (e.g. payment, Digilocker etc. for department services to use) etc.
b) User Interface and User Experience must be uniform and consistent across the platform for all integrated services; Design guidelines should be created covering all fundamental UI aspects such as layout, font/ size, icons, logo, banner, search/ sort/ filter, navigation etc. for consistency
c) User convenience shall be the primary objective and focus area
d) Flexibility to departments/ States to customize their home page to manage/ maintain its look & feel

e) Self-Care Portal for on-boarded departments to manage their services and get clear insights into varied aspects of their services

f) Platform should be monitored and maintained 24x7 and operations support extended to departments as well

g) At least 12x7 Customer Care Support should be provisioned on all popular channels such as toll-free IVR, customer support executive, email, chat etc.

h) Sustainability for perpetual operations and periodic upgrades/ updates or replacements must be factored-in and trigger points at different levels of adoption should be defined

i) For promotions and awareness creation, all medium should be explored & exploited such as presence & promotions on popular social media sites like Facebook, twitter, Instagram, WhatsApp, live Facebook sessions, podcast, promotions on on-boarded departments website, in-app notifications, emails, SMS, stickers & banners in concerned on-boarded departments, participation in conferences, seminars, etc.

j) 'Accessibility' should be given due importance while working out the solution/ architecture so that majority of the population/ users get benefitted.

9.0 CONCLUSIONS

Even though 'Change' is inevitable or 'Change' is the only constant in life but still there is resistance and reluctance to 'Change'. Such resistance and reluctance is prominent and visible for planned changes. Most of the issues and challenges discussed above and faced during UMANG conceptualization and implementation fall in the category of resistance or reluctance, which is driven by basic human nature. There are ways and means to manage/ overcome such resistance and reluctance, though it could be little long drawn process and may require lot of patience and perseverance. Planned changes are envisioned, conceptualized, structured and executed by Change Agents, visionaries and they possess required passion, perseverance and guts to drive through the resistance.

Benefits of the concept, 'One Nation – One Platform', have very clearly emerged in this Paper, which are well substantiated through the UMANG initiative, which has successfully taken-off and heading in the right direction at a decent pace (still evolving). Now, there is a need for more visionaries and change agents to visualize and implement the concept of 'One Nation – One Platform' in further domains and demographics.

REFERENCES

[1] UMANG (Unified Mobile Application for New Age Governance) - https://web.umang.gov.in/web/

[2] Aadhaar - UIDAI (Unique Identification Authority of India) - https://uidai.gov.in

[3] Digital Locker - https://digilocker.gov.in/

[4] India National Payment Service Platform, PayGov - http://paygovindia.gov.in/

[5] Rapid Assessment System (RAS) - https://ras.gov.in/

ACKNOWLEDGEMENTS

Chapter 12

Exploring Data Analytics in e-Governance Environment: India

Rama Hariharan
General Manager
NICSI, 15 NBCC Bhikhaji Cama
New Delhi, India
rama.h@nic.in, 9868956343

Ashutosh Prasad Maurya
Senior Manager
NICSI, 15 NBCC Bhikhaji Cama
New Delhi, India
ap.maurya@nic.in, 9810104284

ABSTRACT[1]

The Digital India Program has provided a fillip to the initiative of e-Governance at all levels in the Government, presenting an opportunity to integrate information into decision-making. As a natural companion, analysis of this data, both retrospective and prospective, will help improve quality of service, planning and monitoring aspects of e-governance. Data analytics presents a compelling opportunity to collate data from across departmental silos to get a comprehensive picture of the development goals of the country. Possibility to analyze data generated by important citizen centric Government schemes can unlock insights that can pre-emptively be used to better the conditions for inclusive growth. With many government departments engaging with the public through social platforms, the sentiments of citizens can be analyzed and integrated into real-time decisions of the government. Possibilities and an ecosystem for data analytics, synergizing with e-governance, can help government derive true value from this gold mine of data. The paper also discusses about the different technological stacks and the success factors for the data analytics in Government using e-Governance system.

KEYWORDS

Analytics, Data analysis, e-Governance, Digital India, Decision making, success factors, Technology, Big Data, log analytics, social media analytics.

INTRODUCTION

Under the Digital India Program, a flagship program of e-Governance by the Government of India, there is an increased focus on developing Information Technology (IT) enabled solutions to improve service delivery to citizen. Governments at all levels – Central, State and local bodies are making significant contributions and investments in e-Governance solutions to realize this vision. This shift to digital ecosystem has led to tremendous growth in data related to various aspects of Government functions and services. As the next logical step, government departments are looking to exploit this mount of gold mine in form of data by investing in analytical solutions that can turn this data into insights and promote data-driven decision making. Advanced analytical techniques and tools make this possible and offer new ways in which the data can be mined to generate insights, from retrospective analysis to prospective analysis, helping the decision makers look into the future and plan accordingly. This will help improve quality of service, planning and monitoring, and various other aspects of governance.

It is pertinent to note that deriving value from analytical tools requires not only advanced technical capability to deal with new and complex technologies but more importantly requires trained and experienced data scientists, data modeling and visualization experts. As with any new technology, advanced analytics investments are costly, both in terms of the tools required and the skilled manpower available in the market to take up analytics projects.

Rapid digitization of various government functions and services under multiple e-Governance program has led to an explosion in the amount of data collected by various departments across the country. The e-Governance initiatives also include active engagement with citizens through social media and increasing use of Internet of Things (IoTs) devices is leading to the generation of structured, semi-structured and unstructured data in huge volumes at an ever-increasing pace. The era of Big Data in Government has arrived and is here to stay. The question is how effectively the government can harness the value that can be generated from this data to inform its policies, programs and services. United Nations e-Government Survey 2016 emphasizes the importance of Whole-Of- Government approach, Policy Integration and Big Data Analytics as major drivers of improved governance. In order for the government to make sense of the data and derive true value out of it, there is a strong need for appropriate analytic solutions that can turn data into useful, actionable insights.

DATA ANALYTICS ECOSYSTEM

Data Analytics refers to tools and methodologies that help transform massive data into useful insights. Data Analytics provides a powerful mechanism to policy makers to understand the whole range of impact of their policies, not only within their own sector but also across the entire Government spectrum. Thus, Data Analytics technologies present a compelling opportunity to collate data from across departmental silos and get a more comprehensive picture of the development goals of the government. To understand the entire eco-system of data analytics, it needs to be viewed from two main dimensions:

Data characteristics (Traditional Data vs Big Data)

Data can be classified as Traditional or Big Data based on three major data characteristics: Volume, Velocity and Variety. Traditional data refers to data which are of manageable volumes and speed which is usually highly structured, most commonly in the form of a relational database and largely stored in well-defined schemas. Big data, on the other hand, is high in any one or all of the above three characteristics. In other words, Big Data usually refers to large volume of data at very high speed in a variety of structures – structured, semi-structured and unstructured formats including diverse data types such as text, video, audio, images etc. e.g. mobile app data, social media data, crowd source data etc. Big Data is generally processed in a distributed manner with multiple commodity hardware. The parallel processing of the data enables much faster processing and the large number of systems enable building a highly fault tolerant system in form of single data repository of integrated and heterogeneous data.

2.2 The Analytics Value Escalator

On the basis of level of difficulty and business value, analytics capabilities are descriptive, diagnostic, predictive and prescriptive types. These four analytics capabilities also vary in terms of how much human input is required to arrive at a decision and finally to take action. As we move up the Analytics ladder, both complexity and value increase. However, each of the four analytics capabilities address different stages of the decision process and hence should be used in combination to build a mature culture of fact-based, data driven decision making.

2.2.1 Descriptive Analytics

To understand what happened so that appropriate action can be taken. Invariably, the question is answered by various key performance indicators, queries and reports. Examples may include number of beneficiaries by region, average service level across districts etc. Descriptive statistics, KPI monitors, dashboards etc. are some of the tools that are useful in performing this type of Analytics.

2.2.2 Diagnostic Analytics

This prompt the users to ask more questions in an attempt to find out the reasons for outliers or specific trends through more drill-down analysis and analyzing the relationships with other data. e.g., if the service level in a district is poor, then finding the poor performing officers, whether there is sufficient manpower posted in the districts. A 360-degree view of the district in terms of related data providing a diagnostic capability to the decision makers for further action. Analytical cubes, dashboards, correlation analysis etc. are some of the techniques that are used to carry out these analytics.

2.2.3 Predictive Analytics

This capability answers the question "What will happen?". It uses statistical and machine learning algorithms to provide the decision makers a peek into the future so that they can take proactive action to ensure desirable outcomes. e.g. understand whether the current trends or behavior will continue into the future or not, forecasting the future prices of commodities so that corrective action can be taken well in time. Techniques such as regression analysis, time series analysis, neural networks, logistic regression, random forests, ensemble models etc. are used in predictive analytics.

2.2.4 Prescriptive Analytics

This takes the analytics capability to a whole new level by providing the decision maker with the best decision within the framework of a given set of objectives and constraints. It can either provide a decision based on which the decision maker may take a call to act or alternatively automate the action itself. Prescriptive Analytics is often used in conjunction with predictive analytics as any decision for the future will have to take into consideration the prediction of the future scenario. Techniques used in prescriptive analytics include various optimization algorithms such as liner programming, mixed integer programming, game theory etc.

3. POSSIBLE ANALYTICS USE CASES

Unlike business entities, Government departments are not profit oriented but they carry the responsibility of ensuring inclusive development of its citizens while ensuring that the scarce resources are utilized optimally. It is in this context that data analytics plays a very important role in giving a window view to the Government on how its policies and programmes are performing and on designing new policies and programmes based on past data and future prospects. Given below are some use cases of the use of Data Analytics in Government.

3.1. Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)

MGNREGA aims at enhancing the livelihood security of people in rural areas by guaranteeing hundred days of wage-employment in a financial year to a rural household whose adult members volunteer to do unskilled manual work. Through its goals of providing strong social net for the vulnerable groups and a growth engine for a sustainable development of an agricultural economy, it attempts to foster conditions for inclusive growth. The programme has been running for more than a decade now

and has been in the forefront in adopting ICT (Information, Communication & Technology) to manage and monitor it. Approximately 5 Giga Byte of incremental data is being generated as part of the daily activities under MGNREGA. The next questions are: how to effectively utilize the rich data to improve the programme and ensure that it meets the ultimate objectives. Some of the areas where Analytics can be effectively used in MGNREGA are given below:

Age group-wise analysis:

MGNREGA beneficiaries can be classified or grouped based on certain age-related criteria so that specific groups could be targeted to effectively take them out of the vicious poverty cycle. For example, 18-30 age group is the most productive age group and a large number in this category is a cause for concern. Such groups should be specifically targeted for skill development.

Analysis by type of work:

State-wise analysis on the basis of type of work can be done for identification of states for suitable action. This can be further drilled down up to the level of districts. A 360-degree analysis of a type of work taken up in a State such as labour-material ratio, trend in number of works in that category, expenditure incurred etc. will throw light on why a specific type of work is chosen in a state. Of course, such analysis should be complemented by domain knowledge of experts to gain valuable insights.

Delayed payments to beneficiaries:

MGNREGA has been proactive in applying many ICT-based innovations including Direct Benefit Transfer. Still, there may be scope for improvement in payment process to beneficiaries like delayed payment with more than 90 days. Such analysis may reveal at what stage the payments are getting delayed and whether such delays are prevalent across a particular district, State or across the country.

3.2 Public Distribution System (PDS)

PDS is an Indian food Security System for poor people established by the Government of India under the Ministry of Consumer Affairs, Food, and Public Distribution. It is one of the largest safety net programmes in India for the poor. While the Central government is responsible for procurement, storage, transportation, and bulk allocation of food grains, the State governments hold the responsibility for distributing the same to the consumers through the established network of approximately 5 lakh Fair Price Shops. Major commodities distributed include wheat, rice, sugar, and kerosene. ICT has played a significant role in improving the efficiency and accountability in PDS and ensuring that the benefits reach to the targeted beneficiary. There is a strong need to analyze the data and identify problem areas so that appropriate policy reforms and/or ICT solution

improvements can be made. Following are some of the sample cases for the application of analytics in PDS:

a)   Week-wise analysis of number of transactions

An analysis of week-wise transactions will help the Government to identify the weeks when food demand is high and the pattern of demand across location. If the pattern in a specific fair price shop is different from the general pattern being followed in the nearby areas or in the district, then it can be analyzed further to understand the reason for the same; e.g., the occupation of the beneficiaries, high demand of specific food item, non-availability of food grains in first week of month, special demand pattern considering festivals etc.

Analysis of Quota Utilization

In PDS system specific quote is allocated to beneficiaries and that should be fully availed by them. There may be chances that in monthly cycle, the full quota may not be utilized by the beneficiaries. Detailed analysis can be done by getting relating quota utilization across time, location, grievances, food items, shops etc. A cluster analysis can also be done of such beneficiaries/fair price shops based on similar behavioral patterns on these parameters.

Another analysis perspective could be how 100% quota fulfillment has been achieved by specific fair price workshops. The performance of such fair price workshops can be analyzed against other variables such as their 'Aadhaar' (a unique identification number of citizen) authentication performance, the days and times at which the transactions happen in these fair price shops etc.

3.3 Centralized Public Grievance and Redress Monitoring System (CPGRAMS)

CPGRAMS is a web-based system that enables citizens to lodge grievances against citizen centric services from anywhere, anytime to any Ministry/Department/Organization. Citizens can lodge grievances through concerned department or through email or post. The analytics cases for CPGRAMS grievances system is as below:

a)   Reducing the pendency

Reducing the pendency of lodged grievances is critical. There is need to analyze the growth of receive & disposal of grievances across the department, services, location etc. Further analysis of these grievances can be done by checking under which department/ organization these grievances fall, how many steps are there in these grievances, in which organization the grievance had been pending for a long time etc. Such analysis will reveal the areas where maximum grievances are coming and the reasons for the delay in redressing these grievances.

Analysis of steps involved in grievances

The CPGRAMS allows officials to forward the received grievances to relevant officials for further resolution. Such forwards may be within or across the departments. High number of forwards may indicate a longer processing cycle to redress the governance. By identifying such grievances, the process followed to redress the governance can be analyzed and the process itself improved thereby reducing the time to redress grievances.

Grievance resolution and feedback analysis

Once the grievances are resolved, the citizens can provide feedback on the grievance. Citizens' feedback can be analyzed and seen as to which type of grievances are receiving poor feedback and appropriate action can be taken by the concerned departments/organization to ensure that the grievances are redressed to citizen's satisfaction.

3.4 Public Financial Management System (PFMS)

PFMS is an e-Governance solution managed by the Office of the Controller General of Accounts (CGA), Government of India to facilitate a sound financial management system for Government by establishing an efficient fund flow system as well as a payment cum accounting network. The scope of PFMS is to cover direct payment to beneficiaries under both Plan and non-Plan schemes. Going forward, it is expected to act as a single platform through which stakeholders at all levels get real-time, reliable and meaningful Management Information System and act as an effective decision support system to the Government through meaningful insights. Considering the PFMS situation, having a powerful analytics platform is intuitively complementary to gain meaningful insights about the financial health of the Government and take pre-emptive and proactive decisions. One of the core strengths of PFMS is its integration with the Banking Systems of country since Banks play a very important role in achieving the purpose. PFMS provides a single platform through which actionable insights can be drawn on the issues arising in the payment process.

a) Ranking of Banks

Ranking of banks based on certain key performance indicators related to PFMS such as acknowledgement response time, debit response time, credit response time, error, downtime instances etc. will help both the government as well as the Banks to know how they are performing in different areas. An overall combined score can help in ranking the Banks based on their performances.

b) Analyzing performance

PFMS is a real-time system and needs to scale even at peak loads. Hence, it is very important to know what is the peak load capacity of the system, which are the particular days / times when the load is high, which are the user types that are instrumental is taking the system to peak load etc.

Such insights into the performance of the system can help the management to put in right efforts in the right areas to ensure scalability of the system.

3.5 Social Media Analytics

With the advent of social media platforms such as Facebook, Twitter, YouTube etc., many government departments have started engaging with the citizens through these platforms. Social media analytics refers to the approach of collecting data from social media sites and blogs and evaluating that data to make governance decisions. This process goes beyond the usual monitoring or a basic analysis of data to develop an in-depth idea of citizens' challenges and needs. Social media is a good medium to understand real-time citizen choices, intentions and sentiments. Such huge volume of information contains citizen sentiments that can be used to evaluate their experience with a particular scheme/service. Understanding the sentiments of the citizens on a certain policy/scheme of the government based on what they express on the social media platforms can go a long way in better shaping the government policies.

However, managing the inputs received from social media is a major challenge for the government; it is practically very difficult and time consuming to go through each and every comment and tweets of citizens. And there could be adverse effects if the government does not respond on the issues raised by citizens. This is where the potential of social media analytics needs to be tapped. Social media analytics can help the government in gauging the sentiments of citizens with respect to a particular policy, programme or service. However, manual intervention will be at some stage to make a more meaningful analysis and proper interpretation of the data.

3.6 Log Data Analytics

Logs are streaming data generated by network devices, operating systems, applications and other smart devices. Logs are generated as part of the functioning of a system. Due to the large volume and speed of generation, information available in the logs are not analyzed on a daily basis. The logs are generally stored to be used for problem diagnostic, to identify a security breach, investigating fraud etc. With the advent of big data technologies, real-time analysis of logs and generation of alerts and insights have been greatly enabled. With many Indian Government e-Governance applications becoming mission critical such as GST (Goods and Services Tax), Banking systems, e-Hospital, eOffice, e-Mail etc., it is now imperative that real-time monitoring of logs are carried out to identify security breaches, serious problems in applications, networks etc. so that the issues are taken care of immediately. Log analytics solution will enable the government to monitor systems and address the problems as they arise rather than do a post facto analysis. Elastic search technology can be helpful for log analytics.

4. ANALYTICS SERVICE SOLUTION

Analytics is the multi-disciplinary scientific activity consisting of expertise from computation, Information Technology, Mathematics, Statistics etc. The analytics service solution in Government can be proposed in following manner:

a) Data Quality Assessment Services

This would be a necessary step in the data analytics journey of a department. Data quality assessment services can provide data profiling tools and techniques and necessary expertise to analyze the data for quality issues so that the data can be appropriately cleansed before being used for further analytics.

Custom-built Data Analytics Solutions

These are such analytic solutions that are specific to a particular problem, which may relate to a single or a combination of departments or government programmes and may include integration of data sets across departments/programmes.

Pre-Built Domain-specific Data Analytics Solutions

This addresses a generic data analytics problem that is prevalent across departments or States. An example is that of State Government Treasury. Because of the common requirements of the domain, a domain-specific analytic solution will be built.

Social Media Analytics Platform

As more departments engage with the citizens through social media, an analytics platform that meets the need of the departments to analyze citizens' responses and sentiments quickly by configuring certain parameters will be made available.

Self-Service Analytics

There is need to enable departments to do self-service analytics by simplifying the data in a manner in which an administrator can use it with minimum technical support or at best with support from the attached existing technical unit. A self-service analytics tool will also be provided to enable the departments to do such analysis and data visualization on their own.

Analytics on Mobile

Making use of cellphones' ubiquity, it is proposed to make relevant solutions available to officials on the mobile so that data and analysis are always available with them even when they are mobile.

5. TECHNOLOGICAL STACK FOR DATA ANALYTICS IN GOVERNMENT

Data collection and cleaning

There are multiple tools available for the data collection and cleaning of collected data. As per need, such tools can also be developed by Government departments catering to a specific need. The effort of data cleaning can also be minimized using appropriate validation during data collection.

Relational Databases

Relational databases collect and manage large volumes of data for further exploration / reporting of information. These databases can easily be connected with analytical tools for further visualization and analytics.

Data Warehouse

A data warehouse integrate data from multiple diversified sources for centralized systematic and ad-hoc reporting. For long term planning over large structured data, data warehouse is a good source of data for analytics over information of a subject.

ETL (Extraction, Transformation & Loading) & OLAP (Online Analytical Process) Cube

An ETL tool handles the activities for transformation and integration of data among multiple data sources. OLAP cube is the way of analyzing the collected data for decision making and for fast retrieval of data for graphical reporting.

Visualization Tools

Visualization tools help to get the visualized effect of the data over report. Visualization reports also provide facility for further exploration of information with features like slice and drill. Through visualization tools, the data can be presented in more than two dimensions using appropriate charts.

Statistical methodologies using tools like R/Python/Others

Analytics uses multiple statistical concepts & methodologies for further meaning inference from data. Such statistics methodologies can include descriptive statistics, ANOVA, Hypothesis testing, Time series, Regression, Correlation, Clustering, classification etc. All such statistical methodologies are used by specialized programming language like R, Python etc.

Advanced statistical methods using Machine Learning algorithms

Machine learning algorithms are used for activities like predictions, recommendations, trends finding, clustering etc. In analytics, such machine learning methods are used for the enhancement & development of policies by the Government.

Big Data technologies

Big Data technologies are used to handle the large volumes of data collected at a fast speed and in multiple formats. The format of data can be of text, images, video, non-structures text etc. Big Data uses specialized toolsand techniques to handle large data sets. Generally Big Data uses parallel processing of data across multiple systems. In Big Data, distributed and Map-reduce concept is used.

6. SUCCESS FACTORS FOR DATA ANALYSIS IN E-GOVERNANCE IN INDIA

Implementation of e-governance in India through multiple projects will include building technical hardware and software infrastructure (along with operational knowledge to utilize thesoftware) for the benefit of government, citizens and businesses. For successful implementation and achievement of set targets,many factors play a role, not just during the implementation, but before it too. The major success factors involve People, Processes, Technology and Legal aspects. On the basis of involvement and associated aspects of above critical success factors of any e-Governance project, the factors for the successful analytics activities over e-governance projects are:

6.1 Strategic Planning

Strategic plan for analytics over e-governance project typically describes the government's view over need, demand and utilization of analytics for identifying all its key stakeholders and provide a road map to lead from the present to a desired status. It also describes vision, goals, strategies and measurable objectives for the project. A strategic plan also specifies how government's readiness for analytics would be established and the basis for prioritizing initiatives. A good strategic planning should cover all affecting stakeholders. A good strategic plan may comprise:

    a) Data Availability & Data Quality
    b) Need of analytics
    c) Capacity planning
    d) Human and Capital Resource
    e) Readiness assessment
    f) Regulatory and implementation framework

6.2 Data Governance

Data governance is a framework that ensures that data entry meets precise standards, business rule, data definition and data integrity constraints in the data model. Data governance is a set of processes that ensures that important data assets are managed throughout the enterprise. A good analysis can only be possible if the data is relevant to it. The elements of data governance are usually people, methods & information technology for proper & consistent handing of data across multiple department / projects. It can be done through:

    a) Consistent data collection across department
    b) Importance of data quality is emphasised
    c) Scope for integration of data with other departments
    d) Importance of data governance among all levels of decisions
    e) Standardization of master data across the departments
    f) Regular monitoring and evaluation of data governance issues

6.3 Awareness and usage

To make analytics in e-Governance effective and acceptable to the target population, positive awareness about utilization is required. The awareness of analytics can be enhanced by showcasing the sample output at multiple platforms and through training means. Involvement of analytics output documents in report / summary/ periodicals etc. can be utilized as a mediumto generate awareness among users.

6.4 Technical proficiency

Data analytics is a multi-discipline field with associations to Mathematics, Statistics, Economics, business, IT and more.To make analytics more user-friendly among the business domain users, the knowledge of technical know-how with respect to analytics concepts, tools, methods etc. will enhance the utilization.

6.5 Internal Readiness

Internal readiness for analytics in e-Governance depends upon technical infrastructure, availability of data, data quality, integration of data, business domain clarity, attitude towards acceptance of analytics, willingness to re-engineer etc. The lack of balance between planning and results may be frustrating. The readiness should in form of awareness among users and decision makers who can understand the need and importance of analytics for enhancement of citizen centric-services using e-Governance. The readiness may be understood using the following aspects:

    a) Financial readiness
    b) Regulatory readiness
    c) Organizational readiness
    d) Human and cultural readiness
    e) Infrastructure readiness
    f) Data and process readiness

CONCLUSION

The Digital India Program presents itself as a golden opportunity to synergize data analytics into decision-making process by the Government. With the amount of data being generated by multiple schemes-such as MGNREGA; and unstructured, high-volume data through interaction of government with citizens on social media,

analytics will bolster the understanding of patterns, trends, classifications, sentiments that can be derived and harnessed to make e-Governance a Whole-of Government approach. For aiding effective analytics as a natural companion to e-gov, strategic planning to understand the measurable objectives and data governance is paramount. This will revolutionize how Government thinks and acts, integrating facts- available at real-time from custom-built analytical solutions- within its processes.

REFERENCES

[1] https://yourstory.com/mystory/4600861fba-how-analytics-can-tran

[2] https://datafloq.com/read/5-applications-big-data-in-government/65

[3]
Dr. Shefali Dash, "Curbing Unsolicited Commercial Communications in India" , 18th National Conference on e-Governance, Compendium of selected papers, Jan 2015, pg-17

[4]

[5] Romit Pandey "From e-Governance to m-Governance: The way forward" , e-Gov - Technological Framework ,IIT-H ,Outreach, pg-2

Wahid, F. (2013), ―Themes of Research on eGovernment in Developing Countries: Current map and future roadmap", in 46th Hawaii International Conference on System Sciences (HICSS), USA, 2013, HICSS, USA, pp. 1743-1752

[6] Tan, M., Xiaoai, D., Qiushi, Y. and Chen, C. (2013), "An Investigation of E-Government Services in China", The Electronic Journal of Information Systems in Developing Countries, Vol. 57 No. 5, pp.1-20

[7]
https://tdwi.org/home.aspx (Transforming Data With Intelligence)

Chapter 13
White Paper
Identification of crops through satellite images using Machine Learning and Deep Learning
Sub-theme: Emerging Technologies for Practitioners

M. Selvendran, Manish Pandey, Raviraj Joshi, Swarn Pant
Revenue Department, Vallabh Bhawan, Government of Madhya Pradesh,

Ph: 9425821181, 8964027075

Email: selvendr@ias.nic.in, manish.pandey@mapit.gov.in, raviraj.joshi@mapit.gov.in, swarn.pant@semt.gov.in

Abstract— **Machine learning based strategies have increasingly become a potent tool for automation of work that is repetitive and follows a fairly recognizable pattern. For the Rabi season of 2017, a pilot has been attempted to explore the possibility of using Machine Learning and Deep Learning based algorithms on satellite images for identification of crops cultivated on a land parcel.**

Satellite DN values are collected for bands (B01, B02, B03, B04, B05, B06, B07, B08, B8A, B09, B10, B11 and B12) along with Indices like NDVI, DVI and RVI.

Multiple classification models like Kernel Support Vector Machine (SVM), Random Forest, XGBoost, DNN, NEAT, etc have been used to identify crops.

The hyper-parameters were tuned using GridSearchCV algorithm. The models' performance was compared using K-Fold Cross validation. Libraries being used are Numpy, pandas, sklearn, matplotlib, XGBoost, Keras, TensorFlow, Pickle and Flask.

In this paper, we are proposing Deep Neural Network (DNN) and NeuroEvolution of Augmenting Topologies (NEAT) based classification to improve the performance of crop pattern recognition and make a comparative analysis with two (2) other machine learning approaches including Kernel SVM and Random Forest.

Keywords-Crop Identification; Machine Learning; Remote Sensing; Deep Learning; Random Forest, Kernel SVM

I. INTRODUCTION

Crop survey (or Fasal Girdawari) is an important activity taken up by the Commissioner of Land Records in Madhya Pradesh. This activity involves survey of the agricultural lands and the crops cultivated on them. The data from this exercise is used for estimation of the area under different crops in a given season. This information is useful for the following stakeholders: -

1. Banks/Financial Institutions use this information for decisions on extending agricultural credit in the form of short term loans or Kisan Credit Card. The type of crop grown decides the scale and term of short term finance.
2. Government uses this data for
   a. Deciding the crops to be covered under agricultural insurance
   b. Procuring crops under the Minimum Support Price Mechanism from farmers and for other schemes.
   c. Input supply by government or its subsidiaries
3. Agricultural Insurance companies
4. Agricultural input supply firms and marketing companies.

Madhya Pradesh is the second largest state of India, located in the central India, comprising 11 Agro-Climatic zones with diverse soil and climatic condition, which helps to support to cultivation of a wide range of crops with diversified cropping pattern. Madhya Pradesh is the largest producer of Aromatic Flowers, Pulses including Gram, Garlic and Gooseberry in India. Second Largest producer of Wheat, Citrus fruits, Onion, Peas, Orange and Coriander in India. Third largest in Tomato, Custard

and Apple and Rapeseed & Mustard in India. With several other irrigation projects underway, agriculture sector has potential for further growth in the State.

Madhya Pradesh has posted an average 20 per cent agricultural growth rate during last four years and clocked close to 17 per cent in manufacturing and 8 per cent in industrial growth during the same period.

For such states, identifying crops and corresponding pattern is very important. Existing methods of identifying crops through field survey through Fasal Giridawari by Patwaris is time consuming, costly and leaves scope for manual errors. Considering importance of this data, it becomes imperative to devise a crop identification / monitoring system, which is more reliable, accurate and fast. Use of Remote Sensing data is one of the ways to identify crops. However, there are various factors which makes identification of crops difficult such as having multiple Agro-Climatic zones, different sowing period, variation of irrigation time, temperature, weather, moisture and quality of the soil.

Machine and Deep Learning based algorithms are being found to be increasingly useful in identifying, recognizing and classifying patterns in various scenarios. Hence, it was envisaged to use these algorithms for identification of crops through classification of remote sensing data.

Academicians and Researchers have been using and applying various algorithms for pattern classification, such as, K-means algorithms, SVM, Decision Trees, etc [3]. We have investigated different machine learning and deep learning approaches including Kernel Support Vector Machine (SVM), Random Forest, XGBoost, DNN and NeuroEvolution of Augmenting Topologies (NEAT) based classifiers to come up with the best classification model for identification of crops.

III. PROJECT COVERAGE AND REFERENCE DATA

A. Project Coverage

This project has been implemented as a pilot project in Ashta Tehsil of Sehore District for a single crop. The State-wide implementation would be carried out soon.

B. Referenced Data

Publicly available Sentinel 2 satellite imagery with all available bands was taken for the study area. Primary reason for choice of satellite sensor was the high spectral resolution offered by the sensor. The acquisition period of satellite image is chosen from mid-December to mid-January so as to enable a clear crop stand visibility. The satellite image reflectance values are utilized without applying any sort of resampling so that raw DN values are retained to the extent possible. The reflectance values are further processed and transformed to format that is readily accepted by the built model.

The data was cleaned for invalid, corrupt or missing values and the band values were feature scaled for sake of better accuracy and faster execution.

IV. IMPLEMENTATION METHODS

Some of the machine learning and deep learning approaches we have used includes Kernel Support Vector Machine (SVM), Random Forest, XGBoost, DNN and NeuroEvolution of Augmenting Topologies (NEAT).

A. Kernel Support Vector Machine (SVM) Algorithm

In machine learning, kernel methods are a class of algorithms for pattern analysis, whose best known member is the support vector machine (SVM). The general task of pattern analysis is to find and study general types of relations (for example clusters, rankings, principal components, correlations, classifications) in datasets. In its simplest form, the kernel trick means transforming data into another dimension that has a clear dividing margin between classes of data. Kernel methods require only a user-specified kernel, i.e., a similarity function over pairs of data points in raw representation. [7] Kernels allow us to do stuff in infinite dimensions. Sometimes going to higher dimension is not just computationally expensive, but also impossible. f(x) can be a mapping from n

dimension to infinite dimension which we may have little idea of how to deal with. Then kernel gives us a wonderful shortcut.[8] kernel equation is

$$K(x, y) = (<x, y>)^2$$

The hyper-parameters for the Kernel SVM Classifier were optimized using grid search, or a parameter sweep. The GridSearchCV from sklearn.model_selection library was called for various values of hyper-parameters like 'kernel', 'C' (The penalty parameter of the error term), etc. The most optimum values returned by the algorithm were used for model creation.

B. Random Forest Algorithm

Random Forest is a supervised learning algorithm. Like you can already see from it's name, it creates a forest and makes it somehow random. The "forest" it builds, is an ensemble of Decision Trees, most of the time trained with the "bagging" method. The general idea of the bagging method is that a combination of learning models increases the overall result. One big advantage of random forest is, that it can be used for both classification and regression problems, which form the majority of current machine learning systems. I will talk about random forest in classification, since classification is sometimes considered the building block of machine learning. [9]

The pseudocode for random forest algorithm can split into two stages.

➢ Random forest creation pseudocode.
➢ Pseudocode to perform prediction from the created random forest classifier.

Random Forest pseudocode:

1. Randomly select "k" features from total "m" features.
2. Where k << m
3. Among the "k" features, calculate the node "d" using the best split point.
4. Split the node into daughter nodes using the best split.
5. Repeat 1 to 3 steps until "l" number of nodes has been reached.
6. Build forest by repeating steps 1 to 4 for "n" number times to create "n" number of trees.

The beginning of random forest algorithm starts with randomly selecting "k" features out of total "m" features.[10]

In this model we created 100 classification trees were created. The criterion was used as 'entropy', and min_samples_split size was taken as 2.

The hyper-parameters for the Random Forest Classifier were optimized using grid search, or a parameter sweep. The GridSearchCV from sklearn.model_selection library was called for various values of hyper-parameters like 'n_estimators', 'criterion', 'min_samples_split', etc. The most optimum values returned by the algorithm were used for model creation.

C. XGBoost Algorithm

XGBoost is an implementation of gradient boosted decision trees designed for speed and performance. The beauty of this powerful algorithm lies in its scalability, which drives fast learning through parallel and distributed computing and offers efficient memory usage. XGBoost is an ensemble learning method. Sometimes, it may not be sufficient to rely upon the results of just one machine learning model. Ensemble learning offers a systematic solution to combine the predictive power of multiple learners. The resultant is a single model which gives the aggregated output from several models. The models that form the ensemble, also known as base learners, could be either from the same learning algorithm or different learning algorithms. Bagging and boosting are two widely used ensemble learners. Though these two techniques can be used with several statistical models, the most predominant usage has been with decision trees.

XGBoost is a popular implementation of gradient boosting. some features of XGBoost that make it so interesting.

• **Regularization**: XGBoost has an option to penalize complex models through both L1 and L2 regularization. Regularization helps in preventing overfitting

• **Handling sparse data**: Missing values or data processing steps like one-hot encoding make data sparse. XGBoost incorporates a sparsity-aware

split finding algorithm to handle different types of sparsity patterns in the data

- **Weighted quantile sketch**: Most existing tree based algorithms can find the split points when the data points are of equal weights (using quantile sketch algorithm). However, they are not equipped to handle weighted data. XGBoost has a distributed weighted quantile sketch algorithm to effectively handle weighted data
- **Block structure for parallel learning**: For faster computing, XGBoost can make use of multiple cores on the CPU. This is possible because of a block structure in its system design. Data is sorted and stored in in-memory units called blocks. Unlike other algorithms, this enables the data layout to be reused by subsequent iterations, instead of computing it again. This feature also serves useful for steps like split finding and column sub-sampling
- **Cache awareness**: In XGBoost, non-continuous memory access is required to get the gradient statistics by row index. Hence, XGBoost has been designed to make optimal use of hardware. This is done by allocating internal buffers in each thread, where the gradient statistics can be stored
- **Out-of-core computing**: This feature optimizes the available disk space and maximizes its usage when handling huge datasets that do not fit into memory

The hyper-parameters for the XGBoost Classifier were optimized using grid search, or a parameter sweep. The GridSearchCV from sklearn.model_selection library was called for various values of hyper-parameters like 'min_child_weight', 'gamma', 'subsample', 'max_depth', etc. The most optimum values returned by the algorithm were used for model creation.

D. Deep Neural Networks

A deep neural network is a neural network with a certain level of complexity, a neural network with more than two layers. Deep neural networks use sophisticated mathematical modeling to process data in complex ways. Experts define deep neural networks as networks that have an input layer, an output layer and at least one hidden layer in between. Each layer performs specific types of sorting and ordering in a process that some refer to as "feature hierarchy." One of the key uses of these sophisticated neural networks is dealing with unlabelled or unstructured data [11].

Deep-learning networks are distinguished from the more commonplace single-hidden-layer neural networks by their depth; that is, the number of node layers through which data passes in a multistep process of pattern recognition.

Deep-learning networks perform automatic feature extraction without human intervention, unlike most traditional machine-learning algorithms. Given that feature extraction is a task that can take teams of data scientists years to accomplish, deep learning is a way to circumvent the chokepoint of limited experts. It augments the powers of small data science teams, which by their nature do not scale [12].

Five hidden layers, one input layer and one output layer were used in DNN. In input layer ReLU (Rectifier Linear Unit) function is used to find the probability of desire output.

D. NeuroEvolution of Augmenting Topologies

NEAT (NeuroEvolution of Augmenting Topologies) is an evolutionary algorithm that creates artificial neural networks. Neuroevolution, i.e. evolving artificial neural networks with genetic algorithms, has been highly effective in reinforcement learning tasks, particularly those with hidden state information. The increased efficiency of NEAT is due to (1) employing a principled method of crossover of different topologies, (2) protecting structural innovation using speciation, and (3) incrementally growing from minimal structure [13].

In the current implementation of NEAT-Python, a population of individual genomes is maintained. Each genome contains two sets of genes that describe how to build an artificial neural network:

1. Node genes, each of which specifies a single neuron.
2. Connection genes, each of which specifies a single connection between neurons.

To evolve a solution to a problem, the user must provide a fitness function which computes a single real number indicating the quality of an individual genome: better ability to solve the problem means a higher score. The algorithm progresses through a user-specified number of generations, with each generation being produced by reproduction and mutation of the most fit individuals of the previous generation. [14]

Parameter optimization for NEAT algorithms are still being explored.

TABLE 1. ACCURACY OF MACHINE LEARNING METHODS

Algorithm Name	Accuracy (%)
Kernel Support Vector Machine (SVM)	75.23
Random Forest Algorithm	87.54
XGBoost Algorithm	87.03
Deep Neural Network	88.37
NeuroEvolution of Augmenting Topologies (NEAT)	89.94

TABLE 3: K-Fold Cross Validation

Algorithm Name	Mean Accuracy
Kernel Support Vector Machine (SVM)	74.51
Random Forest Algorithm	86.34
XGBoost Algorithm	88.34
Deep Neural Network	89.56
NeuroEvolution of Augmenting Topologies (NEAT)	90.23

V. RESULTS AND ANALYSIS

A. Classification Accuracy

The models were creating using Python language using Spyder on Anaconda Platform, The programs were run on 64-bit AMD64 machine having 16GB of RAM. The satellite image reflectance values were utilized without applying any sort of resampling so that raw DN values are retained to the extent possible. The reflectance values were further processed and transformed to format that is readily accepted by the built model. The input data was divided into training and testing sets in proportion of 75:25 respectively. Various Python libraries were used like numpy, pandas, sklearn, matplotlib, XGBoost, Keras, TensorFlow, Pickle, Flask, etc. The hyper-parameters were tuned using GridSearchCV algorithm. The models' performance was compared using overall accuracy, specificity, Sensitivity and K-Fold Cross validation. The mean accuracy being received in these prediction models ranges between 75-90%..

According to Table 2, the accuracy of Kernel SVM is 74.51% which is the lowest amongst all algorithms. From same table, it is apparent that deep neural network (DNN) gives an accuracy of 89.56% and NEAT gives accuracy of 90.23.

B. Optimization Method

Wherever applicable, the hyper-parameters were optimized using grid search, or a parameter sweep. The GridSearchCV from sklearn.model_selection library was called for various values of hyper-parameters and the most optimum values returned by the algorithm were used for model creation. Other hyper-parameter optimization methods like Bayesian optimization and Evolutionary optimization are also being considered for hyper-parameter tuning.

It is clear from above table that the accuracies of DNN and NEAT are very better. As per our observation though NEAT algorithm is delivering better accuracies, however it is taking quite longer time to execute and needs further hyper parameter optimization.

VI. CONCLUSION

As per our research we found that both DNN and NEAT algorithms are giving best results, hence both can be recommended for Crop Identification. However, as NEAT is giving slight better results and has scope of improvement with higher number of generations, hence, we would recommend it to be used along with further hyper-parameter optimization.

REFERENCES

[1] M. Bishop, C. (2018). Pattern Recognition and Machine Learning.

[2] Lebourgeois, V. and Dupuy, S. (2018). A Combined Random Forest and OBIA Classification Scheme for Mapping Smallholder Agriculture at Different Nomenclature Levels Using Multisource Data (Simulated Sentinel-2 Time Series, VHRS and DEM).

[3] Tatsumi, K. and Yamashiki, Y. (2018). Crop classification of upland fields using Random forest of time-series Landsat 7 ETM+ data.

[4] Rustowicz, R. (2018). Crop Classification with Multi-Temporal Satellite Imagery.

[5] Statistics How To. (2018). Cohen's Kappa Statistic. [online] Available at: http://www.statisticshowto.com/cohens-kappa-statistic/

[6] En.wikipedia.org. (2018). Sensitivity and specificity. [online] Available at: https://en.wikipedia.org/wiki/Sensitivity_and_specificity

[7] Kernel Method: https://en.wikipedia.org/wiki/Kernel_method

[8] Kernel equation: https://www.quora.com/What-are-kernels-in-machine-learning-and-SVM-and-why-do-we-need-them/answer/Lili-Jiang?srid=oOgT

[9] Random Forest Algorithm: https://towardsdatascience.com/the-random-forest-algorithm-d457d499ffcd

[10] Random Forest Algorithm: http://dataaspirant.com/2017/05/22/random-forest-algorithm-machine-learing/

[11] Deep Neural Network: https://www.techopedia.com/definition/32902/deep-neural-network

[12] Deep Neural Network: https://skymind.ai/wiki/neural-network

[13] NEAT: http://nn.cs.utexas.edu/downloads/papers/stanley.cec02.pdf

[14] NEAT Overview: https://neat-python.readthedocs.io/en/latest/neat_overview.html

Chapter 14

Implementing IoT in Rice Bowl (State Of Chhattisgarh) for Environment Monitoring

Sandeep Tikariha(Senior Manager), Chhattisgarh Infotech Promotion Society(CHiPS), Raipur (CG)
Sandeep.tikariha@cgchips.in, 8928437636

Abstract

As per WHO global air pollution database released(2018), not only 14 out of 15 most polluted cities in the world are from India but the top 14 cities are from India only. Chhattisgarh being a state of heavy industries like steel and power is prone to be in the list. In year 2014 Raipur was third most polluted city in the world.

Govt of Chhattisgarh is taking numerous steps to reduce the pollution level and enhance the quality of environment. One aspect of such effort is continuous monitoring of pollutant parameters and taking necessary actions. This is not effectively possible through manual monitoring system. However this could be effectively done by inducing IT into current system. This paper studies the current environmental situation like AQMS/CEMS/EQMS etc in state of Chhattisgarh, existing system of industrial pollution monitoring and details the implemented system which uses IoT concept along with cloud/client server model of operating.

Keywords: IoT, AQMS, CEMS, EQMS cloud, digital governance, e-Governance.

Introduction

Known as central India's rice bowl, Chhattisgarh is speeding towards industrialisation. The state has 200 large industrial units and scores of small ones. This fast industrial development has put Chhattisgarh and Raipur in International map for third most polluted city in the world on year 2015. However many significant steps have been taken by Govt to reduce pollution resulting Raipur out of list of among polluted city in the world by year 2018. One of such major step is to monitor real time monitoring and regulating the industry pollution across the state through use of recent information technology components.

In an effort to effectively real time monitoring of AQMS/CEMS/EQMS parameter in industries within the permissible value a system is introduce by the Government of Chhattisgarh where IoT devices are installed at industry site which collects real time emission value of parameters like PM2.5, PM 10, SPM, NO2, SO2 etc and communicate to central server. These data are logged against respective industries and compared against the permissible value as per CPCB (Central Pollution Control Board) guidelines. In case of exceedance all stakeholders in the system such as Industry, Regional Office and CECB is notified and necessary action as per the regulatory board is taken.

The implemented system is a live example of e-Governance of regulation. e-Governance is considered as high priority agenda of Digital India. e-Governance not only provides a transparent working system but also reduces cost and delay in service and has better reach to citizens.

Objective

The objectives for implementing ICT in Chhattisgarh Environment Conservation Board (CECB) are given below:-

1. To improve the industrial pollution monitoring mechanism across the State of Chhattisgarh by implementing ICT and better administrative process and standardizing it throughout the State.

2. To establish an integrated real time online monitoring system for monitoring the stack emission, ambient air and effluent parameters from the various industries located across Chhattisgarh.

3. To acquire accurate and high integrity real time measurements of the emission and Ambient air parameters directly from the analysers installed at the industry site without any intermediate conversions, logics or changes. However, in order to standardize, some unit conversion may be applied.

4. To detect exceedance of monitored parameters for the prescribed standards and provide real time alerts on the same.

5. To provide a multi-client open architecture platform that supports any analyzer (make and model) and on a single integrated Central database system which supports all type of communication between the industry and the regulator.

6. To provide a unified web based access controlled platform accessible from CECB Headquarters, Regional

Offices and all Industry sites in the State based on the provided authorization level.

7. To ensure that the SOP (Standard Operating Procedure) as par CPCB and CECB highlighting course of action to be taken in the event of industry emission default are integrated in the software.

Process Re-Engineering

The As –Is system is manual process and rely on industry and Regional Officer from CECB. Industries are supposed to send emission parameter to CECB, in case of any exceedance Regional Officer from CECB visits industry for inspection and take necessary according to Standard Operational Procedure (SoP). Major challenges in this process is to get real time data from industry, data sent to CECB are prone to manipulation and CECB does not receive data on time.

Proposed implemented system eliminates dependency on industries to sent data as data is streamed to server on real time basis 24*7. This also eliminates manual intervention by department as SoP actions are initiated in the system itself like sending notification alert/notice to industry from deployed system. Thus possibility of data manipulation by industry or any other corrupt practise is eliminated in this system.

Operational Model

Technology: - Internet Of Things (IoT)

IoT is the network of devices where devices contain electronics, software, actuators, and connectivity which allows these devices to connect, interact and exchange data. These devices need not to be necessarily internet enabled devices in-fact these devices can be non internet enabled physical devices. Such devices are embedded with technology to get data and communicate over internet and they can be remotely monitored and controlled.

Parameters to be Monitored:-

Pollutant parameters which need to be monitored are classified in to three categories:-

AQMS (Air Quality Monitoring System) : This system monitors air quality and monitors concentration of air pollutants such as SO2, NOx, CO, O3, THC, PM, etc, continuously.

CEMS (Continuous Emission Monitoring System): As per CPCB guidelines to State Pollution Board and Pollution Control Committee under section 18(1) installation of online emission quality monitoring system in 17 categories of highly polluting industries like pulp

& paper, Distillery, Sugar, Power Plants, Iron & Steel, Cement, Fertilizers etc for measurement of PM, NH3(Amonia), SO2, NO2 and other sector specific parameters is required.

EQMS (Effluent Quality Monitoring System) : EQMS system is used to measure water pollutants parameter like pH, BOD, COD, Ammonia, TSS etc which is discharged from industries.

Different pollutant parameters under above categories are to be monitored as per industry type respectively and to be insured that it should be within regulatory level.

Operating Model:

Below Diagram depict the overall data flow from industry to server side.

Architecture Component and it's Roles & Responsibilities

Component	Owner	Function	Input	Output
Analyzers	Industry	To measure AQMS/CEMS/ EQMS parameters through sensors and log the values	Sensors	IoT
IoT Device	CECB	To fetch logged data in analyzers and	Analyzer	Server

		communicate it to Server		
Internet	Industry	To transmit gathered data over web can be in for of GPRS/Wi-Fi/Ethernet.	NA	NA
Cloud Server	CECB	Server where data from all industry side is stored and secured	IoT	NA
Dashboard/ Portal	CECB	Dashboard to display data in desired format and take necessary action in case of exceedance.	Server	NA

Implementation:-

Phase – I (In Progress)

Initially in Phase-I 42 industries with 465 analyzers are selected for implementation. Implementation of Phase I is In-Progress. As of now installations in 11 industries have been completed successfully and data is received from industry site to server.

Dashboard

Phase – II

As part of phase II additional 121 industry will be covered where number of analyzers to be integrated will be scaled up to 2000.

Issues & Challenges Faced

➢ Different industries have installed different types of analyzers of different make and model as per different protocol. To streamline data gathered from these industries and to display the same in dashboard was the main challenge.

➢ Internet connectivity – As some of the industries are installed in remote location it was difficult to get proper internet connection. In such case other means of internet connectivity like Ethernet was implemented.

➢ Resistance from Industries – many industries were not in support of implementation of this project. Through CECB intervention installation were done in such sites.

Benefits (observed as of now)

➢ **Real Time data Acquisition** – real time data is acquired through online portal. This data can be stored and analyzed for trend analysis and proactive monitoring.

➢ **Automated Monitoring** – This system is designed to monitor any exceedance and generate alert in for form SMS and email. All the stakeholders get notification of exceedance hence real time monitoring is spontaneous and resolution time is reduced.

➢ **Transparency and Visibility :** As data is available on dashboard online 24*7 and all the stakeholders are notified in case of exceedance there is better transparency in system comparing to As-Is process. Data is visible to different user groups based on their login credential.

➢ **Reduces manual intervention and Better Response Time: -** There is no need of manual inspection to industry site in case of exceedance, also SoP actions are triggered as soon as there is exceedance.

➢ **Eliminates corrupt practise:** As minimal manual intervention is required in function of this system this reduces corrupt practise as of now involved in As-Is process.

Conclusion

The data analysis above proves that a balance between development and environment is need of the time for a healthy living environment. Monitoring of pollutants which are emitting in environment is required to be monitored and has to be within safe limits. A better automated monitoring system is required. The Government of India planned Digital India - an ambitious programme to "transform India into digital empowered society and knowledge economy" will ensure that government is extending the digital platform to environment also.

The implementation of the real time monitoring of industrial pollutants ensures better monitoring and pro active actions to keep the environment in sound health. As of now its being implemented for industrial pollution monitoring, going further scope of this project can be extend to other areas like monitoring public areas, etc.

References:-

[1] Information from Chhattisgarh Environment Conservation Board

[2] Central Pollution Control Board guidelines for CEMS/AQMS/EQMS.

Chapter 15

Improving coverage of community based Maternal, Neonatal and Infant health services to reduce Neonatal and Infant mortality and Malnutrition in Gujarat by empowering health staff through use of innovative mobile phone application "TeCHO+"

Author:Dr.Jayanti S Ravi, IAS
Commissioner (Health) &
Principal Secretary
 (Public Health & Family
Welfare)
Block-5, 1st Floor, Dr. Jivraj
Mehta Bhavan,
Gandhinagar, Gujarat.
Phone: 079-23253271
Email:
cohealth@gujarat.gov.in

Author:Dr.Prakash Vaghela
Additional Director-Family
Welfare Office of the Health
Commissioner, Medical
Services & Medical Education,
Block-5, 2nd Floor, Dr. Jivraj
Mehta Bhavin Gandhinagar.
Gujarat.
Phone: 079-23253311
Fax No: 079-23253304
Email:
addir.health.fw@gmail.com

Author:Dr.Gaurav Dahiya,IAS
Mission Director-NHM
State Program Management
Unit, 2nd Floor, Block No. 5,
Dr. Jivraj Mehta Bhavan,
Sector – 10, Gandhinagar.
Phone: 079-23253299
Email: md-
nrhm@gujarat.gov.in

Abstract

TeCHO+ "Technology enabled Community Health Operations'' is an initiative of the GOG to further improve cover- age and quality of health services using state of art mobile information technology to achieve Sustainable Develop- mental Goals (SDGs) related to health, nutrition and well- being. TeCHO+ is an innovative mobile phone and web application for tracking health services and health status of citizens. It is a job aid for Auxiliary Nurse Midwives (ANMs) and all supervisory cadres of health facilities. Key features of TeCHO+ mobile phone application include re- minders for due health services, digital checklist to ensure compliance with standard clinical guidelines, decision tree triage for screening and risk stratification of serious illnesses, customized treatment notifications based on risk stratification, and short video clips for counselling. The data transfer happens through internet, data entry is possible offline. Key features of TeCHO+ web application for the supervisory staff include performance reports, reminders for high risk cases and notifications for stock outs. TeCHO+ is linked with GVK

EMRI's call center which verifies quality of data and will soon help in referral of high risk cases through 108 ambulance services. Since its launch in October 2017, all 10,000 ANMs of Gujarat are provided smart phone with TeCHO+ application and postpaid data plan. The project has been rolled out in all 33 districts and 8 municipal corporations. 5.2 Crore citizens (80% of State population) are already registered by ANMs through TeCHO+ mobile application. More than 5 lac m-transactions occur every week. Evaluations have noted 16% reduction in Infant Mortality Rate and found it to be highly cost-effective. The project has reduced inequities and promoted gender equality as all users of the TeCHO are women health workers. The scope of TeCHO+ will soon expand by including other health domains such as non-communicable diseases in context of the Health and Wellness Centers of Ayushman Bharat

Background

TeCHO+ is a mobile & web based application which works as a job-aid for health workers and administrators for improving coverage and quality of health services

related to reproductive and child health, non-communicable diseases, communicable diseases, mental

health. TeCHO+ application provides name based tracking of eligible couples, pregnant women, children and entire population using mobile phones along AAA (convergence of ANM, ASHA and Aganwadi) and linkage with health facilities. After a successful pilot and evaluation in 3 tribal districts since 2013, the TeCHO+ Project was launched by the Hon. Prime Minister on 8th October, 2017 to scale up in entire state. TeCHO stands for "Technology enabled Community Health Opera-tion".

Objectives of TeCHO+

TeCHO+ is leading further improvement of Gujarat's performance for: (1) MMR, (2) IMR, (3) Low birth weight babies, (4) Complete immunization, (5) Under nutrition,(6) Anaemia among mothers, (7) Epidemics, (8) Sex ratio at birth, (9) Mental health, (10) TFR/spacing methods, and

(11) Non communicable diseases.

Roll Out/Implementation status:

All 10,000 ANMs (all women) are given android smart phone with a postpaid dataplan. ANMs register all existing and new pregnant women and children under the age of five years in her village using the TeCHO+ mobile phone application. Subsequently, the software **prepares entire** schedule of health services as per the national standards and sent reminders to ANMs. Every day, ANMs log in to the application to review their schedule, provide health services based on the task list, complete and **submit digital form** to close out the scheduled task. To emphasize key health and wellness messages, ANMs show short **video clips on mobile phone** to family members during the home visits. The digital forms had checklists to **screen for high risk medical conditions**. The application has **decision support system to show probable diagnosis with risk stratification** to ANMs based on the entries made in the digital forms; a customized management plan which included tools to **call free emergency transport vehicles;** and suggest home based remedies along with names and doses of drugs in compliance with national standards. Additionally, ANMs record details of the services, including immunization, de-livered by the during monthly village health and nutrition

day in the TeCHO+ application as well. Based on the data entered by ANM throughout a month, her **performance report was generated.** The medical officers and **PHC staff used web interface to track high risk cases, view reports and manage incentiv**es and supplies. The systems and processes of implementing the project was accredited by the International Standards of Organization (ISO9001:2015)Figure 1: **Interactive process flow of TeCHO+** Tracking status: Each **due/scheduled services is tracked** by supervisors. Supervisors can see list of pending services and details of services completed in-cluding time and duration of services. This is used for supervision and monitoring health workers. Each pregnant woman and child is digitally tracked longitudinally once they are registered through the TeCHO+ application. Such name**- based, digital, mobile based tracking** helps with service delivery and monitoring.

Till 3rd January, 2019, 5.3 crores family members have been enrolled through the TeCHO+ system from the entire state. ANMs and ASHAs enter information in TeCHO+ mobile application about all services provided by her. Every week, there are such 5.0 lacs to 5.40 lacs forms(m-transactions) which gets entered in TeCHO+ by ANMs and ASHAs.

Features of TeCHO+

Each of the 10,000 Female Health Workers and ASHAs from selected districts are already given a smart phone loaded with TeCHO+ mobile phone application which she is using while providing care during home visits and vaccination days

Steps for roll out include:

Mapping of health facilities, Creation of users in soft- ware, Procurement of smart phones and SIM cards, Preparation of mobile including download TeCHO+ software, Training of district master trainers, Training of ANMs and PHC staff,Ongoing supportive supervision and technology support, Ongoing iterative process to further improvise the software based on inputs from ANMs and PHC staff and Evaluation

Change management is an important part of roll out. "*Change management is an approach to transitioning individuals, teams, and organizations to a desired future state*". We anticipated resistance among ANMs and PHC staff towards use and uptake of TeCHO+ because it involved a significant change in their working environment due to use of technology; hence, efforts required to reduce and

manage resistance would be required. Factors which motivate ANMs were identified and processes were established to influence these factors so that ANMs and PHC staff realize value for using TeCHO+. Most importantly, benefits of using TeCHO+ need to be communicated to ANMs and PHC staff repeatedly. Their participation towards implementing and refining TeCHO+ through iterative process make them partners in bringing the "change". This coupled with encouragement from higher and local health administration for which close coordination with them was needed.

Technology Platform used:

Mobile Application - Developed on Native Android (Gradle), the Techo+ application works with Version 6 onwards. The application connects securely with the server using web- services to sync data. All data is codified and sensitive information is encrypted end to end. The application can work in online as well as offline mode as well. Web page- The front end of the web application has been developed in Angular JS. The Web backend has been developed using Java / J2EE and Sprint Boot. The database that is used is PostgreSQL. Environment-The web application runs on Tomcat Application Server on Ubuntu

➢ Citizen/Customer centricity and relevance
- **Details about impact on effort and time invested by user**: Citizens (pregnant women, children) receive essential maternal and child care related services including counseling through multimedia from ANMs at no cost to them. It is **free** evidence based **service available at door step to citizens through** ANMs, nurses and doctors with the help of innovative mobile phone based TeCHO technology. This saves citizens' time and efforts for seeking care at distant health facilities.
- ANMs now save lot of time from paper based record keeping.
- A **call center** has been established GVK EMRI to address concerns of ANMs and other users. A call log is maintained at ongoing basis and the issues are addressed immediately.
- **Feedback Mechanism: WhatsApp group and email group** has been created to receive and re spond to any feedback from district program coordinators
➢ **Audit Trails:** To keep **track of services provided by ANMs and PHC staff.** The TeCHO+ system records and compiles services provided to every citizen with details of time and

name of service provider in a dynamic beneficiary case file. A random checking is done by GVK EMRI call center by **verifying 1% of data** to check truthfulness of information entered by users.
➢ To **audit quality of training**, 5% of ANMs are interviewed over phone to test their knowledge and skill to operate TeCHO+ mobile phone application. 95% of ANMs passed the test.
➢ **Two way exchange of data from community to health facility and vice a versa**: TeCHO is an interactive platform to provide health services to respective beneficiaries at their door steps with **two way exchange of data from community to health facility and vice a versa**. The system is developed in such a manner that relevant information is shared among appropriate authority. For an example, once ANM diagnose a high risk case, immediately relevant medical officer and notified about this case. Similarly information about death, short supply and incentive management are also uploaded on web interphase in real time basis. Services provided at health facilities is also being entered in TeCHO thru web interface which is then transmitted to respective ANM.
➢ **Interactive web interface for GVK EMRI for data quality verification:** An independent agency, GVK EMRI, does random data verification. A sample data is shared with GVK EMRI call center through an interactive web interface. The call center responders calls out citizens to verify information entered by the ANMs. In case any data is found to be inaccurate, the web interface has feature to send back inaccurate data back to respective ANM.
➢ **SMS facilities** are used for escalating information.

The mobile interface is in form of **facility interactive to taking pictures**, and entering responses in a diagram projected on the screen.

Sustainability, scalability and security:

The software application in its entirety has been designed and developed based on a clearly designed architecture that is easy to scale as well as maintain. This ensures that the application is both scalable and extensible which are key aspects when it comes to sustainability of a software application. The base technologies that are used are all in the Open Source domain including any frameworks, libraries, database, Application Servers and UI Frameworks. The code has clear documentation and is designed for easy maintenance.

MoUs have been documented to ensure the availability of the source code and ensure that there are no vendor dependency issues for maintenance of the software. The domain name as well as all certificates are issued by Government Agencies or approved government partners. The capability requirements for the management of the software as well the administration of the servers as well as the training requirements are documented and can be changed / adopted as the application matures further and expands its scope both longitudinally as well as in depth and coverage of programs.

A web application firewall is used to protect the site against cross-site scripting vulnerabilities and web site vandalism. It also protects the data from SQL injection attacks as well

All sensitive data elements is encrypted and stored in the database. Also a level of indirection in the form of encrypted user identities is also present so that a person's personal information and their medical information can never be corelated other than through the web application.

Web interface is protected by password; hence, only authorized personnel will be able to access the information

The database server is also configured behind the firewall and shall have network access only to the web- server. Only the application is able to access the data- base server to prevent any other application or system to try and break into this data. The database server as well as the web application is installed at a Tier 1 high security data center to prevent

unauthorized physical access to the webservers and the database servers.

Financial sustainability

The project is led, implemented and funded by the Government of Gujarat and National Health Mission. The government is keenly interested in the Digital India movement by digitizing public services. Therefore, the government has and continue to invest in the project.

Social sustainability

Almost all primary users of TeCHO+ are ANMs and ASHA- who are all female. They are first time users of the state of art technology. Their use of mobile phone and application has improved their credibility, confidence and image in their communities. The project has given boost to gender equality in this regards.

Also, the project has reached the most vulnerable communities, especially the tribal population.

Environmental sustainability

The paper based registers maintained by the ANMs are now completely digitized and the paper registers are in process of getting removed by the state government. This will save many papers and trees.

Organizational sustainability

TeCHO+ project is implemented by existing cadres of health workers and no new recruitment from the government has been necessary. The project has strengthened the systems and processes of the rural and urban health delivery.

Benefits
- Real time data entry by service provider at point of service delivery so that real time tracking will be possible for the services of the beneficiaries.

- Maternal Mortality Ratio (MMR) of the state is 91 per one lakh live births (SRS 2014-16). Gujarat is committed to achieve Sustainable Development Goal of MMR 70 in year 2022 and 45 in the year 2030. To achieve this target, it is essential to ensure provision of due services to every pregnant woman without disruption of service; early identification and tracking of early signs of high risk and timely treatment / referral

services if required. TeCHO+ can play an important role in real-time tracking.

- Infant Mortality Rate of Gujarat is 30 per thousand live births the same has been desired to be 10 in year 2022 and 6 in year 2030 under Sustainable Development Goals. This can only be achieved by providing timely services to each new-born where TeCHO+ will play an important role.

- Similarly, TeCHO+ will help in reducing total fertility rate and unmet needs, ensuring minimum three years spacing between two children, increasing the percentage of full immunization of

children 0-1 years, increasing use of contraception, control of communicable and non-communicable diseases, reducing prevalence of malnutrition, anemia control and diagnosing psychiatric diseases and providing proper treatment.

- Digitalization of various Register, Records and reporting.
- In future based on symptom, probable diagnosis and possible treatment will be provided for ANM, facility for scheduling doctors will be included in TeCHO, which will increase the value of health worker.

Under the said project, the EMRI will also provide re- minder / call services through 104 helpline to increase

awareness and get due service, to receive treatment of high risk pregnancy and child-related diseases, ensuring institutional delivery and services to mother and child of out reached and underserved areas. The EMRI will also verify the authenticity of the services reported in TeCHO from the beneficiaries. High risk mothers and children will also be tracked through this helpline and PHC medical officers, ANM will be informed about the status of these beneficiaries. There will be provision of ensured referral linkages in high risk cases. Supervisors and health officials will receive an alert message if due services are not being provided to high risk mothers and children.

Project Partners: SEWA Rural, Argusoft India Ltd, GVK EMRI, UNICEF

References:

[1] Modi D, Gopalan R, Shah S, *et al.* Development and formative evaluation of an innovative mHealth intervention for improving coverage of community-based maternal, newborn and child health services in rural areas of India. *Glob Health Action* 2015; **8**: 26769.

[2] Modi D, Desai S, Dave K, *et al.* Cluster randomized trial of a mHealth intervention "ImTeCHO" to improve delivery of proven maternal, neonatal, and child care interventions through community-based Accredited Social Health Activists (ASHAs) by enhancing their motivation and strengthening . *Trials* 2017; **18**: 270.

[3] Press Information bureau. PM visits Vadnagar, launches Intensified Mission Indradhanush, addresses public meeting. Government of India. Bhubaneshwar. http://www.pib.gov.in/PressReleseDetail.aspx?PRID=1505 368 (accessed on 2 Oct, 2018)

Chapter 16

Integrated Proactive eGovernance (IPeG)

1)Alex Paul Menon (IAS)
Chief Executive Officer
Electronics and Information IT Department, Chhattisgarh
Chhattisgarh Infotech Promotion Society
Raipur, CEO@cgchips.in

2)Pushpendra Kumar Meena (IAS) , Chief Operation Officer
3) Shashank Pandey, Additional Chief Executive Officer

ABSTRACT

This paper offers information about the vision for the birth of Integrated Proactive e Governance (IPeG) project, spearheaded by the Government of Chhattisgarh. The projects intends to develop a technology based whole-of-Government architecture enabling automated identification of potential beneficiary and proactive transfer social welfare benefits and services in a seamless, effective and timely manner. The paper details the IPeG framework and its process as it integrate and automate the various functions in the government system - proactive beneficiary management, grievance management, savings and progress monitoring, evidence and data driven policy making.

The paper describes the framework deployed by Chhattisgarh Infotech Promotion Society for realization of the objective. The framework has major components as, firstly, Common DBT Portal, enabling department beneficiary data digitization, update and direct transfer of benefits to the bank account of the beneficiary. Secondly, Data Exchange Framework enables the integration among multiple departments for the purpose of data cleaning and dynamic real-time data update. Thirdly, Trigger Management System deployed on the top of it, paves the way for automated beneficiary identification for proactive transfer of benefits to the eligible beneficiary avoiding the need for them to apply on their own. Finally, the Data Driven Governance system anchored in data analytics and policy-planning tool facilitate evidence based policy design

1. IPeG Project Overview and Definitions

Chhattisgarh is one of the leading States in providing Proactive e-Governance by leveraging Information Technology. Dedicated efforts have been laid down for strategic deployment of information technology to meet government's aim of achieving quality and excellence in the State Government G2C service, State transactions with citizens and businesses, and internal State Governmental operations. State has also designed IT and ITES Policy to provide stimulus in achieving this vision and laying the foundation of a vibrant IT/ITES industry and meet the state government's vision to create an 'enabled society effectively contributing to the social and economic development' of the State. This is a major step toward democratizing governance and enabling effective delivery of public services.

To further the effective implementation of e-Governance projects it is felt necessary for the state to build a holistic ecosystem –Data Exchange Framework, Data Quality Improvement Methodology, Chhattisgarh DBT Portal, Data Driven Governance Framework which integrates the e-Governance systems and processes of all the departments to bring whole-of-Government perspective enhancing efficiency and effectiveness. Further the project is pivotal in implementing proactive Governance by automated identification of potential beneficiary and trasnfer the benefits eliminating the need for the beneficiary to apply for the social welfare benefits. The project deploys emering technologies as Blockchain, Business Analytics for ensuring data security and evidence based policy design.

1.2 Vision

A governance regime, which ensures reliable, secure and automated citizen- centric services in a proactive manner.

1.3 Mission

To facilitate a paradigm shift in process of delivering Government services by end to end automation of all internal and external Government data interfaces anchored in secure protocols, ensuring ease of doing business, data

driven decision making and proactive citizen centric e-Governance.

1.4 Goals

Following have been envisaged as the goals of the IPeG system for enabling proactive e- Governance in the state:

1. Maximize the automation and digitization for beneficiary management processes.
2. Minimize inclusion and exclusion errors and disburse benefits to all eligible beneficiaries under social welfare schemes.
3. Minimizing leakages of public funds by ensuring accurate identification of beneficiary and data quality management.
4. Ensure data privacy and security for departmental beneficiary data by deploying security protocols.
5. Ensuring timely and automated reporting of DBT progress, savings and grievance redressal.
6. Leveraging crucial statistical insights from IPeG for data driven decision-making.

1.5 IPeG Functions & Benefits

IPeG is a technology based solution to support proactive governance initiatives and building an empowered society. It is being envisioned to build a supportive ecosystem for citizen-centric service delivery, leveraging information technology. It also extends to all concerned government and non-government entities. In a nutshell, IPeG comprises of best practices and guiding principles adhering to data security and privacy, methods to bring about data quality improvement, and data driven proactive e-Governance.

The IPeG envisions to develop technology based architecture and platform that would enhance department's data quality and interactions under secure protocols to enable proactive and seamless delivery of Government benefits. This would further provide an opportunity to the government to bridge the technological inequity and graduate towards effective e-Governance. CHiPS, being the state nodal agency for implementation of ICT related projects in the state, would design the following components necessary to develop this architecture: Data Exchange Framework, Trigger Management Platform, Common application platform, Dashboard & Analytics features (Data driven

governance), Aadhaar vault, Social Registry, Grievance redressal mechanism and Policy Planning tool. This would be in line with defined government's privacy guidelines.

1.5.1 Benefits of IPeG:

Benefits of IPeG from stakeholder perspective:

State:

1. With the Data Exchange Platform in place the State will gain on numerous fronts, primarily from the augmented efficiency of its State departments when it comes to disbursal of public services.
2. By enabling a citizen interface on the Data Exchange Platform the State will be enabled to deliver transparency to its citizens which would not have been possible before.
3. The resulting savings arising from real-time de-duplication of beneficiaries will go on to add to the State's benefits.
4. State would be able to proactively identify the citizens who are eligible for certain benefits and schemes on their own through a Trigger Management Platform (TMP) thereby discarding the need for the citizen to apply on their own or the need for departments to identify beneficiaries manually.

Department:

1. Various departments in the State work in silos and their efforts regarding identification, seeding, and authentication and this leads to massive duplication of efforts on their part.
2. Departments would be able to leverage the data among each other without compromising on citizen privacy and data security.
3. Different department databases would interact with each other in order to validate beneficiary data over a secure application, and irrefutable logs would be maintained of the interactions happening between the departments.

Citizen

1. The Data exchange platform provides the citizen with an interface to log in and access the information pertaining to his availed scheme details, and get access to apply to other schemes on his/her own.
2. The platform will also provision for citizen grievance redressal, which would be managed under stipulated timeline.
3. Citizens would be identified automatically for the schemes and benefits for which they are eligible thereby avoiding the need for them to apply on their own. Thus,

maximum citizens would be covered under the scheme who are eligible for it.

1.5.2 Function:

1. For making data driven policies, leading to proactive e-Governance.

2. For deriving usable results for good governance and creating a collaborative data driven citizen interface for automated real time update of the databases.

3. For enabling benefit transfer to accurately identified beneficiary and minimizing leakages. India as well a nations similar in characteristics to Chhattisgarh.

2. IPeG Components and their Definition:

2.1 Data Exchange Framework: Data Exchange framework (DEF) is a technology based solutions supporting good governance initiatives and building an empowered society. It is being envisioned to build a supportive ecosystem for citizen-centric service delivery leveraging information technology compliant with privacy protocols. It also extends to all concerned government and non-government entities. In a nutshell, DEF comprises of best practices and guiding principles adhering to data security and privacy, methods to bring about data quality improvement, and data exchange platform for data driven proactive eGovernance.

2.2 Social Registry: Most of the Government departments have been using SEC as fundamental database to target beneficiary. Therefore, for the purpose of data standardization and data quality it is vital to update and improve the quality of SECC database. Data Exchange Framework would have social registry as a key data updation system. Social registry would be a common centralized system having an updated SEC database. The registry would have an integrated system of data updation, in the front end it provide a citizen interface for direct and regular update by the citizen. Further, through a publisher and subscriber model it would enable private and secure interaction with departmental database through a network of secure API for data update and management.

2.3 Common Application Platform: It is a Common Application Platform that would be developed and provided to different departments to facilitate beneficiary life cycle management, to validate and take consent of beneficiaries for Aadhaar along with their identity validation. It will help in updating the beneficiary details

in the database. It will also help departments to undertake end-to-end scheme digitization, right from beneficiary identification to benefit disbursement

2.4 Trigger Management Platform: It is a system that can automatically identify the eligibility of the beneficiary for any government scheme and trigger a response to both department and beneficiary about inclusion and exclusion of beneficiary in the concerned beneficiary database.

As illustrated in above diagram, first trigger would occur at the time of birth and the schemes pertaining to this trigger would be notified. The event for the first trigger need to be manually generated; rest triggers would be automatically propagated to the various stages of life according to the eligibility of beneficiary. For example, the information of beneficiary registered in the birth registered would be communicated to the relevant schemes for which he is eligible at the age of six. Similar would be the propagation of event to the eligible schemes at the various stages of life. Thus by this mechanism we would be able to create a complete automated life cycle management system of the beneficiary. In addition, self-seeding initiated by the citizen would also entail the automatic seeding of the citizen in all the schemes where they are eligible.

2.5 Aadhaar Vault: Aadhaar Data Vault is a centralized storage for all the Aadhaar numbers collected by the AUAs/KUAs/Sub-AUAs/ or any other agency for specific purposes under Aadhaar Act and Regulations, 2016 and Chhattisgarh State Aadhaar Act, 2018. It is a secured system, which consists of reference key, which is a unique token to represent the Aadhaar number.

2.6 Grievance Redressal System: A system partially exists in the state for troubleshooting the problems faced by citizen in availing scheme benefits. Presently, it only supports outbound calls, which needs to be enhanced to support inbound calls and allied problem solving processes.

2.7 Policy Planning Tool: The state intends to convert the process of policy formulation into a completely data driven

one. This can be achieved through the adoption of existing policy planning tool across all departments and connecting this tool to all other systems being built as a part of this implementation. Necessary integrations need to be undertaken with the newly developed components of IPeG.

3. Technology

3.1 Blockchain utility for proactive eGovernance

Within our Proactive eGovernance model, there is a continuous exchange of data between various departments, the usage of Blockchain technology for identity management can provide the middle path between having ease of identity authentication and between citizen data privacy.

Given that Blockchain offers us the gifts of irrefutability, time stamps, and audit trails, it can be leveraged to create a possibility of trust between not just State and citizens but between various departments of the State. The database of citizens itself need not be in Blockchain, but an additional layer could be provided over a traditional database and still the essential advantages of the technology could be leveraged to our advantage.

Going in future, the government can also consider using the technology for authenticating delivery of benefits or subsidies to citizens as well to radically enhance their Direct Benefits Transfers scheme.

Blockchain can enable us to perform necessary data analysis without running the risk of profiling or breach of privacy. This aspect could prove to be instrumental in future where the advantages and risks of oncoming data will have to be balanced.

Further, after identity management and data security, Blockchain could be extended for other aspects of a citizen's life, namely health records and land records. Considering the sensitive nature of the data at hand, as well as the tremendous utility of having the data secured and available, a Blockchain environment surrounding a citizen's life could be envisioned for the future.

3.2 API environment for Data Exchange

DEF will allow API based system-to-system information/ data transfers, bulk upload of a data files or direct entry of data records through a web-based portal. 'Data Exchange' reflects the two-way focus on both smarter and more

efficient ways of collecting data from public delivery agencies, and more useful data reporting about the outcomes achieved for individuals, families and communities. Data requirements will be streamlined, processes automated and performance focused measurements for more meaningful information about service delivery outcomes. Specifically there will be:

- Significantly fewer data items reported
- Streamlined reporting arrangements
- A simple and easy to use IT tool (the Data Exchange)
- Greater access to outcome data

4. Benefits of IPeG:
With Proactive e-Governance we bring the citizen to the center-stage of public service delivery by ensuring that least amount of onus is laid upon the citizen and government takes up responsibility of correct identification of beneficiaries along with ensuring that their data privacy and consent is respected:

- With the 'Data Exchange Platform' in place, we save the State's resources by eliminating the duplication of efforts of the departments.
- The 'Trigger Management Platform' ensures that eligible beneficiaries are not left out of availing from their deserving benefits, as well as ensuring that ineligible or cancelled beneficiaries would be deregistered from the department's databases automatically thereby saving resources.

Further, the rising concerns of citizen data privacy can be addressed effectively with the adoption of emerging technologies like Blockchain. Since the Government is already moving towards an era of digitization of all its records, it makes good sense to begin directly with Blockchain wherever the use-case for it stands reasonably justified. With Blockchain and other emerging technologies, the Government itself becomes more accountable to maintaining citizen privacy given the feature provided by these technologies.

5. The Way Ahead for Chhattisgarh
CHiPS is working with experts across the globe and given the unprecedented nature of the project itself, it is working to conduct a number of proof-of-concepts to validate the use-cases, especially when it comes to emerging technologies. CHiPS has also conducted an international Blockchain Grand Challenge that saw participation of start-ups from across the world. The conceptual framework is thus being validated by both

on-ground pilots as well as after validation from experts in relevant domains.

The framework envisioned would fit well to any State like Chhattisgarh, which does not have the burden of any archaic legacy systems and where there is a real potential to leapfrog to a citizen-centric model of governance. Consequently, if successful, there is a wide scope of replication of the Proactive e-Governance model across the states of India as well as nations similar in characteristics to Chhattisgarh

Chapter 17

National Generic Document Registration System

Sub Theme: One Nation One Platform

Deepak Chandra Misra,Seemantinee Sengupta, D. S. Venkatesh

National Informatics Centre, A-Block, CGO Complex, Lodhi Road, New Delhi - 110 003 India

dcmisra@gov.in, ssengupta@nic.in, venkat@nic.in

K J Honrao, Vishakha S Gorwade

National Informatics Centre, Software Development Unit, Pune, Maharashtra – 411005 India

gauri.honrao@nic.in, gorwade.vs@nic.in

P. Gayatri

National Informatics Centre, Hyderabad,Telangana – 500063 India

gayatri.ap@nic.in

Abstract

Different States and Union Territories are using State specific applications for digitising state specific property and document registration processes. Many of these applications are custom developed under Digital India Land Records Modernization Programme (DILRMP), a programme launched by Government of India in August 2008 to modernize management of land records, minimize scope of land/property disputes and enhance transparency in the land records maintenance system.

A survey by the National Informatics Centre (NIC), Department of Land Resources (DoLR) team conducted in 2015-16 revealed that most of these applications needed to be upgraded using modern technologies. Drawbacks in terms of comprehensiveness, security, scalability, reusability and interoperability with the state land records systems and other intra / inter departmental applications were a recurrent observation across all these applications developed by states / Union Territories. After due considerations to the various alternatives, it was identified that development of a National Generic Document Registration System (NGDRS) that could be leveraged across States represented the best course of action to alleviate these shortcomings.

This paper describes the key features and components of one nation oneplatform –National Generic Document Registration System and its impact on document registration domain across States / Union Territories.

Index terms –NGDRS, Paper Submission, National Conference, e-Governance, One Nation One Platform

Document Registration in India

Registration is the process of recording a document with a recognized officer and to safeguard its original copies. Registration of all (different) types of document is not necessary but it plays key role in the overall governance ecosystem by being the authentic source of property and other articles related information. Registration of the document is governed by the Registration Act 1908[3] and is a State subject. Assessment of stamp duty as per the Indian Stamp Act or the State Stamp Act is also a core function in the property registration process. The Registration Act 1908 categorises document registration in two broader terms – Mandatory Registration and Optional Registration.

Computerization of Document Registration in India

Since document registration is a State subject, States have taken their initiatives to modernize the management of registration of different articles, and to facilitate moving towards guaranteed conclusive titles to immovable properties in the country, based on the analysis conducted by NIC, the States and Union Territories of India can be categorised as below in using the applications for document registration in the current context:

1. Manual - States which have digitised some of the processes but still are dependent on manual processes.
2. Automated - States which have digitised the process to a broader extent but still the standards, interoperability and technology upgrade are the key issues faced by them. And, wherever there are

connectivity issues, certain processes are being achieved manually.

This has led to creation of multiple applications which resulted in issues like - implementation and maintenance cost & quality, standards, interoperability with required stakeholders/applications.

Drivers of One Nation One Platform for Document Registration Process

Some of the major challenges faced by the stakeholders which led to the vision of One Nation One Platform - National Generic Document Registration System (NGDRS)- are:

1. Enabling a flexible system which can meet dynamic needs of various stakeholders.
2. Focus towards achieving reduction in land disputes because of increased efficiency and transparency in the processes No Single Source of Truth: The States were either providing document registration services through manual processes or partially automated processes. So, there was no single source of truth for the registration related information.
3. Siloed Applications: Different States were using different applications for different capabilities and these systems were not integrated to provide the larger point of view.
4. Performance and Efficiency Measurement: Mechanism to measure efficiency of registry offices was not defined.

Some of the operational challenges which impacted citizens and department:

1. Long waiting time for completion of the registration process at the offices of Sub-Registrar
2. Lack of adequate transparency and involvement of various middlemen dealing in land related issues.

Difficulty in analysis of the transactions for any decision-making. Scope for wrong valuation because of the manual processes involvement Difficult to find the transaction history of a property due to increased number of transactions. These drivers and challenges led to the initiative for development of Enterprise Architecture Framework and National Generic Document Registration System.

Enterprise Architecture Framework for Document Registration Ecosystem

To assist the States and Union Territories in analyzing and streamlining their document registration landscape, and guide them in adopting the NGDRS in a swift and methodical manner, a framework titled "Document Registration System Enterprise Architecture Framework (DRS EAF) [1]" has been developed by using the India Enterprise Architecture (IndEA) Framework of Government of India. The EA Framework defines a holistic view of the document registration capabilities and processes required for the effective functioning of the document registration system. EA Framework also helped to check and suggest the scalability and modularity of the NGDRS application, advanced data and application security architecture along with a measurement mechanism for registration process and department. The whole-of-government approach was driven around the vision *"To provide "One Nation One Software" for document registration services under Digital India Land Records Modernization Programme"*. Mission of NGDRS is *"to provide document registration services with effective use of modern technology to the people using well defined procedures, with right means, in specific time frame and the transparent manner."*

DRS EAF as a framework provides a set of building blocks which will help the State IGRs or departments to build and customize their own enterprise architectures as per their State's document registration laws and policies, which are compliant to the standards and guidelines of Department of Land Resources and Registration Act 1908. In a broader sense the framework works as a superset of structures functions and business services and states can then customize it as per their need. IndEA was the starting reference point guide for the development of DRS EAF and is aligned with 8 reference layers' of IndEA (business, data, application, technology, application integration, security, governance and performance) which contain the related artefacts of these different dimensions. IndEA is a framework that enables the development and implementation of Enterprise Architectures independently and in parallel by all governments and their agencies across India, conforming to the same models and standards.

Mechanism to measure the efficiency and effectiveness

Mechanism to measure the efficiency and effectiveness of the document registration process has been defined under performance reference model which provides a uniform and consistent mechanism including the key performance indicators for different levels and hierarchies and processes in achieving the overall goals of the department in a cost-effective manner. KPIs are the principal instrument to rationally measure the outputs and outcomes of the document registration processes.

Business Footprint of Document Registration Ecosystem

Citizen focused Business Footprint diagram depicts the integrated view covering all the eight architecture domains

(reference layers) [2]. The scenario covers citizen as a stakeholder who triggers the service, KPIs addressed, business and application capabilities utilised to deliver the services, core data hubs participation, technology and security components used with integration of inter departmental applications and the governance board defined.
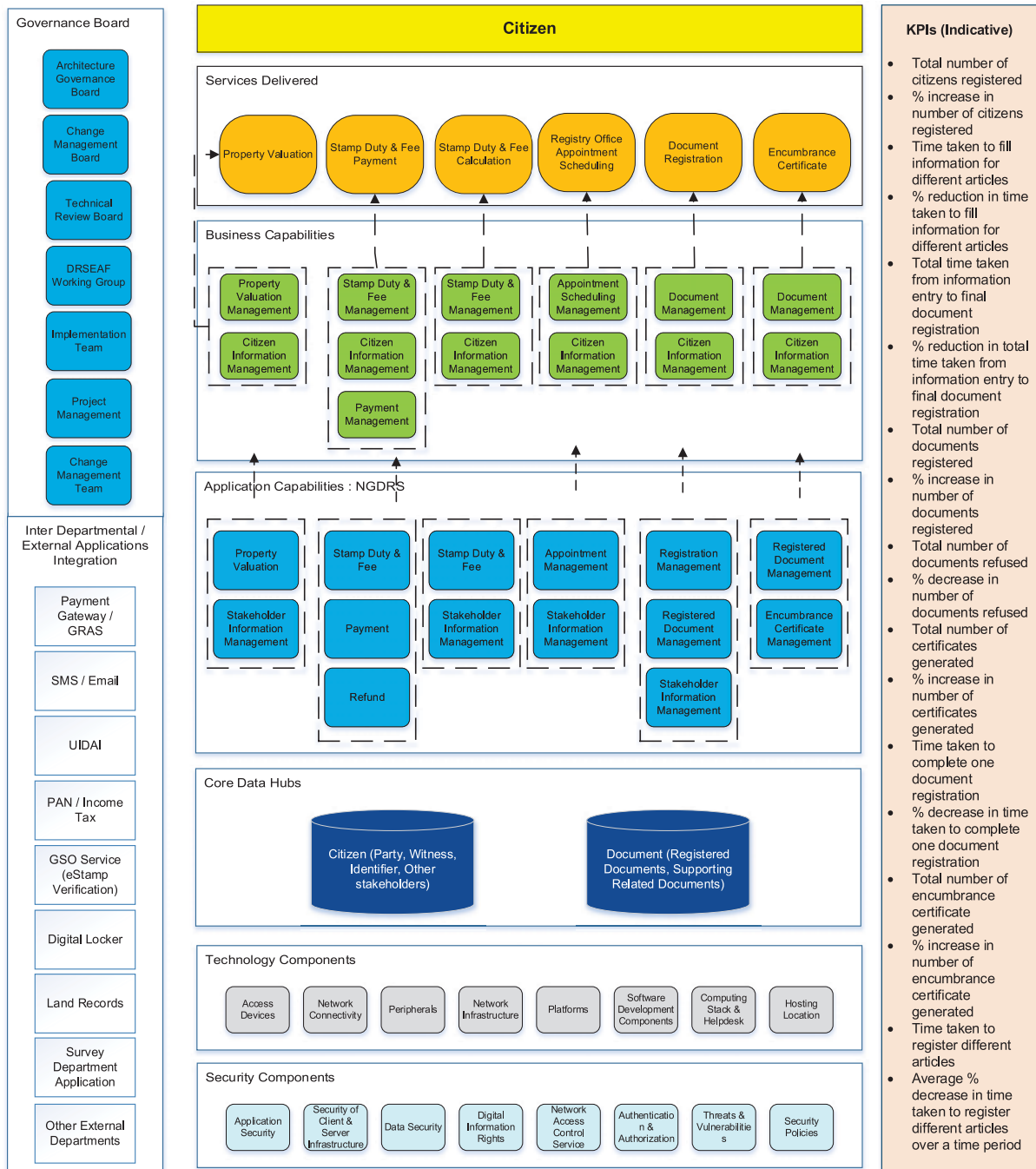
Figure 1: Business Footprint Diagram - Document Registration System

National Generic Document Registration System
Approach
The first step in this direction was to understand the document registration domain across different states / Union Territories, meetings and discussions were held with some representative States. Subsequently a detailed questionnaire was floated to all States / UnionTerritories to capture the variations in the document registration process.

This exercise ensured that individual requirements of the States were identified and consolidated into a set of generalized requirements for NGDRS. The next step was to finalize the requirements and approval from the

Figure 2: NGDRS Design and Development Approach

NGDRS As a Product

NGDRS Technical Solution Perspective
1. NGDRS Technical Solution Perspective One Nation One Platform contributing to Digital India e-Governance Initiative
2. Contribution to ease of doing business
3. Open source technology and MeitY Productization standards adopted
4. Single, web based, cloud enabled application
5. Configurable State Instances as per State's Property Registration Act
6. Unicode based multiple local language compliant
7. A complete user interface for registration process
8. Role based flexible authentication & authorisation
9. Rule engine based development Provision for usage of biometric, iris, web camera and other peripheral devices
10. Mobile and email communication
11. Web services for external government database linkages and data sharing

Key Features of NGDRS Solution
The National Generic Document Registration System provides mechanism for citizens to register the documents with a Registering Officer for conservation of evidence, assurance of title, publicity of documents and prevention of fraud. The following are the main features of the product:

1. Citizen empowerment through online entry of deed, online payment, online appointment, online admission, document search and certified copy generation

department, post which the designing and development of NGDRS commenced. Diagram below represents the NGDRS design and development approach followed:

2. Rule based online property valuation
3. Calculation & payment of stamp duty, registration fee and other fee types
4. SMS and email enabled alerts on valid/ prohibited property transactions
5. eKYC - UID based authentication with the help of biometric or iris at the time of Admission
6. Linkage with land records system
7. Interface for online payment facility
8. eSign for digital document signing
9. PAN verification
10. Data export API for Income Tax Department
11. Storage of copy of registered documents using scanning technology
12. Registration anywhere within concurrent jurisdiction
13. Generation of Registration certificate, Index & Summary reports

Dashboards created in NGDRS are control tools that help in continuous monitoring of the activities of all Sub Registrar offices in the State at a click of a button. The activities like opening and closing of office, the registration of documents, scanning of documents with the time details can be monitored and administered by the IGR using NGDRS. The system also generates daily reports on various activities, thus helping to control any non-compliance immediately.

NGDRS Application Modules
NGDRS provides multiple modules and major functions under each. The modules are uniquely identified as:

Table 1: NGDRS Modules and Functions

Module Name	Function
Appointment for Registration	Management of online appointment (normal and tatkal) for document submission at SRO
Property Valuation	Rule based valuation with accurate calculation of property cost
Stamp Duty & Fee Calculator	Calculation of stamp duty, registration fees and other applicable fees like processing/ scanning/ print fees, etc.
Public Data Entry	Management of user registration, property, party, witness, identifier and other document related information

Document Registration	Scrutiny, payment verification Final endorsement, scanning of registered document and storage management
Document Search	Document search and encumbrance certificate management
Case Monitoring	Case lifecycle management (Case Admission, Case Notice, Case Hearing, Case Judgment, Case Disposal, Case Monitoring)
Administration	Land types, measurement units and other requirements management for document registration
Configuration Management	Configuration of the administrative blocks, property usages, valuation rules rate chart information management
User Management	Management of registrar's offices, employees, biometrics
Dashboard	Dashboard report generation and management

NGDRS Implementation Approach
NGDRS has been built as a collection of variations, rules, languages and processes which can be configured in a quick time frame for any State and the major steps to adopt it are described in the figures 2 & 3:

Figure 3: Phase 1

Figure 4: Phase 2

Figure 5: Phase 3

NGDRS Deployment
High Availability (HA) and Disaster Recovery (DR) strategies were created to address non-functional requirements, such as performance, system availability, fault tolerance, data retention, business continuity, and user experience. These strategies were translated into a deployment model for the solution.

NGDRS Implementation Status
NGDRS has already been implemented and launched in Punjab, Andaman Nicobar, Manipur, Jharkhand and Goa States/Union Territories. The State of Punjab is first state in the country to implement NGDRS application that has been customized and configured as per the requirements finalized by Department of Revenue (Govt. of Punjab). Mizoram is in advanced stage of customization and implementation. Other state instances under testing include Bihar, Uttarakhand, Himachal Pradesh, Madhya Pradesh, Maharashtra and Rajasthan. Puducherry, Tripura, Chhattisgarh, Kerala, Nagaland, Daman &Diu have communicated their desire to implement the system.

Impact of NGDRS

Transparency and stakeholder participation

1. Citizen empowerment through online entry of deed, online payment, online appointment, online admission, document search and certified copy generation
2. Property rate chart (Ready Reckoner) readily available for citizens
3. Rule based transparent online valuation with accurate calculation of property value
4. Rule based fee calculator available for citizens to calculate the amount of stamp duty, registration fee, handling charges and other applicable fee types

Increased efficiency of processes

1. Standard procedures followed throughout the implementing State
2. Accommodates all variations/ gaps prevailing across the States
3. Cost effective solution with improved efficiency and transparency achieved in document registration process
4. Configuration under the control of State Registration Department which includes work flow processes, property valuation rules, fee and exemption rules, property rate chart, user roles and authentication types
5. Presentation for Document registration anywhere within concurrent jurisdiction

6. Ease of maintaining valuation rules, property rates, and fee & exemption rules
7. Prohibited property related transaction notice

Effectiveness of outcomes

1. Reduced process time of document registration at Sub Registrar level
2. Dashboard for senior authorities for monitoring the outcomes and analysing the performance or challenges faced by SROs. This helps in taking the corrective and preventive measures
3. Data shared and used by important government authorities/stakeholders with a data policy and standards in place
4. External system integrations can be provided as required (i.e. eSign, eKYC, Payment Gateways, PAN Verification, 7/12 (ROR) to fetch party names)
5. Promotes ease of doing business by simplifying and reducing the dependencies on middlemen

Way Forward
Being a solution, which can cater to all the States/Union Territories, NGDRS provides the flexibility to the States to quickly conduct an analysis, understand and gather the requirements, configure and implement the solution at state and district levels. This will allow the department to easily automate the process of document registration to increase the service delivery quality and efficiency. The NGDRS solution has adopted open architecture for plug & play, scalability, common use of service, infrastructure and software knowledge.

Usage of digital technologies such as blockchain for verification and validation of registered article information and for organizing and managing activities of the functionaries in geographically dispersed locations has been considered.This will be the edge factor to reduce the fraudulent registrations and increase the transparency in the whole document registration domain.

Conclusion
With the increased internet penetration and improved ICT infrastructure, governments around the world are transforming the way they offer administrative services. Governments are leveraging the enhanced infrastructure to push towards active, enhanced and automated services provided to the citizens. Towards this vision, One Nation One Platform can be very helpful for the government agencies if identified, implemented, governed and managed well across States/Union Territories, departments or other stakeholders.

National Generic Document Registration system will help the states and union territories to adopt and automate the document registration process at the same time the integrations with external departmental application along with services for sharing data is provisioned which will lead to provide maximum value to departmental end users.

NGDRS is a common, generic and configurable web based solution which enables collaboration between different participating stakeholders and is effective as 'anywhere-anytime' availability of the information related to the document registration.

References
[1] Document Registration System Enterprise Architecture Frameworkhttps://nicea.nic.in/node/194

[2] IndEA Framework and Adoption Guide http://egovstandards.gov.in/sites/default/files/IndEA%20Framework%201.0.pdf

[3] Registration Act, 1908

https://indiacode.nic.in/acts/7.%20Registration%20Act,%201908.pdf

Chapter 18

Reduction in Civil Litigation by Interlinked Databases

– An Approach

Arpit Jain Singhai

Scientist-'B'

National Informatics Centre

Ministry of Electronics & IT

Govt. of India

Email: arpit.jain@nic.in

Amber Jain Singhai

B.A.L.L.B. (Hons.) 5th year

Damodaram Sanjivayya National Law University,

Visakhapatnam

Email: amberjaindsnlu@gmail.com

1.   ABSTRACT

Timely delivery of justice has always been a major pain point in India. Various reforms and systematic improvements made in judicial system over time have lowered the pendency in courts. But, the number of cases have steadily reached to over 2.18 crore [2], thereby entailing need for further reforms in handling litigation in judicial system. In this paper, we present an innovative inter-linked method of exchanging information between government and courts using Information and Communication Tools which can reduce litigation to a large extent. The paper presents a workable model for government – judiciary collaboration by which fake litigants shall be deterred in pursuing their cases in courts of law. The model suggested here shall need to be supported by certain amendments in laws to accommodate ICT enabled tools in justice delivery. Creation of unique identification for land is also proposed akin to Aadhaar which can be used to develop decision support systems for courts. Various judgments of court and legislations pertaining to reduction in litigation by use of technology have been also analyzed here.

KeyWords: Aadhaar, Civil Litigation, Multimodal Data Analytics, Land Unique Identification, Geotagging, e-Judiciary

3.   INTRODUCTION

The judicial system in India has been slowly adapting ICT tools for various purposes. "E-Courts", "e-Legalix" and few other case management systems have already been deployed in various courts across the country.

But, this has not helped courts in achieving speed in delivery of justice. Although transparency has increased, same has been negated by rising pendency in the courts. Most of the court matters pertain to two distinct strains of law, criminal and civil. Majority of cases currently pending in courts pertain to civil matters. And the question which constantly haunts such cases is "ownership" and "possession". With ICT tools being implemented in various departments across central and state government, it is now possible to find answer of questions pertaining to "ownership" and "possession" with higher accuracy, thus rendering valuable assistance to learned judges in faster delivery of justice in civil suites. An ideal scenario should be one where change in one aspect of land record has consecutive non-alterative change in all aspects of land record. But, due to multiplicity of controls and laws, a change in ownership has to be proved and recorded in numerous departments. Even a single spare unchecked could lead to a

---

[2]More than 2 crore cases pending in India's district courts: Report. Retrieved June 9, 2016 from http://indianexpress.com/article/india/india-news-india/indian-judiciary-shortage-judges-ts-thakur-2-crore-cases-pending-in-indias-district-courts-report-2842023/.

heavily time consuming unfruitful litigation by miscreants in court.

4. INTEGRATED LAND INFORMATION SYSTEM
Integrated land information system is a system which shall combine all stratums of land records to form a single standardized comprehensive land database (SSCLD) of all information pertaining to a piece of land in the country by using ICT tools already being used by government. This shall involve:

Table 1. Categories of data sources involved in SSCLD

Sl.	Type of data	Data Source	Agency
1	Satellite imagery	Shrishti GIS	Available / NIC / ISRO / Remote Sensing
2	Khasra data	Bhulekh maps	Already digitized / State governments/ Lekhpals
3	Khatauni	National Land Record Modernizatio n programmes	Already digitized / State Government / NIC
4	Registry data	Registry offices	Already digitized / State government
5	Urban planning data	Development Authorities	Not yet digitized / state government
6	Property tax data	Municipal Corporation/ Board under AMRUT	Digitized / State government
7	Agricult ural Farms sale	e-Procurement System	Available in some states
8	Litigatio n data	e-Legalix	Available but needs interlinking / Courts
9	Water Tax Bills	Data with respective Engineering Divisions	Available but needs interlinking / Central / State government
10	Electricit y Bills	Data with respective Engineering Divisions	Available but needs interlinking / Central / State government

5. DETAILED PARAMETERS
   a. *Satellite Imagery data*
Satellite imagery data with a resolution of at least 1mtrs with panchromatic images of land is now available with ISRO. Shrishti GIS [3] developed by NIC also has large amount data pertaining to land terrain and geography. This data shall assume primary place when preparing SSCLD. A policy governing annual recording of photographs of a region and linking them with land data shall provide courts with accurate picture of condition of land over time when litigants approach court submitting claims of ownership or possession. For example, a tin shade, house or trees at a location can give clear idea about occupation of some kind.

   b. *Khasra data (Historical land map data)*
In most of the states of India land records digitization has been done under NLRMP[4] project, in Uttar Pradesh, khasra record contains a hand drawn map of entire village accounting for old mutations and changes in habitation. This record has been already digitized and being further

---

[3] http://gis.up.nic.in
[4] NLRMP: National Land Record Modernization Programme launched by Government of India in August 2008, aims to modernize management of land records, minimize scope of land/property disputes, enhance transparency in the land records maintenance system, and facilitate moving eventually towards guaranteed conclusive titles to immovable properties in the country. The major components of the programme are

computerization of all land records including mutations, digitization of maps and integration of textual and spatial data, survey/re-survey and updation of all survey and settlement records including creation of original cadastral records wherever necessary, computerization of registration and its integration with the land records maintenance system, development of core Geospatial Information System (GIS) and capacity building.

linked to "Record-of-Rights" (RoR) i.e. Khatauni , to give precise information about the size of holding and right holder / titleholder details and succession.

c. Khatauni data (Record of Rights)

Under National Land Record Modernization Programme (NLRMP)[5], the right holder data has already been digitized and readily available on websites of respective land record departments of State Governments.

d. Registry data

In rural areas, sale or transfer of land is recorded in ROR data while in urban areas, sale of property or land is recorded by Registry. Incharge registry official registers a sale/purchase after the payment of requisite stamp duty. Noteworthy being that majority of litigation in civil courts comes from this factor alone. This due to the fact that registry official do not check previous ownership of land / property from past records neither any provision of law compulsively forces them to do so, resulting in resale of already sold property or fake registries forcing actual owner to contest the same in civil courts.

e. Urban planning data

In notified urban areas, the governments establish Urban Development Authorities which are whole sole in-charge of urban planning in their domain. Every permanent construction plan has to be designed by a registered architect and duly submitted to the authority for approval. Only on proper approval, construction can be started. A complete design drawing of construction with details of various neighbors, roads etc. has to be provided in this plan. Since, urban planning data is not linked to any other land record data, mischievous encroachers are often successful in getting wrongful / dubious construction plans approved which are later contested in civil courts. A digitization exercise to digitalize existing records and timely computerized update of all approvals shall assist authorities in tracking, protecting and verifying construction plans as per the existing laws.

f. Property tax data

In rural areas, farmers have to pay annual tax / fees to government as per the land being tilted. In urban areas, Municipal Corporations / Boards / Palika / Parishads charge annual property tax from owners / possessors for

maintenance of civic amenities. The records of property tax are often used in civil courts to submit claims regarding a possession / ownership. But again non-interlinking of this data with other land data makes property tax record forging an easy task by submitting limited / outdated documentation to get owner's name mutated.

Thus again causing litigation and claims challenged in civil courts. Under central government's AMRUT[6] project, a large portion of Property tax data is now available in digital format and can be easily linked to SSCLD.

g. Agricultural farms sale data

Agricultural produce from farming is sold either in open market or to government owned procurement centers the government owned procurement centers keep strict records of the cultivation of farming land and amount of produce and accordingly the payments are made to farmers electronically. But this system is not linked to the online khasra and khatauni data, due to which exact nature of agricultural sale and claims regarding tilting of land / possession in rural areas are disputed.

h. Litigation data

It has been observed that many a times litigants after laying claim over rightful owners of the land / property and submitting multiple claims in civil courts either persuade rightful owner for out of court settlement or force him to sale the land / property while in litigation. Such transfers of land / property create new questions of ownership which are again to be settled in court of law. A proper interlinked data regarding litigation related to a piece of land and publicly accessible shall help potential purchaser to know the current State of prospective purchase.

i. Water tax bills data

On the basis of documents pertaining to ownership or rent holder deed, water supply connection is provided to applicant. The receipts of payment of water tax are often produced in courts to submitting claims about history of possession even if the litigant has not availed a single drop of water. This happens due to differences in current

---

[5] Supra Note 3
[6] AMRUT: The purpose of Atal Mission for Rejuvenation and Urban Transformation (AMRUT) is to (i) ensure that every household has access to a tap with assured supply of water and a sewerage connection; (ii)

increase the amenity value of cities by developing greenery and well maintained open spaces (e.g. parks); and (iii) reduce pollution by switching to public transport or constructing facilities for non-motorized transport (e.g. walking and cycling).

records of rent holding / ownership and water tax records. On termination of rent agreement, if respective water tax record is changed or connection is removed, then such cases of spurious possession claims shall be reduced. But this is only possible if rent agreements are duly registered in registry offices and the details are interlinked with water taxation system data.

Table 2. Datatype of SSCLD

    j.   Electricity bill data

Electricity connection requires address proof, ownership proof or NOC by owner / property tax receipt / rent agreement etc. Once these documents are submitted, electricity connection is provided to the applicant. Consider a case where a tenant who resided and year back and has already left the property, submits a year old documents to avail an electricity connection without knowledge of owner and later claims forceful dispossession and sues the owner in court. This situation could not have arisen if electricity department could have updated and interlinked records of property tax and registered rent agreement etc. Civil courts have to place high reliance on historical records before they arrive at conclusion, but the same records, if outdated create a larger mess only to sorted in extremely slow yielding litigation and claims and counter claims.

6.   ASSOCIATED DATABASE FIELDS

Since respective departments are owners and controllers of their data, the information from multiple agencies shall not be available on one server but shall be sourced in real time from servers of respective departments. To maintain high integrity of data, following standardization features shall be required in documentation and applications:

    5.1   AADHAAR LINKING: Aadhaar number should be made compulsory in all land / property related transactions and same should be followed by biometric authentication to verify antecedents of applicants. Presence of AADHAAR details in all records shall minimize fraudulent claims and application.

    5.2 CROSS VERIFICATION: Interlinking of records should allow cross verification of records before approval of applications.

5.3   FORMS and FORMAT: There should be standard legal document template designed for sale / purchase / rent agreements / mutation which can be easily transferred to digital databases. All such applications should confer to a nationwide standard paving way for integration of records. Vaguely written agreements without proper citations should be discouraged by rule of law.

Sl. No.	Type of data	Data Fields	Type
1	Satellite imagery	Latitude / Longitude / Area Markers	SPATIAL
2	Khasra data	Map File / Boundary Marked	XML
3	Khatauni	Name of Owner / Area under possession / UID of property / land	NVARCHAR
4	Registry data	Name of Owner / Area under possession / UID of property / land / Biometric data	NVARCHAR / XML
5	Urban Planning data	Name of Owner / Area under possession / UID of property / Land / Urban planning Standards verification	As Above
6	Property tax data	Name of Owner / Area under possession / UID of property land	NVARCHAR
7	Agricultural Farms sale	Name of Owner / Area under possession / UID of property / land / Biometric data	NVARCHAR
8	Litigation data	Name of parties in civil suit / Area Coordinates Latitude/ Longitude	NVARCHAR / SPATIAL
9	Water Tax Bills	Owner name / Fathers name / lat/ long / rent agreement details / expiration date check / biometric data	NVARCHAR / XML / SPATIAL
10	Electricity Bills	Owner name / Fathers name / lat/ long / rent agreement details / expiration date check / biometric data	As Above

7. UNIQUE IDENTIFICATION RECORD OF LAND (Dharti UID)

Akin to Aadhaar for residents of India, unique land identification should be provided to land across the country. This unique ID should contain following data:

6.1. Spatial data locked in a grid covering entire country of a standardized square/rectangular/ hexagonal size of approx. 10-20 sq. mtrs.

6.2. Various land parcels in the grid shall be further identified and geo tagged on the basis of Khasra / kahatauni information / registry information.

6.3. Land Unique ID with main grid level identification code, sub- grid level identification code and spatial data identification code shall be created.

6.4. Land Unique ID shall not have state / district level markers incorporated in ID but shall be identified through spatial data markers.

6.5. Historical data of land shall be accessible to know past ownership details akin to purchase of vehicles.
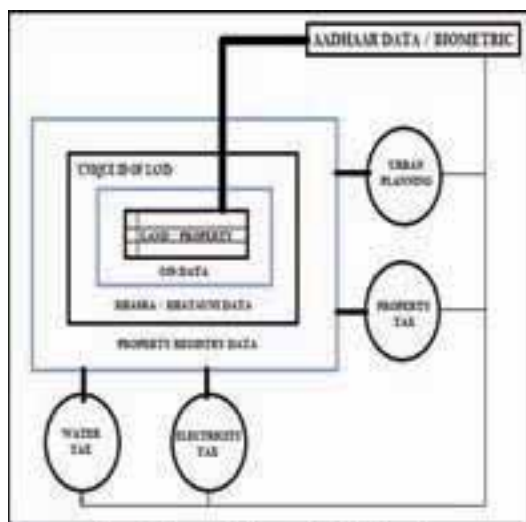

Figure 1. Interconnected data sources for land information

8. LEGAL ASPECTS

Indian judiciary has been continuously working on improving various aspects of legal services including courtroom proceedings and non-courtroom activities. Technological indulgence has played key role in fast pacing justice delivery system in India. Introduction of e-court, video-conferencing and use of social platforms as legal means of summoning has ushered a new wave of transformation in Indian judiciary. Still, a lot has to be done, especially in lower courts where basic computer knowledge is hard to find. Law Commission of India in its various reports has singularly pointed out the role of information technology in improving efficiency of judiciary. In its 213th Report[7] the Commission opines that *"In this era of globalization and rapid technological developments, which is affecting almost all economies and presenting new challenges and opportunities, judiciary cannot afford to lag behind and has to be fully prepared to meet the challenges of the age. It is heartening to note that use of information and communication technology in judiciary is growing despite various constraints. Day-to-day management of courts at all levels can be simplified and improved through use of technology including availability of case-law and meeting administrative requirements. Congestion in court complex can also be substantially reduced through electronic dissemination of information. The objectives that can be achieve(d) through use of technology include transparency of information, streamlining of judicial administration and reduction of cost."* In the same report[8] Commission further submits that, *"The speedy trail is guaranteed under Article 21 of the Constitution of India."*

On the issue of English being dominative language of communication in higher courts, 216th Report of Law Commission[9] opined that *"Reforms in Indian judiciary are already overdue which are possible when English alone is allowed to be used for the higher judiciary besides availing the emerging advancements in science and technology."* and *"Apart from Revenue laws, several new subjects like information technology, stem cell development, telegraphic laws and laws relating to cyber crime can be provided for only in English. Many of the phrases and expressions which are used in English language, it would be difficult and, indeed a complete waste of public time and money, to prepare them in Hindi."* So, apprehension that use of English due to technological usage in judiciary has been largely settled in this report.

[7] Report On Fast Track Magisterial Courts For Dishonored Cheque, 213th Law Commission of India, Government of India, 21-22, Nov. 2008.
[8] Supra Note 5

[9] Report on Non-Feasibility of Introduction of Hindi as Compulsory Language in the Supreme Court of India, 216th Law Commission Of India, Government of India, 46 December 2008.

As has been the case with Aadhaar (UIDAI), interlinking of databases to form a unique identifiable characteristic can also raise privacy alarm among skeptics. Article 21 of constitution implicitly protects privacy as individual's right.

On this issue, Law Commission in its 271st report[10] (DNA profiling and Fingerprinting), July 2017, categorically viewed privacy as a subject of serving of wider state interest while narrowly interpretable form of privacy infringement. It said that *"While examining the constitutional validity of a law providing restrictions on fundamental rights, the proportionality of measures taken becomes relevant. The "compelling State interest" is just one aspect of the broader "strict scrutiny" test, which was applied by the Court in Anuj Garg v. Hotel Association of India 55. The other essential facet is to demonstrate "narrow tailoring", i.e., the State must demonstrate that even if a compelling interest exists, it has adopted a method that will infringe in the narrowest possible manner upon individual rights."* Further [11], *"In the case of People's Union for Civil Liberties v. Union of India & Ors., the Court has endorsed bio-metric identification of homeless persons also so that benefits like supply of food and kerosene meant for persons who are Below Poverty Line reaches to the genuine persons."*

Courts have also been supportive of ICT initiatives in judiciary and have emphasized use of technology for faster delivery of justice. The ECommittee of Supreme Court of India in its Policy and Action Plan Document[12] for Phase -2 of the ECourts project has specifically stressed on *"**Interoperability with other components of Justice Delivery System:** The systems and softwares in Phase II of the Project will be so designed and deployed that they ensure smooth interoperability with Police, Jails, FSL etc. so that the communication between these stakeholders and Courts is expedited in order to curb the delays involved."* This plan involves faster processing in criminal trials.

Equal emphasis should also be directed in creating a workable plan to reduce pendency of civil suits in India. A majority of these suites are result of mismanagement and apathy of local municipal/ registrar offices in record keeping or a direct result of forgery and falsification of records in connivance with unscrupulous officials in government. Inclusion of a constructive plan in this regard in the Policy and Action Plan Document for Phase -3 of the E-Courts project by the E-Committee of Supreme Court of India can help unburden lower courts from pendency in civil suits.

9. CONCLUSION

Considering various Acts and varied legal treatments of lands in the country, it is difficult to arrive at common parameters to access and create a common standardized information database of land. But, some of the parameters being intrinsic to any land record may have different terms but common architecture. Such data can be identified and used in creating common data fields. An integrated land information system (SSCLD) which uses unique ID to identify a parcel of land or property and complete historical data available through a common platform shall help learned civil courts to study all aspects of a civil suit in easier way. Also, it shall be extremely useful for higher courts by reducing burden of re-verifying and obtaining hard copies of records again. General public shall also be able to take an informed decision by having knowledge of nature of property they are dealing. At the same time, this shall also discourage encroachers and miscreants from litigation by preventing them from falsifying or by hiding of specific records from the court. With full knowledge of the civil suit, the courts shall be able to take well informed decision while dispensing civil suits faster and reducing backlog. Further, integrated land information system can be used in decision support systems for e-Courts.

REFERENCES
[1] Prakash, S.B.N, 2014. E Judiciary: a Step towards Modernization in Indian Legal System. *Journal of Education & Social Policy*, June 2014, Pg. 113-124.

[2] Prakash, R., Mohanty, T., Gupta, R., and Jain, V. 2011 ICT in Indian Court Challenges & Solution. *International Journal of Internet Computing (IJIC)*, ISSN No: 2231 – 6965, Volume-1, Issue-2, 2011, Pg. 21-25.

[3] Improving court efficiency: The Republic of Korea's e-court experience: A Report. Apr. 23, 2014

http://www.doingbusiness.org/~/media/GIAWB/Doing%20Business/Documents/Annual-Reports/English/DB14-Chapters/DB14-Improving-court-efficiency.pdf

---

[10] Report on DNA profiling and Fingerprinting, 271st Law Commission Of India, Government of India, 23-24, July. 2017.

[11] Supra Note 8

[12] Policy And Action Plan Document Phase II Of The E-courts Project, E-committee Supreme Court Of India, 87, Jan. 8, 2014.

[4] Supreme Court of India, eCommittee Newsletter, March 2016.

[5] Perry4Law Techno-Legal Base , OLCMS December 2014

[6] E-governance in India: Concept, Initiatives and Issues, Insights. Retrieved November 21, 2014 http://www.insightsonindia.com/2014/11/23/e-governance-india-concept-initiatives-issues/

[7] Towards Paperless Courts! : Justice P K Balasubramanyan, Chairman, e-Committee, Supreme Court of India. Jan. 01, 2010 http://egov.eletsonline.com/2010/01/towards-paperless-courts-justice-p-k-balasubramanyan-chairman-e-committee-supreme-court-of-india-2/

सत्यमेव जयते

Department of Administrative Reforms & Public Grievances
Ministry of Personnel, Public Grievances & Pensions
Government of India