DEPARTMENT OF ADMINISTRATIVE REFORMS AND PUBLIC GRIEVANCES

National e-Governance Award 2023

CASE STUDY

TABLE OF CONTENTS

8 Sampurna Shiksha Kavach Program

Filo Edtech Pvt Ltd

9 Mission Antyodaya

Department of Rural Development, Government of India

10 Maa Navjaat Tracking Application (MaNTrA) for Delivery Point Health Facilities

National Health Mission, Government of Uttar Pradesh

11 Jal Jeevan Mission - Water Quality Management Information System

Department of Drinking Water & Sanitation., Government of India

12 Apuni Sarkar

Information Technology Development Agency, Government of Uttrakhand

13 Water SCADA

Bhopal Smart City Development Corporation Limited

14 Jan Sahayata Koshang

District Administration, West Singhbhum, Government of Jharkhand

15 Lucky Bill App

Kerala University of Digital Sciences, Innovation and Technology (Digital University Kerala)

16 Percept Extended Detection and Response (XDR)

Sequretek IT Solutions Pvt. Ltd.

National Automated Fingerprint Identification System (NAFIS)

By: National Crime Records Bureau, Ministry of Home Affairs, Government of India

Abstract

National Automated Fingerprint Identification System (NAFIS) represents technological advancements in the area of criminal investigations. Creation and maintenance of databases on Fingerprints in digital form for sharing and accessing by all the stakeholders in the system is an essential aspect to effectively meet the growing challenges of Crime Control and maintenance of public order.

NAFIS project has established a centralized database of criminal fingerprints accessible to law enforcement agencies throughout the country, significantly enhancing the efficiency and effectiveness of criminal identification and investigation procedures.

1. Project Background

Prior to the launch of NAFIS, India's fingerprint data management relied heavily on manual processes. States/UT s used to create duplicate fingerprint slips and send a copy to Central Finger print Bureau, NCRB for creating a national repository of the slips while retaining one copy for State/UT database. For criminal identification and antecedent search, physical slips were sent by States/UT s to NCRB for manual search through the extensive physical database of fingerprint slips. Such manual intervention made the process time consuming and the trace percentage from the physical system was abysmally low. It also resulted in duplication of slips and excessive use of paper. The wear and tear of the physical slips also resulted in loss of crucial data points. An attempt at digitization of the fingerprint database was made by implementing an Automated Fingerprint Identification System (AFIS), namely FACTS (Fingerprint and Criminal Tracking System), but the system could not effectively eliminate the aspect of manual intervention in collecting physical slips from States/UT s. Additionally, there was a lack of standardization in fingerprint collection practices across States, and the system was a standalone one. Therefore, it was imperative that a completely digitized fingerprint system which is connected throughout the country is established and NAFIS created a centralized repository of criminal fingerprints that can be accessed by law enforcement agencies across the country. NAFIS pioneered the fingerprint data management process by automating key aspects, such as fingerprint enrolment, storage, and retrieval.

The system improved the efficiency and effectiveness of criminal identification and investigation processes by increasing the trace percentage.

2. Current (AS IS Process) and Critical Stakeholders

National Crime Records Bureau (NCRB) conceptualized the NAFIS project with an aim of creating a national searchable criminal fingerprints database accessible from workstations installed across the country to provide real-time detection of prints for investigation of cases. The existing fingerprint data management process encompassed four major applications within the NAFIS ecosystem. These applications are:

i. **The Live enrollment application:** It enables capture of fingerprints using Fingerprint Enrolment Devices (FEDs) provided with each workstation. This application also works in offline mode, if connectivity is not available.

ii. **The Chance print and Slip capture application:** It enables scanning of fingerprint slips and chance prints using flat-bed scanners that are provided with each workstation.

iii. **Android based module application:** The app enables verification of fingerprints of a suspected person against the national database using a single digit live scanner which is connected to a mobile phone.

iv. **Document case application:** It enables processing of questioned documents and generation of reports.

Critical stakeholders of the project are:

a Ministry of Home Affairs, Government of India (MHA)
b National Crime Records Bureau (NCRB)
c States/UTs Law Enforcement Agencies
d Central Law Enforcement Agencies (CLEAs)

3. Problem areas and the need for intervention

Implementation of the Fingerprint and Criminal Tracking System (FACTS) in early 1990s had resulted in elimination of manual intervention to a large extent. However, it had several shortcomings. Some of the pain points/ grievances of the system were as follows:

i. **Standalone System:** FACTS was a standalone system and did not have interoperability with other systems of the time. It did not overcome the shortcoming of the manual system of physically uploading fingerprint slips in the system and has issues related to data sharing and retrieval.

ii. **Limited scalability:** The inability to scale the system effectively to accommodate the growing volume of fingerprint data posed a significant challenge. Inadequate scalability hindered the system's ability to handle the increasing number of fingerprint records, resulting in potential performance bottlenecks and data management issues.

iii. **Data standardization issues:** Variances in data formats and quality from different sources resulted in challenges related to data standardization. Inconsistent data formats and quality hindered the system's ability to establish a comprehensive and unified database, leading to difficulties in data processing and retrieval.

4. Planning for the new Project/System and the role of the Organization.

The earlier system of manual search was a time-consuming method of criminal detection. The FACTS system was a step towards digitization; however, it had certain shortcomings such as being a standalone system and it did not completely overcome the manual system. Overcoming these challenges required a holistic approach, including addressing integration issues, enhancing scalability, promoting standardization, providing adequate technological support, managing change effectively, and prioritizing robust security measures to ensure the efficient and secure operation. Based on the digitization experience gained in the FACTS system a new system of NAFIS was conceptualized.

NAFIS (National Automated Fingerprint Identification System) was a significant step forward in India's efforts to modernize and streamline its fingerprint data management system.

5. Objectives and Scope of the Project

i. Objective:

The overall objective of the project is to create a national searchable repository of criminal fingerprints for identification of criminals.

ii. Scope:

a) NAFIS Data Centre is established at NCRB, New Delhi and a Disaster Recovery Centre is established at NDC, Bhubaneshwar.

b) Establishment of NAFIS Workstations and other peripheral equipment at every District/ Commissionerate/FPB of all 36 States/UTs and three CLEAs namely, CBI, NIA, and NCB.

c) Use of bridge software to ensure effective sharing of data from States/UTs which are already having AFISs, with NAFIS without disturbing their own operation.

d) Integration with CCTNS to avoid duplication of data entry and better utilization of existing infrastructure.

e) Allocation of separate space for each State/UT/CLEA in NAFIS database to ensure that data is under the ownership of State/UT/CLEA. Each State/UT/CLEA has the right to edit their data whereas it can only be read by other stakeholders for making searches.

f) NAFIS databases can be accessed only by Authorized users through workstations installed across the country.

6. Implementation Processes

The NAFIS implementation involved several critical steps:

i. **Project Design:** A comprehensive in-house drafted Request for Proposal (RFP) outlining architectural requirements, service level agreements, and technical specifications for inviting bidders was prepared.

ii. **Selection of Vendor:** An evaluation committee was constituted to evaluate bids received from vendors. After a thorough technical evaluation, the lowest bidding vendor was selected.

iii. **Data Center:** A data center at NCRB, New Delhi and its disaster recovery center at NDC Bhubaneswar were established.

iv. **Data Migration and Digitization:** Digitized fingerprint data received from various States/UTs was converted into NIST standards format and migrated to the NAFIS database. The physical fingerprints slip available at various SFPBx were also digitized and migrated.

v. **Hardware Deployment:** 1,381 NAFIS workstations have been deployed across the country at districts, Commissionerate's, FPBx and CLEAs like CBI, NCB and NIA.

vi. **Commissioning:** The hardware deployed was made functional by installation of NAFIS software and connectivity was established through VPN to ensure security of the system.

vii. **Capacity Building:** Extensive training programs have been organized at NCRB and States/UTs for the NAFIS users of States/UTs/CLEAs.

viii. **Project Go-Live:** NAFIS was inaugurated by the Honorable Union Home Minister at the National Security Strategies Conference held in New Delhi on 17-18 August 2022.

7. The Redesigned Process and the Role of ICT

NAFIS has pioneered the digital fingerprint data management process by automating key aspects, such as fingerprint enrollment, storage, and retrieval. A unique National Fingerprint Number (NFN) for each criminal, ensuring a lifelong association with a single identity within the system, has been introduced. Integration with the Crime and Criminal Tracking Network and Systems (CCTNS) has resulted in elimination of repeated data entry and further enhancement in efficiency.

8. Change/Transformation

The implementation of NAFIS brought about significant changes:

i. **Prompt detection of chance prints:** Criminal fingerprint data was consolidated and made available in real-time for national-level searches resulting in faster detection of chance prints.

ii. **Improved Rate of Conviction:** The faster matching and quick search through the National database presented the judiciary with conclusive evidence for quick trials resulting in higher conviction rates in cases which were investigated using NAFIS.

iii. **Metamorphosis of the criminal fingerprint landscape:** Automated tools enabled stakeholders to capture high-quality fingerprints and create standardized databases compliant with NIST standards.

iv. **Improving policing and safety of citizens:** Field officers gained access to Quick Search for real-time preliminary suspect identification.

9. Constraints and Challenges Faced and Overcome

i. **Data Migration and Integration:** Fingerprint data available with various States/UTs were in different formats and some were non-NIST format. The conversion of these data into uniform NIST format was a complex yet essential process.

ii. **Data Security:** Protecting sensitive criminal data is a top priority, leading to the necessity of robust cyber security measures. Therefore, to ensure overall security of the system, it has been declared as Infrastructure and Protected System.

iii. **Capacity Building:** The utility of the system depended on the proficiency of users in NAFIS tools which required extensive and regular training programs. NCRB has been conducting regular training both on and off site for NAFIS users. Since its launch in August, 2022, 1,653 officials have been trained.

iv. **NAFIS Helpline:** To ensure timely resolution of issues faced by various Users a helpdesk team was established in NCRB.

10. Impact of the Project

The implementation of NAFIS has brought about a substantial transformation in the entire fingerprint (FP) operations, marked by the following key changes:

i. **National-level Search Capabilities:** The system enables national-level searches from NAFIS workstations commissioned across the country, enhancing efficiency and ease of use.

ii. **Unique Identification for Criminals:** NAFIS assigns a unique identity, i.e., National Fingerprint Number (NFN) to each criminal, ensuring improved individual tracking.

iii. **Significant Boost in Prints Traced and Detected:** There has been a remarkable increase in the successful tracing and detection of chance prints. Cases as old as 17 years were solved using NAFIS.

iv. **Expedited Matching Results:** Matching results are now accessible within FEW seconds, thereby substantially reducing the response time.

v. **Enhanced Tracing and Detection:** The system has maximized chances of tracing and detecting prints, resulting in more precise identifications.

vi. **Increased User Accessibility:** Owing to the utility served by the system, Active user base of the system has expanded exponentially across the country. This also indicates a rapid & wider adoption and utilization of the system. The system supports a concurrency of 500 users without compromising on the efficiency.

vii. **Full Automation with Minimal Manual Intervention:** NAFIS has achieved a high degree of automation, minimizing the need for manual intervention.

viii. **Transition to Paperless Operations:** The adoption of live scanners has eliminated the requirement for paper-based fingerprint recording and increasing the quality of fingerprint data captured.

ix. **Real-time Nationwide Connectivity**: The system ensures real-time connectivity across India, enabling immediate data access through workstations installed across the country.

x. **Adoption of Uniform Standards:** NAFIS adopts a single standard, namely the National Institute of Standards and Technology (NIST), ensuring uniformity in the recording and storage of fingerprint data as well as seamless exchange of data between State AFISs and NAFIS.

xi. **Expanded Database:** The database size has grown to approximately 1 crore, significantly enhancing the matching capabilities resulting in detection of more than 3,686 cases solved using NAFIS. These enhancements represent a revolution in the fingerprint identification system, rendering it more efficient, accurate, and widely accessible. The user-friendly interface and real- time search capabilities of the system have contributed to the detection of a huge number of cases, including heinous, old and interstate ones, within just months of its launch.

11. Lessons Learnt

The experience gained from the implementation and operation of a National Automated Fingerprint Identification System underscores several critical lessons that have far-reaching implications:

i. **Paramount Importance of Accuracy:** The success of NAFIS hinges on the precision and reliability of fingerprint data. This underscores the significance of maintaining data integrity and implementing rigorous quality assurance measures. The stringent data validation and verification processes are required to prevent erroneous results caused by data entry errors or image acquisition issues.

ii. **Imperative for Data Sharing and Interoperability:** Effective collaboration and information exchange among law enforcement agencies at the District, State, and National levels are indispensable. The lesson underscores the need for well-defined interoperability standards and protocols that facilitate seamless data sharing among various agencies and the broader Criminal Justice System.

iii. **Vital Role of Training and Skill Development:** Adequate training for law enforcement personnel using NAFIS is indispensable for its efficient and accurate utilization. The lesson underscores the importance of ongoing training and skill development programs to ensure that users remain proficient in utilizing the system effectively.

iv. **Scalability as a Key Requirement:** The ability to accommodate an ever expanding volume of fingerprint data and service requests is of paramount importance. The lesson emphasizes that NAFIS must possess scalable infrastructure to address increasing demands, whether driven by population growth or heightened law enforcement activities.

v. **Robust Disaster Recovery and Redundancy Measures:** Considering that the system stores sensitive and irreplaceable data, the lesson learned highlights the critical need for robust disaster recovery plans and data redundancy strategies. These measures are essential to safeguard the system against data loss and system failures as well as ensuring uninterrupted system operation and data security.

12. Long Term Significance

NAFIS continues to have a lasting impact:

i. **Prompt detection of chance prints:** By serving as a centralized repository of criminal fingerprint data, it enables States/UTs/CLEAs to rapidly identify suspects to solve criminal cases effectively.

ii. **Addressing Interstate Crimes:** NAFIS continues to play a pivotal role in addressing interstate crimes. Its ability to quickly identify individuals with criminal records across State borders has been instrumental in cracking down on criminal networks that operate across multiple regions.

iii. **Preventing Criminal Activities:** NAFIS also serves as a deterrent to potential wrong-doers. The knowledge that their fingerprints can be swiftly matched to previous crimes discourages individuals from engaging in unlawful acts, contributing to an overall decrease in criminal activities.

iv. **Timely investigation of cases:** The system allows for the reopening and resolution of cold cases resulting in timely investigation of cases.

v. **Advancing Forensic Science:** The project has contributed to advancements in forensic science. Fingerprints are now not only used for identification but also for forensic analysis, which holds long-term significance in enhancing investigative techniques and accuracy.

vi. **Enhancing Public Safety:** The system has been successful in its ability to identify criminals and security threats swiftly and accurately, thereby bolstering the overall safety and well-being of the community.

13. Future Roadmap

The project's future roadmap includes:

i. **Expansion to Police Station Level:** There is a potential plan to extend NAFIS to encompass all police stations across the country.

ii. **Integration with ICJS:** NAFIS will be seamlessly integrated with the Interoperable Criminal Justice System.

iii. Enhancement of Biometric Features: Continuous improvement of the system's capacity to capture and analyze fingerprints through advancements in hardware, sensors, and software algorithms, enhancing accuracy and reliability.

iv. Scalability Strategy: A strategic approach to accommodate future growth and the rising demand for fingerprint matching services, which may involve investments in more robust infrastructure capable of handling larger datasets and increased usage.

v. Cybersecurity Reinforcement: Strengthening and regular updation of the system's security measures to safeguard against data breaches and unauthorized access.

vi. Integration of Machine Learning and AI: Incorporating machine learning (ML) and artificial intelligence (AI) techniques to enhance fingerprint matching accuracy and speed. These technologies can assist in identifying intricate patterns and reducing false results.

vii. User Training and Support: The provision of continuous training programs and support for users to ensure their effective utilization of the system and to keep them abreast of new features and procedures.

***

Suvidha Vehicle Facilitation System

By: Department of Information Technology & Electronics, Government of West Bengal

Abstract

The field of Information technology has improved tremendously in the past decade with the invention of all kinds of new technologies. **Suvidha Vehicles Facilitation System** is intended to provide an online platform to the exporters where exporters can book slots on preferred date through web portal. Government of West Bengal in coordination with Land Ports Authority of India, Indian Customs (CBIC), and Border Security Force (BSF) has started **Suvidha Vehicles Facilitation System** for quick clearance and smooth movement of export bound vehicles to Bangladesh at various **Integrated Check Posts (ICPs)/ Land Custom Stations (LCSs)** of West Bengal. Once registered with this portal, all sorts of facilitations for smooth movement and clearances with concerned agencies are ensured in a time bound manner. In case of any issue faced by the User, a round the clock Control Room with a Dedicated Helpline has been opened to address and provide quick redressal of those issues.

1. Project Background

The problem of unstructured and manual queue management for the exportation by road at various **Integrated Check Posts (ICPs)/Land Custom Stations (LCSs)** on Indo-Bangladesh border results chaos and several malpractices. There is a backlog of huge number of trucks waiting for long time (e.g., 40 to 45 days waiting period) to cross the border. An accountably simple web portal namely **Suvidha Vehicles Facilitation System** was proposed to resolve the problem and to reduce the cost enhanced due to the chaotic atmosphere.

2. The Current (AS IS Process) and the Critical Stakeholders

Before the implementation of SUVIDHA facility, trade growth was impeded due to lack of facilities and infrastructure deficit at all the ICP/LCS within the state of West Bengal. Poor facilities have made border crossing time-consuming and costly.

All cargo trucks headed for any ICP/LCS need to first obtain a parking pass / serial number and on the basis of first-arrived, first-served they were allowed to enter into the custom notified zone. Average time delay for a single shipment was approximately **45 (forty-five) days**. The trucks were parked by the either side of the road until they were permitted to enter the desired ICP/LCS. In the areas close to ICP/LCS, queue of thousands of trucks could be seen waiting. This in turn was resulting in massive traffic congestion on the narrow approach road in the vicinity of custom notified area. **The date and time of export was uncertain and exporters had to bear huge expenditure on transport, parking, detention and transshipment**. The vicinity of custom notified area was in a total chaos and various malpractices had crept in among the people involved in the process of export. The export, despite the best efforts, could not be scaled up by the stakeholders. The process flow includes:

- The entire process was manual and time consuming.
- All cargo trucks used to come to ICP/LCS and Manually collected Parking Pass/ Serial number on a first come, first serve basis.
- Vehicles were allowed to enter customs notified area according to parking pass/serial number.
- All procedure inside ICP/LCS undertaken by different agencies were manual.
- Unstructured queue on both sides of the road near ICP/LCS.
- Long and uncertain detention period at various parking zones outside ICP/LCS due to various malpractices being done by various interested groups.
- Massive traffic congestion on the narrow approach road in the vicinity of custom notified area.
- Date and time of export was uncertain.
- Huge financial burden on exporters due to long waiting, detentions and other such practices.
- Complete chaos at all ICP/LCS.
- Various malpractices by the people involved in the process of export.

Critical Stakeholders:

Government Agencies Involved

- Land Ports Authority of India (LPAI)
- Indian Customs (CBIC)
- Border Security Force (BSF)

- Central Warehousing Corporation (CWC)
- Police
- Transport Department

Private Agencies Involved

- Custom House Agents (CHAs) Association
- Exporter Association.
- Transporters Association
- Truck owners Association
- Loading and Unloading Labor Association
- Drivers Union and Local Residents

3. Problem areas and the need for intervention

Pain points:

- Unstructured Queues
- Long waiting Periods, Detentions Up to 40/45 days
- No certainty of date of export
- Huge financial burden on exporters due to waiting, Detentions and other such practices
- Quality degradation of Goods and Damaged Goods
- Queue Controlled by Local Groups/Mafias
- Repeat of Process by different agencies
- Complete chaos at land Ports due to above mentioned points

4. Planning for the New Project/System and the Role of the Organization:

Many meetings were arranged with the stakeholders for understanding the process of different agencies and identification of Problems. Online Software was planned for slot allocation. It has been decided that digitization of all entries will be done and paperless procedure would be adopted. All stakeholders will be connected through dashboard for ease of working. All relevant information will be pushed to all stakeholders in their dashboard prior to their actual handling and dealing with the case in order to ensure minimum time is taken.

5. Objectives and Scope of the Project

Main objective of the project is to facilitate the trade and maximize the overall export. The date of export was uncertain. Average delay was approximately 45 days. Objective of Suvidha is to facilitate for quick clearance and smooth movement of vehicles at various ICPs and to make the Cross-border movement easier and less time-consuming.

There is a scope to develop a platform where exporters can book slots on preferred date through web portal. Digitization of all entries will be done and paperless procedure would be adopted. All stakeholders will be connected through dashboard for ease of working. All relevant information will be pushed to all stakeholders in their dashboard prior to their actual handling and dealing with the case in order to ensure minimum time is taken. Following are the details of APIs for Integration:

a. Integration with GRIPS.
b. Integration with SMS and Email services.
c. Integration with Vahan and Sarathi database.
d. Integration with API Setu.
e. Integration with ICE GATE software.
f. Integration with Boom Barriers.
g. Integration with ANPR cameras.
h. Integration with FASTag.
i. Integration with online Car Pass system.

6. The redesigned Process and the Role of ICT

Manual procedure has been replaced by **Online Slot Booking Facility** the chaos and malpractices has come to an end. The overhead cost on transportation of trucks has reduced. The uncertainty of the date and time of export has gone and detention period become zero. Uses of Hard copies of documents removed, in its place Suvidha links all stakeholders with dashboards, by using dashboards stakeholders are now able to access the required data instantly which reduce the time of operation. Using its Notification Process Suvidha also shares real time status of the vehicles to the exporters/CHAs/Drivers. Digitization of all entries done and paperless procedure adopted. Round the clock Control Room with a Dedicated Helpline has also been introduced to address and provide quick redressal of problems

Following are the **processes that were re-engineered:**

Slot Booking Process: Earlier, to receive a serial for the movement of vehicle, the vehicle was first required to be present physically in the parking area near customs notified zone on a first come, first served basis. After the implementation of Suvidha, this process is re-engineered by using online slot booking.

Document Verification Process: Previously, Serial slip, Driving License and other relevant documents were physically required for the entry of vehicles into the Customs Notified Area for export. At present, this process is re-engineered by using Suvidha dashboards for LPAI, BSF, etc. Now details of validity of Vehicle Registration and Driving License of drivers are directly fetching from centralized Vahan and Sarathi database.

Notification Process: The manual system lacks a notification system. A new feature is added into the Suvidha vehicle facilitation system where, SMSs notification are being sent to the Exporters, Customs House Agents (CHA) and Drivers after completion of each and every stage of operation inside ICP/LCS till returning of the empty truck from Bangladesh.

Role of ICT

ANPR cameras, CCTV cameras, Boom Barriers and other state-of–art equipment's have been introduced for greater surveillance, access control of trucks, better traffic management, quick and seamless clearance of vehicles, reducing time of operation and synchronization amongst different stakeholders.

Process Flow after GPR:

- Exporters register themselves by using a valid Importer -Exporter Code only through this portal.
- Exporters book their slots online on preferred dates.
- Generates **Suvidha Pass** online.
- Vehicle report to entry point of ICP/LCS as per the date of booked slots.
- All documents viz RC of the vehicle, license of driver and Aadhaar of khalasi already available at dashboard of BSF. This software is also linked to Vahan portal and all motor vehicle documents are automatically verified by the Vahan in Suvidha software to avoid any manual intervention by any agency.

- Vehicles having any issues with respect to any papers of truck, driver and khalasi are made to stand at segregation area close to in gate for greater scrutiny thus allowing constant/unhindered move of line of trucks.
- On scrutiny a click by BSF data operator, the vehicle enters and report for weighment.
- SMSs are sent to the Customs House Agent (CHA) and Exporter after each and every stage of operation inside ICP/LCS till returning of the empty truck from Bangladesh.

7. What is the change/Transformation?

SUVIDHA facility has transformed the cross-border movement of goods between India and Bangladesh by bringing in all the concerned agencies under one roof and thus substantially organizing the processes. **Cross-border movement has become easier and less time-consuming.**

Online, systematic and automated support facilities comparable to international standards have been introduced. All stakeholders are connected through dashboards. ANPR cameras, viewing cameras, boom barriers and other state-of–art equipment's have been introduced for greater surveillance, access control of trucks, better traffic management, quick and seamless clearance of vehicles, reducing time of operation and synchronization amongst different stakeholders. Round the clock **Control Room** with a Dedicated Helpline has also been introduced to address and provide quick redressal of problems.

The manual process is now replaced by automation process and Online Booking of Slots on Preferred Dates in a Web Based Solution enhanced the transparency of the system. Exporters now be able to view the details of the available empty slots of upcoming days. Contact Free and seamless Movement of Vehicles at all checking Points has enhanced the quality-of-service delivery. This facility has also created significant time and cost-saving impacts to the beneficiaries involved in international trade. Exporters can now ship the goods in a single day, which used to be about 40-45 days causing enormous losses in terms of both time and money. Exporters can now save a significant amount of time and cost related to storage, parking, detention, and transshipment. It facilitates the growth of export volume for the exporters. Awareness is generated among all stakeholders through offline and online training.

Average cost for making a complete transaction before GPR was Rs. 70000 and now it has become Rs.3000 – 10000 depending upon the category of the cargo.

8. Implementation Processes

- Gap analysis in existing process
- Gathering data for requirement analysis
- System Feasibility analysis
- Process flow creation for development of new application
- Introduction of new policies and Publishing of Government Orders
- Starting Pilot using Chassis for ICP Petrapole
- Taking feedback from all stakeholders for final development

Initially it was developed for ICP Petrapole. Subsequently, this facility was extended to five other ports. Each ICP has its own features due to its nature of trade. Currently Suvidha is running at ICP Petrapole, ICP Ghojadanga, ICP Mahadipur, ICP Hili, ICP Changrabandha and ICP Fulbari.

9. Constraints and Challenges Faced and Overcome

All activities of different agencies were running as stand-alone components. It's very difficult to bring all the agencies under the same umbrella, though the same was done after series of meeting and discussions with them. Their process was discussed in detail and the same was incorporated while preparing the solution. Another challenge is sharing of data among agencies; the lower functioning has a huge rigidness for the same. However, after intervention of the appropriate level it was made possible. Some data from the Indian Customs are yet to be received to make the process completely automatic. Another constraint was the local interested groups, they were dealt with discussions and firmness.

10. Impact of the Project-Tangible/ Intangible (with data), Social Impact

Exporters are now able to maintain their commitments to the importers, capital blockage due to waiting of vehicles with loaded goods minimized which improved cash flow of business. Exporters are now able to operate their business in preplanned way. Transporters, vehicle owners and drivers are now getting multiple trips in a month as total time to complete the export process is reduced. Custom House Agents (CHAs) are now getting more consignments as overall export volume has increased. Traffic Management around the custom notified areas has improved considerably. Buyers are also happy now, as cost of goods reduced significantly. A positive response is received from all stakeholders as the aspirations are met and the trust and confidence in the new system is appreciated.

Till now approximately Rs 340 Cr has been deposited in Government Treasury as Suvidha facilitation fee. Government of West Bengal has spent Rs 40 Cr from this fund for both welfare as well as infrastructural development of the local area and people in and around custom notified areas. More welfare projects are under process.

	Post-SUVIDHA		Pre-SUVIDHA	
ICP	**Per Day Export**	**Waiting Period**	**Per Day Export**	**Waiting Period**
Petrapole	**400-450**	**0-1**	**300-350**	**40-50**
Ghojadanga	**350-400**	**0-1**	**250-300**	**60-70**
Mahadipur	**400-450**	**0-1**	**300-350**	**40-50**
Hili	**150-200**	**0-1**	**120-150**	**30-40**
Changrabandha	**350-400**	**0-1**	**300-350**	**40-50**
Fulbari	**150-250**	**0-1**	**075-125**	**30-40**

Table 01: Comparison of Per Day Export and Waiting Period

	Post-SUVIDHA	Pre-SUVIDHA
ICP	Average cost for making a complete transaction	Average cost for making a complete transaction
All ICPs	**Rs. 3000 – Rs. 10000**	**Rs. 70000**

Table 02: Comparison of Average cost for making a complete transaction

Before implementation of Suvidha facility vehicles of other states were facing enormous difficulties due to long waiting periods. Now as waiting period reduced, vehicles of other states are also export their vehicles directly in place of transshipments.

11. Lessons Learnt

The Suvidha Vehicle Facilitation System has taught some valuable lessons to the stakeholders involved in the project. One of the most important lessons is that the development of a fully transparent system is crucial for the success of any project. The Suvidha facility has enabled exporters to view available slots by logging in, ensuring transparency in the system. The project has also taught the importance of coordination among different government agencies, which has played a crucial role in implementing the project successfully. It's also learnt that to deal with transporters, truck associations and such stake holders it's important to understand their concerns as well as issues. Multiple dialogues and meetings helped to deal with them. An equal importance must be given to all the team members/ stake holders irrespective of how big or small they are, the role of each member is important.

12. Long Term Significance

Average cost at all ICPs for one transaction reduced from Rs 70k-100k (approx.) to 3k-10k. The export release time is reduced significantly, at ICP Petrapole it shows most significant improvement of 72 percent from 50:59 hours in 2022 to 14:06 hours in 2023 as per the Multi-Stakeholder Committee Report on Export Release Time after Customs Formalities, Dated 31, July, 2023 prepared by Central Board of Indirect Taxes and Customs, Department of Revenue, Ministry of Finance, Government of India. The Suvidha Vehicle Facilitation System is in line with the national priorities of the Government of India, such as:

a. Improving ease of doing business in India.
b. Promoting and improving cross-border trade.
c. Development of the country's infrastructure.
d. Encouraging digitalization and automation.

13. Future Roadmap

An exhaustive review is carried out on weekly basis to further strengthen the SOPs and drills to bridge the gaps. A special emphasis is being laid down on providing review of booking of slots, accommodation, living conditions, insurance of driver and helper, developing models for local bodies for improving the areas close to custom notified areas in terms of men and machine for furtherance of export operations.

14. Points for further Improvement

- Stakeholders of other side of the ICPs (Bangladesh Land Port Authority (BLPA), Border Guard Bangladesh (BGB), Bangladesh Customs, etc.) not yet included
- Exchange of information with Customs EDI portal is required to facilitate more single-window activities which will help reduce the time taken for submission of EGM.
- Online Car pass facility is not yet integrated.
- Parking and Goods unloading Capacity of other side of the ICPs are required to be increased.

***

SVAMITVA: Survey of Villages & Mapping with improvised technology for Village areas

By: Ministry of Panchayati Raj

Abstract

Survey of Villages and Mapping with Improvised Technology for Village Areas (SVAMITVA) is property validation solution leveraging Drone survey and CORS technology for providing accurate Record of Rights to property owners in village Abadi area. The scheme is a collaborative effort of Ministry of Panchayati Raj, Survey of India, State Revenue Dept. State Panchayati Raj dept and NIC-GIS. The scheme aims to cover drone survey of inhabited areas of villages got creation of high-resolution maps on a scale of 1:500 and establishment of a network of Continuously Operating Reference Stations (CORS) for high accuracy (5cm) positioning services that can be utilized by any department or agency for developmental work.

1. Project Background

SVAMITVA scheme was launched by the Hon'ble Prime Minister on National Panchayati Raj Day, 24th April 2020 with a resolve to enable the economic progress of Rural India by providing a "Record of Rights" to every rural household owner in a rural inhabited area. The scheme covers multifarious aspects viz. facilitating monetization of properties and enabling bank loans; reducing property-related disputes; comprehensive village-level planning. "Record of Rights" to the household owners in rural inhabited areas under the SVAMITVA Scheme are provided through the use latest Drone Technology and Continuously Operating Reference Station (CORS) technology for capturing images. The high resolution and accurate image base maps have facilitated the creation of the most durable record of property holdings in these areas. Such accurate image base maps provide a clear demarcation of land holdings in a very short frame of time compared to on-ground physical measurement and mapping of the land parcels. Further, these maps are free from measurement errors to a very large extent, which is not the case with physical on-ground measurements. Such maps provide a visual aid to the landowners as well as to the officials for identifying and resolving any property dispute and are also an invaluable tool for local-level planning.

2. The Current (AS IS Process) and the Critical Stakeholders

Since independence, government surveys of rural land had been restricted to agricultural land. In several states the inhabited areas of villages – known as "abadi" land in Uttar Pradesh and Madhya Pradesh, "laldora" land in Punjab and Haryana, "gaothan" land in Maharashtra and Gujarat, among others – largely remained out of the purview of such surveys. As a result, many village communities across India do not possess record of rights, and their claim of ownership over land in "abadi" area depends largely on their actual possession of the property. In the absence of a legal document, the owners of the properties in the rural areas are not able to utilize their own property as a financial asset for availing loans from banks.

Additionally, the current process of survey of land involves manual and time-consuming methodology of using DGPS machines for surveying and demarcation of individual land parcels by Revenue Dept./Land Records Dept./Panchayati Raj Dept. The resolution of the maps created is often lower compared to those obtained using drone survey. The maps created are then ground verified manually by Tehsil level revenue officers which is prone to human as well as instrumental errors.

3. Problem areas and need for intervention

Among the challenges faced by various stakeholders in implementation of current process of survey prior to SVAMITVA include:

i. Non-existence of record of rights for the property owners in rural inhabited areas
ii. Consequent inability to leverage rural abadi property as a financial asset for benefits
iii. Traditional method of undertaking survey is prone to errors and time-consuming
iv. Lower accuracy of maps created
v. Higher instances of Land related disputes in rural areas
vi. Lack/absence of updated property register with panchayat for assessing property tax
vii. Lack of spatial data to prepare gram panchayat development plans

4. Planning for the New Project/System and the Role of the Organization

In order to cater to the challenges faced by the land records/revenue/Panchayati raj department due to lack of updated land records, property register and absence of Record of Rights with property owners, Ministry of Panchayati Raj in collaboration with Survey of India, State Revenue Department and State Panchayati Raj Department is implementing SVAMITVA Scheme. The scheme involves participation of various stakeholders from National and State level functionaries to panchayat level representatives. A brief overview of the Role and responsibilities of different Stakeholders is illustrated below. Details can be seen in the Scheme Framework/Guidelines

Ministry of Panchayati Raj

The Ministry of Panchayati Raj is the nodal department for the implementation of the Scheme. It manages funding and monitoring of the scheme at the Central level.

Survey of India

Survey of India (SOI) is responsible for drone-based surveys and the generation of high-resolution (1:500 scale) images, Spatial/GIS data, and Digital Elevation Model (DEM). SoI also undertakes outsourcing activities for drone survey, inhouse/outsourced digitization of maps, and quality check of deliverables, which is possible due to the new Geospatial and Drone policies. SoI is also responsible for the establishment of Continuous Operating Reference Stations (CORS) under the Scheme. The CORS network provides real-time and high-accuracy (5cms) positioning services for land measurement, which has far-reaching benefits.

State nodal department

In order to provide legal sanctity to the record of rights created through drone based survey, the State Revenue Dept. amended the Revenue Act/Land Revenue Code or Survey Rules to grant the format of the Property Card due legitimacy. The department issues appropriate notifications/notices, facilitates field survey activities, ground verification and validation of land parcel maps, adjudication of doubts/objections and resolution of any post-survey objections received from property owners, finalization of maps and subsequent updating/partitioning.

State Panchayati Raj Department

State Panchayati Raj department organizes the Gram Sabha to intimate the schedule of the survey and post-survey validation of maps, provides support to

sensitize the villagers about the project work and its intended benefits leveraging RGSA funds for IEC etc. and prepares and updates the Property (Tax) Register through GPs.

Gram Panchayats

Individual gram panchayats help to generate awareness among the residents of the village about the survey, digitize existing property (Tax) Registers, wherever applicable, and make them available to SoI and Enquiry Officer for preparing interim maps/Records. They are also responsible for coordination of ground-level activities for conducting the survey, help in the resolution of the post-survey objections received from property owners which may be related to correction in owner name, property boundaries, joint holding, etc. For unresolved objections/disputes, the final decision shall rest with the State Authorities/ Judicial System. Ultimately, Gram Panchayats need to make use of the created maps for GPDP formulation.

National Informatics Center (NIC)

NIC team is responsible for enhancing the Ministry's Spatial Planning Application "Gram Manchitra" by leveraging digital spatial data/maps created support the State in development of State system for SVAMITVA Property Cards generation and reporting & Monitoring of Scheme.

5. Objectives and Scope of the Project

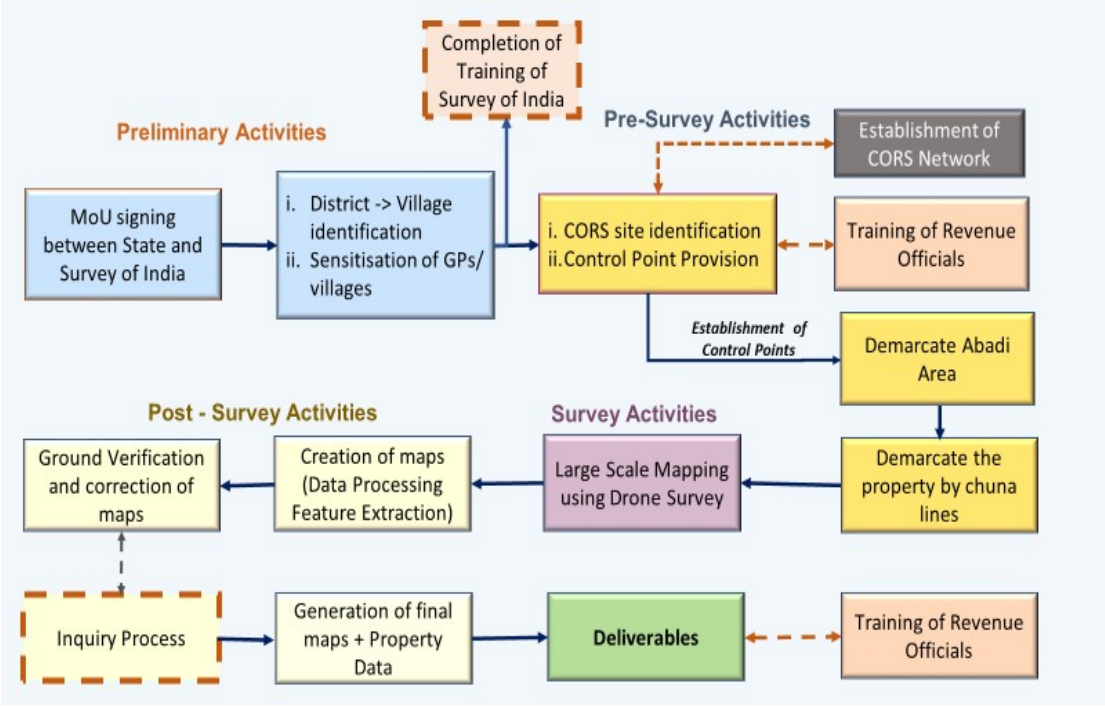
The scheme aims to achieve the following objectives

i. Creation of accurate land records for rural planning and reducing property related disputes.
ii. To bring financial stability to the citizens in rural India by enabling them to use their property as a financial asset for taking loans and other financial benefits.
iii. Determination of property tax, which would accrue to the GPs directly in States where it is devolved or else, add to the State exchequer
iv. Creation of survey infrastructure and GIS maps that can be leveraged by any department for their use.
v. To support the preparation of a better-quality Gram Panchayat Development Plan (GPDP) by making use of GIS maps.

6. The redesigned Process and the Role of ICT

SVAMITVA scheme, is a collaborative effort of the Ministry of Panchayati Raj, State Panchayati Raj Departments, State Revenue Departments, and Survey of India
and aims to provide an integrated property validation solution for rural India, through the latest Drone Surveying technology, for demarcating the inhabitant (Abadi) land in rural areas.

The brief/broad-level implementation process flow of the scheme is illustrated below:



The activities are broadly divided into Pre-Survey, Survey, and Post Survey activities.

Pre-survey activities include the signing of an MOU between the state and Survey of India, IEC activities by Gram Panchayat for sensitization of rural population, identification of sites for the establishment of CORS, notification of villages for the survey, and demarcation of boundaries of Abadi and parcels using chuna lines. Also, the Survey of India assists in training revenue officials on survey processes like KML creation, chunna marking, maps verification, etc. Some states like Madhya Pradesh, Maharashtra, Gujarat, Karnataka have developed online process for notification of villages and planning of survey schedule.

Survey activities include the establishment of Ground Control Points for Drone based surveys to capture aerial images. Images are then processed by SoI for the creation of property maps and high-resolution Spatial data. Cloud based data transfer is leveraged for real time transfer of images from field to digitization/feature extraction labs of Survey of India.

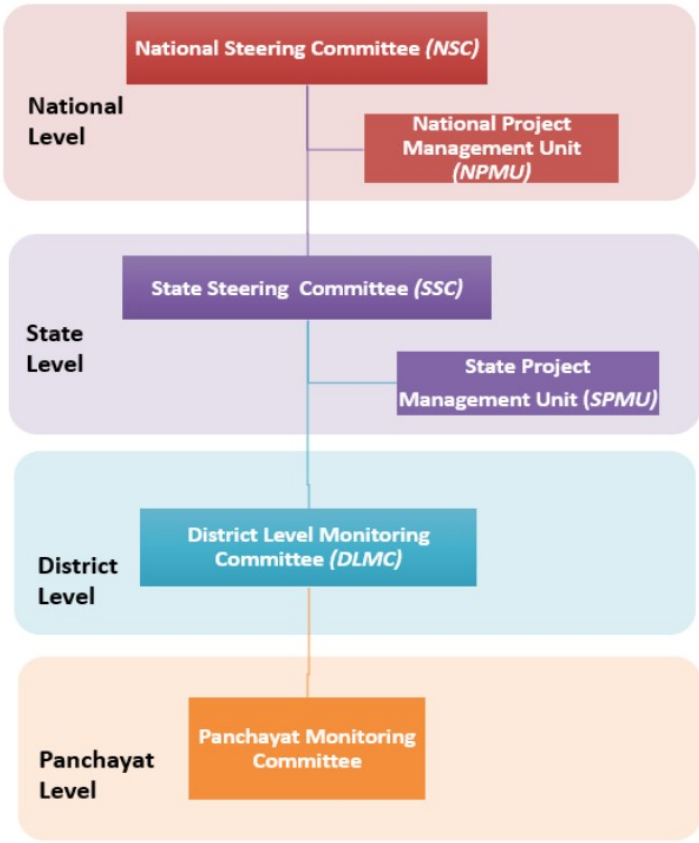
Post-Survey activities include ground verification of maps and ownership data collection by the State Revenue Department and Gram Panchayat. It also includes inquiry/objection process for ownership adjudication with the help of gram sabha, land owners, and review the existing documents and resolve any objections received from property owners. Thereafter, the printing and distribution of property cards to village household owners are done by State. SoI also provides training and Capacity building of Revenue Department Government Officials for regular updation and usage of maps. ICT plays a significant role in streamlining the ground verification exercise wherein maps are loaded on the mobile application/GIS platform. Field officers/patwaris/tehsildar perform ground verification and corrections on the mobile application/GIS platform and maps are shared with Survey of India for finalization. Finalized maps are shared with State for printing of property cards.

Property cards are also provided digitally to individual owners through Digi locker application.

Monitoring of Progress

Ministry of Panchayati Raj has created an online mechanism for monitoring progress of Drone survey, maps creation, property cards preparation at State, District, Tehsil and Village level through SVAMITVA Dashboard (www.svamitva.nic.in)

The framework of SVAMITVA scheme provisions for a four-layer monitoring and evaluation framework for timely monitoring, reporting and course corrections (wherever necessary). It operates at National level, State level, District level and Panchayat level and comprises relevant decision makers and subject matter experts that meet at regular intervals to review the progress of the scheme. The following four-layer Institutional Mechanisms as envisaged



7. What is the change/ Transformation

The SVAMITVA Scheme has helped states to move from a manual procedure of land survey to technology driven participatory approach for land governance through the drivers of technology, people and regulation.

Technology driven approach

i. Drone survey along with CORS technology has helped in driving the coverage of the scheme at speed and scale.
ii. Adoption of Drone as a service model by Survey of India for outsourcing survey and digitization of maps to empaneled agencies for faster coverage of villages
iii. Adoption of Technology to digitize manual process of notification of villages, cloud-based data sharing from field to Survey of India offices for digitization, use of mobile application for ground verification of maps created
iv. Leveraging Digi locker application for providing property cards directly to property owners

People's participatory approach

i. A participatory approach was adopted to ensure minimal disputes during demarcation of properties wherein gram panchayat representatives, revenue officers and property owners are present.
ii. In order to encourage participation of local leadership during drone survey, SMS notification was sent to MPs and MLAs to inform them about the drone survey commencement in respective areas.

Regulatory changes

i. Recognition of property cards by Banks for providing loan against property through mortgage
ii. State have created facility for online creation of charge on property cards by Bankers
iii. High courts of India have started to recognize property cards as legitimate proof of ownership in case of property related disputes

8. Constraints and Challenges Faced and Overcome

i. While executing the processes of SVAMITVA scheme one of the major challenges was the IEC activities for villagers. The State Panchayat Raj Department, state revenue department conducted IEC campaigns for the villages including pamphlets distribution, wall paintings, nukkad-natak, drum-beating, etc. and created awareness.

ii. Since hardly any funds are provided to the State/UT, inducing officers to provide chuna-marked villages on time is challenging and it needs to be top-driven. In order to encourage participation of local leadership during drone survey, SMS notification was sent to MPs and MLAs to inform them about the drone survey commencement in their areas.

iii. A participatory approach was adopted to ensure minimal disputes during demarcation of properties wherein gram panchayat representatives, revenue officers and property owners are present. Some states/UTs adopted an approach wherein individual property owners demarcated the properties thereby minimizing the chances of any disputes.

iv. Extensive training of revenue officers was conducted by Survey of India at tehsil, district and state level to ensure that people involved in activities are well versed with the technology for ground verification and map creation.

v. In order to cover a large number of villages at speed and scale, Survey of India adopted the use of Drone as a Service model and outsourced the work of drone survey and map creation to private empaneled agencies. Additionally, Survey of India and States also adopted an outsourcing model for digitization of maps to cater to large number villages surveyed. A cloud-based data sharing mechanism was also adhered to wherein images captured from drone survey were directly transferred to Survey of India offices for digitization.

vi. States also incorporated use of mobile applications for faster ground verification. In order to directly handover property cards to beneficiaries, integration with Digi locker was also completed and property cards were directly pushed to the Digi locker accounts of property owners.

vii. In order to provide co-ownership to women in properties, the State of Madhya Pradesh has mandated co-ownership of women in property cards, thereby establishing the Women's right to property.

9. Impact of the Project-Tangible/ Intangible, Social Impact

i. With the adoption of drone survey technology, cloud-based data sharing, use of mobile applications for ground verification etc. 2.78 lakh villages have been covered with drone surveys and 1.45 Crore property cards have been prepared for 93 thousand villages.

ii. Property cards have also helped in settlement of disputes for example an instance has been reported wherein High Court of Nainital gave verdict in favor of a property owner belonging to Bhimawala village of Dehradun district against an eviction notice served by Uttarakhand Jal Vidyut Nigam. The property owner presented the property card issued under SVAMITVA Scheme as an evidential proof of ownership of property.

iii. Banks have started to recognize property cards for providing loans against property. Empirical evidence has emerged wherein bank loan has been availed by property owners through mortgaging the property card.

iv. Women have gained increasing access to Right to Property as States have provisioned for mandatory co-ownership of women in property cards.

v. States have adopted Technology based land survey approach to move towards an efficient land governance system.

vi. Few gram panchayats have also experienced an increase in property tax accrued as a result of identification of ownership of vacant land.

10. Lessons Learnt

Through the coordinated approach to implement SVAMITVA Scheme, following broad lessons have been drawn:

i. Importance of rule-based process for successful and mission mode implementation of the scheme in each district.
ii. Stakeholder consultation and trust is an important factor for execution of the scheme iii. Criticality of integration of information for successful and timely implementation of the scheme enabling accurate decision making.
iv. Digital capacity building of the stakeholders and beneficiaries, to enable them to take full benefit of the innovation.
v. Digital Public Infrastructure can be established with collective efforts and alignment of objectives from national to the village level.

11. Long Term Significance

i. SVAMITVA Scheme has paved the way for a holistic rural development along with advancements in land governance of villages. CORS established under SVAMITVA Scheme can be used by any department or agency for developmental activities like preparation of project plans, monitoring scheme works, assessment of impact of disaster and disaster mitigation etc.

ii. State Revenue departments need not use Drones to carry out surveys in the future for land measurement, any updation in land records can be measured with the help of Rovers and handheld devices.

iii. Property owners can now leverage their property as a financial asset for bank loans and also as evidential proof of ownership in case of property related disputes.

iv. States are moving towards creating an online database of property cards which would also help bankers in online charge creation thereby safeguarding banks and bringing transparency.

12. Future Roadmap

In order to showcase the potential of high-resolution maps created under SVAMITVA Scheme, the Ministry of Panchayati Raj has undertaken initiatives in respect of plan development for Gram Panchayats through Gram Manchitra application and assessment of property tax in Gram Panchayats through Samarth application.

i. With the preparation of high-resolution maps of the village Abadi area, Govt. departments can now leverage the maps to prepare comprehensive village level plans to cater to disaster mitigation, resource planning, infrastructure planning, monitoring developmental works among others. Gram Manchitra application developed by the Ministry of Panchayati Raj is leveraging SVAMITVA spatial data and maps to enable Panchayats to plan interventions accurately.

ii. For better assessment of property tax in Gram Panchayats wherever devolved, SVAMITVA maps can be used to create/update property registers leading to an increase in Property Tax assessed. A generic property tax calculator software SAMARTH (Svatantra Gram ArthikUthan) is being developed by NIC for possible adoption by States except for Tamil Nadu, Telangana, Andhra Pradesh, Karnataka, Kerala, Maharashtra, and Gujarat.

***

Real time tracking & Surveillance for Yatra management through RFID technology & CCTV network and Digitization of Pilgrim services

By: Shri Mata Vaishno Devi Shrine Board

Abstract

Real time tracking and surveillance for Yatra management through RFID technology and CCTV network and Digitalization of Pilgrim services by Shri Mata Vaishno Devi Shrine Board. This integrated portal serves as an end-to-end solution, consolidating all devotee-centric services, ERP, and e-surveillance systems into a single gateway for Yatra management, enhancing e-governance. This innovative and unique initiative has been successfully implemented by the Shri Mata Vaishno Devi Shrine Board, setting a benchmark in the pilgrimage sector.

a) RFID (Radio Frequency Identification) based Yatra Access Cards:

The complete system is an amalgam of RFID based registration of pilgrims, establishment of Radio Frequency Network for connecting all components of the system with the server, RFID readers at different locations on the track for validation of pilgrims. The system so established is capable of tracking pilgrims all along the track through RFID technology and generates reports at Main Switching Center Tarakote Katra using various criteria on a real time basis.

b) E-surveillance through CCTV cameras:

CCTV Surveillance grid of over 720 Cameras has added another layer of security on the track with round-the-clock monitoring at 2 Main Control rooms at Katra and Bhawan. Real-time Visuals through CCTV camera has helped in efficient disaster management including forest fires, landslides, and stone shootings.

c) Digitalization of services:

The digitization through ERP has ensured digital transformation through Cashless Digital payments, elimination of fake tickets/touts, QR code-based and kiosk-based payment systems. Curtailment of queue and real-time data compilation and accounting.

1. Project Background

a) RFID (Radio Frequency Identification) based Yatra Access Cards:

RFID based Yatra registration has been successfully functioning since August 2022 onwards, playing a model role in regulating the yatra in an efficient manner along with managing crowd control at all strategic locations enroute Bhawan. For the convenience of visiting pilgrims, 39 registration counters have been established at Jammu & Katra where credentials of the pilgrims like photograph, name, address, gender, age, mobile etc. are digitally recorded in order to make the verification system tamper proof. Since launch of the project in August 2022, a total of 90 lakh pilgrims from various States/UTs of the country have been covered till date.

b) E-surveillance through CCTV cameras:

An elaborate CCTV Network has been put in place for crowd management and strengthening of security infrastructure from Katra to Bhawan. This has served as a huge deterrence for anti-social elements besides reducing response time in case of emergencies.

c) Digitalization of services:

Digital platforms including QR scanners and POS machines introduced in collaboration with Paytm for Prasad Counters and souvenir shops.ERP Module has been developed through TCS for accessing pilgrim services and facilities including Helicopter and Battery Car services onWebsite and Mobile platforms. In addition, self-order kiosks integrated with digital payments have been introduced in Bhojnalaya on the track to eliminate queues.

2. The current (AS IS Process) and the Critical Stakeholders

a) RFID (Radio Frequency Identification) based Yatra Access Cards:

Earlier, pilgrims were being issued paper slips at the time of registration and there was no mechanism to assess the actual number of people on the track at any point of time. Accordingly, crowd management as per carrying capacity was based on human assessment of various personnel deployed on the track. Moreover, it was a huge challenge to track any lost pilgrim who got separated from his/her group during the journey and was not carrying an operational phone. Verifying credentials of pilgrims obtaining Yatra slip without photograph

via online mode was a huge challenge for security forces. The unfortunate incident of stampede in the Bhawan area on the intervening night of 31st Dec 2021 and 1st Jan 2022 triggered the conceptualization of the project involving introduction of RFID based Cards with antennas all along the track for real-time information of Yatra numbers.

b) E-surveillance through CCTV cameras:

CCTV Surveillance grid of over 720 Cameras has added another layer of security on the track with round the clock monitoring at 2 Main Control rooms at Katra and Bhawan. All strategic locations are now being continuously monitored through PTZ, Dome and Bullet Cameras for crowd management, petty crimes, monitoring of any forest fires, landslides, shooting stones etc. and such other purposes.

c) Digitalization of services:

An overwhelming majority of payments were being made in Cash across the Board's establishments. This entailed problems of delayed accounting, difficulty in transactions, wastage of time and inconvenience for pilgrims besides scope for pilferages. A manual system for Current counter reservations in helicopter and Battery Car bookings and such others was in place that had a huge scope of human discretion causing inconvenience to pilgrims and often harassment at times.

Key Stakeholders

The beneficiaries of the initiatives are categorized as:
Devotees
Service Providers SMVDSB

3. Problem areas and need for intervention

There were several gaps and challenges identified by Shri Mata Vaishno Devi Shrine Board which led the way to the implementation of Real time tracking and surveillance for Yatra management through RFID technology and CCTV network and digitalization of Pilgrim services by Shri Mata Vaishno Devi Shrine Board to optimize governance.

Some of the **persistent challenges** such as lack of real-time information available to effectively administer Yatra at the time of peak rush and disaster management led to creation of this initiative.

SMVDSB identified several problems in achieving the objectives. The development of the Project was considered to address the key issues like Management of Yatra throughout the year Effective Disaster Management.

To help security forces in crime control and keep a check on anti-social elements.

Digital Payments to check pilferages and ensure ease of transactions besides eliminating long queues.

To enable senior citizens, Divyang and those with medical ailments to get hassle-free access to pilgrim services Planning of the New Project/System and the Role of the Organization.

The quest to integrate all Devotee Centric Activities by harnessing technology into an end-to-end solution for Yatra management was the core inspiration behind Gap analysis in all existing processes and activities.

Gathering of existing data and requirement analysis. System Feasibility analysis of the introduced system.

4. Introduction of new policies and Departmental Orders

Design a Prototype of all defined modules and user interfaces (Mock-up model)

Evaluating server specification by server expert as per the no. of modules and concurrent users load Planned Cloud server to secure departmental data/information Adoption of Agile Methodology in development of modules/software Taking feedback & relevant inputs from all stakeholders & final development of the application.

5. Objectives and Scope of the Project

The key objectives of the project are:

a) RFID (Radio Frequency Identification) based Yatra Access Cards:

A technological intervention for real-time tracking of every pilgrim on the track through RF Antennas at strategic locations.
To check any malpractices of service providers and facilitate pilgrims while hiring services at pre-paid counters.

b) e-surveillance through CCTV cameras:

Maintaining round the clock surveillance and providing effective security cover from Katra up to Bhawan.
To have real time visuals for efficient Disaster management including forest fires, landslide and stone shootings.

c) Digitalization of services:

Real-time electronic accounting and compilation of payments thus optimizing manpower requirements and checking any pilferages.
Ensuring digital transformation through Cashless Digital payments, elimination of fake tickets/touts, QR code-based and kiosk-based payment systems.
The redesigned Process and the Role of ICT Information and Communication Technology (ICT) serves as a pivotal instrument in introducing simplicity, accountability, and transparency into processes, representing a transformative paradigm shift in governance. The fundamental goal of e-Governance is to facilitate and elevate the quality of governance while ensuring active citizen participation in the decision-making and governance processes through electronic means such as email, websites, SMS connectivity, WhatsApp messages, and mobile app notifications.

The strategic implementation of ICT by the Shri Mata Vaishno Devi Shrine Board (SMVDSB) has yielded substantial enhancements in transparency, accountability, efficiency, effectiveness, and inclusiveness within the governing framework. This transformation has been achieved through the establishment of reliable channels for information exchange between pilgrims and the SMVDSB, thereby empowering individuals through access to and utilization of vital information.

In pursuit of these noble objectives, the Shri Mata Vaishno Devi Shrine Board has embarked on a distinctive initiative, resulting in the development of an ICT-driven system. This system seamlessly enables real-time tracking and surveillance for Yatra management, harnessing RFID technology, CCTV networks, and the digitalization of pilgrim services.

6. What is the Change/ Transformation?

a) RFID (Radio Frequency Identification) based Yatra Access Cards:

All 9-10 million pilgrims visiting annually are being provided free RFID Yatra cards with accidental insurance cover of Rs. 5 lakhs per pilgrim. Every pilgrim registering for the Yatra being issued Radio Frequency Identification (RFID) based Yatra Access Card since 13 Aug 2022;

More than 90 lakh pilgrims have been covered since the launch.

Service providers are also provided with RFID card as more than 11,000 Pony, Pithu, and Palki operators issued RFID-based Identity cards. RFID-based Access Cards issued to all Pony, Pithu and Palkhiwala with verification counters enroute to check any malpractices and facilitate pilgrims while hiring such services at prepaid counters.

Enforcement and Security Agencies equipped with technological tools for Yatra management including handheld RFID card scanners at strategic locations enroute Yatra. Elimination of unregistered and duplicate cards holders through verification counters at various locations on the track

RFID technology has been introduced for a scientific approach to Yatra management, especially the regulation of numbers on the track on a real-time basis. The track has been divided into 06 zones and real-time Yatra figures vis-a-vis carrying capacity of that respective zone are relayed through a dedicated RF Network to a Web Based MIS Dashboard. Analysis of Objective Reports based on this data enables the management and field personnel to regulate Yatra footfall accordingly. Cross-verification of photo Identities stored in the RFID Card through Handheld readers has enabled security forces in crime control and keep a check on anti-social elements.

Prompt Redressal of complaints regarding missing pilgrims analogous to GPS based tracking that benefits over 500 pilgrims/families on a daily basis.

b) e-surveillance through CCTV cameras and Integrated command and control center along with MIS Reporting systems. CCTV Surveillance grid of over 720 Cameras has added another layer of security on the track with round-the-clock monitoring at 2 Main Control rooms at Katra and Bhawan. All strategic locations are now being continuously monitored through PTZ, Dome, and Bullet Cameras

for crowd management, petty crimes, monitoring of any forest fires, landslides, shooting stones, etc., and other purposes.

c) Digitalization of services for pilgrims including payments, Helicopter and Battery Car bookings, etc. Digital platforms including QR scanners and POS machines in collaboration with Paytm for Prasad Counters and souvenir shops. ERP Module has been developed through TCS for accessing pilgrim services and facilities including Helicopter and Battery Car services on Website and Mobile platforms. In addition, self-order kiosks integrated with digital payments have been introduced in Bhojanalayas on the track to eliminate queues. Confirmation to Yatri via SMS or WhatsApp. Generation of e-ticket/Boarding Pass based on SMS/WhatsApp text. Digital booking receipts for Helicopter and Battery Car services have enabled senior citizens, Divyang, and those with medical ailments to get hassle-free access to these services

These measures have ensured hassle-free access to pilgrim services with no manual intervention.

7. Implementation Processes

a) RFID (Radio Frequency Identification) based Yatra Access Cards:

The enhanced technological accessibility is now available through 39 registration counters strategically located at Jammu and Katra. These counters facilitate the issuance of RFID-based Yatra Cards to every pilgrim, marking a significant improvement in the registration process.

Notably, the RFID cards are re-programmable and designed for recycling, thereby ensuring optimal resource utilization and sustainability.

To provide real-time insights and enhance Yatra management, a Management Information System (MIS) Dashboard has been implemented. This dashboard allows for the instantaneous compilation of data and the generation of comprehensive reports on Yatra footfall, aiding in informed decision-making and efficient resource allocation. In addition to pilgrims, RFID-based Identity Cards have also been extended to more than 11,000 service providers, including Pony, Pithus, and Palki operators. These identity cards are synchronized with Pre-Paid Counters, enhancing the convenience of pilgrims by enabling them to hire service providers at the onset of their journey seamlessly.

To maintain the integrity of the system and ensure that only authorized individuals are using the RFID cards, verification counters have been established at various locations along the pilgrimage track. These counters play a crucial role in eliminating unregistered and duplicate cardholders, contributing to the overall security and effectiveness of the system.

b) e-surveillance through CCTV cameras:

A comprehensive security and monitoring infrastructure have been established along the pilgrimage track, incorporating 720 Closed-Circuit Television (CCTV) cameras strategically positioned at various locations, including key establishments. These cameras are seamlessly integrated into a network system using dedicated Optical Fiber Cable (OFC) and Radio Frequency (RF) technology, ensuring uninterrupted live feed

transmission throughout the entire track. The CCTV system is designed to operate in all weather conditions and features high-end IP-based cameras with superior resolution. These cameras provide clear day and night vision capabilities, delivering real-time visuals that are invaluable for efficient disaster management. This includes the early detection and response to potential hazards such as forest fires, landslides, and stone shootings. Additionally, headcount cameras have been strategically deployed at key locations along the track to cross-verify the Yatra numbers, enhancing safety and accountability.

To manage and oversee this extensive surveillance network seven control centers have been established at critical points along the track, namely Bhawan, Bhairon, Sanjichhat, ArdhKuwari, Banganaga, Tarakote and SGC Katra. These control centers, in conjunction with the additional cameras installed at vital locations in Katra, provide security forces with the capability to maintain round-the-clock surveillance and ensure effective security coverage from Katra all the way up to Bhawan.

This comprehensive monitoring system is a pivotal component in safeguarding the safety and security of pilgrims throughout their journey.

c) Digitalization of services:

QR code Scanners and POS Machines for digital payments at 15 Prasad Kendras, Souvenir shops and Booking counters with Real-time electronic accounting and

compilation of payments thus optimizing manpower requirements and checking any pilferages.

Introduction of Self-order Kiosks with digital menu installed at Bhojanalaya integrated with digital payment facility to place Orders and get receipts resulting in elimination of queues.

Reduction of human interface for hassle free and seamless access to services with almost exponential growth in digital payments bringing ease of convenience for all pilgrims.

The SMVDSB also runs a 24X7 Contact Centre/ Help Desk aimed at providing much needed assistance to the pilgrims regarding yatra status, availability of heli, battery Car, accommodation services and other facilities at any given point of time on a real time basis. The facility now has 06 work centers and is providing facilities round the clock. This facility will now be upgraded to 10-seater with Artificial intelligence-based Chat bot, WhatsApp Bot, bilingual IVR support, grievance management system.

Confirmations of yatra through SMS and WhatsApp messages has reduced physical presence. This has also checked pilferages, ensured ease of transactions besides eliminating long queues.

8. Constraints and Challenges Faced and Overcome

Situation before the initiative

Previously, a paper-based system was employed for issuing pilgrim registration slips, lacking the capability to accurately assess the real-time headcount on the pilgrimage route. Consequently, crowd management strategies, aligned with the carrying capacity, relied solely on subjective evaluations conducted by personnel stationed along the route. Furthermore, the challenge of locating lost pilgrims who had become separated from their groups during the journey and were without operational phones posed a significant difficulty. The verification of pilgrim credentials for those obtaining Yatra slips without photographs via online means also presented formidable challenges to security forces.

Another prevalent issue revolved around the predominant use of cash for payments across the various facilities managed by the Board. This gave rise to concerns such as delayed accounting, transactional difficulties, time wastage, and pilgrim inconvenience, as well as potential opportunities for misappropriation.

Additionally, a manual reservation system was in place for current counter reservations related to helicopter rides, battery car bookings, and similar services. This manual system was fraught with the potential for human discretion, which often led to inconveniences for pilgrims and, at times, incidents of harassment.

Situation after the initiative

The implementation of RFID (Radio-Frequency Identification) technology represents a pivotal advancement in the realm of Yatra management, specifically geared towards the real-time regulation of pilgrim numbers on the pilgrimage track. To achieve this, the track has been divided into six distinct zones, each equipped with RFID technology. Real-time data pertaining to the Yatra figures in relation to the carrying capacity of each respective zone is transmitted through a dedicated RF Network to a Web-Based Management Information System (MIS) Dashboard. The analysis of objective reports derived from this data empowers both management and field personnel to make informed decisions and effectively regulate Yatra footfall in accordance with the predefined limits. Moreover, the integration of Handheld RFID readers for cross-verifying photo identities stored in the RFID Cards has significantly bolstered security measures. This technology has proven instrumental in crime prevention and the monitoring of potential antisocial elements, enhancing overall safety and security. In an effort to modernize payment methods, digital solutions such as QR-based payments, UPI (Unified Payments Interface), and POS (Point of Sale) machines have been strategically introduced at 15 key establishments along the pilgrimage track. As a result, the proportion of digital payments has witnessed a substantial increase, exceeding 30% from previously negligible levels. These digital payment options, coupled with the seamless integration of real-time data compilation and accounting, have not only streamlined transactions but also curbed pilferage issues. Additionally, the introduction of real-time refunds has further improved the overall pilgrimage experience by eliminating long queues and enhancing transactional efficiency.

9. Impact of the Project-Tangible/ Intangible (with data), Social Impact

a) RFID (Radio Frequency Identification) based Yatra Access Cards:

Photo-identity and KYC details of every pilgrim being captured in RFID based Yatra Access Card since 15 Aug 2022**.**

Till 10th July, 2023 total 82,68,744 RFID cards have been issued 28 Km track divided into 7 Zones with defined Crowd carrying capacities Real-time pilgrim count for each zone shared through MIS Dashboard with multiple agencies for hassle-free Yatra management Helps prevent overcrowding in vulnerable zones

Verification Counters and teams at various strategic locations to verify credentials

- Deterrence for anti-social elements

Prompt Redressal of lost pilgrim complaints analogous to GPS tracking

b) e-surveillance through CCTV cameras:

- 720 CCTV Cameras enroute track and various establishment Combination of PTZ, Bullet and Dome cameras as per requirement Dedicated OFC and RF network across the track for uninterrupted live feed
- 7 control centers across the track at Bhawan, Bhairon,Sanjichhat, ArdhKuwari, Banganaga, Tarakote and SGC Katra.
- Integrated Command and Control Centre at Spiritual Growth Centre Katra being manned round the clock
- Additional Cameras installed at vital locations in Katra to facilitate Security forces in peak periods
- Real time visuals for efficient Disaster management including forest fires, landslide and shooting stones.
- Headcount Cameras at strategic locations for cross verification of Yatra numbers.

c) Digitalization of services:

Integrated Next Gen online platform including RWD Version for all donations Installation of QR code at 50 locations for online Donation. Tie up with SBI Bank and HDFC bank for onboarding their donation platforms
Collaboration with Paytm for donation as well as Prasad Resulting into greater ease and access for pilgrims and lesser queues at the counter.
Mobile OTP based login for online services for easier and secure access WhatsApp notification alerts. Currently being employed for Protocol requests
SMS alerts for each financial transaction as well as for verification at the counters

10. Lessons Learnt

- Rule bound process for successful implementation of the project.

- Stakeholder‘s consultation and trust are an important factor for execution of the project.
- It is possible to transform service delivery through integrated service delivery.
- Bridging the gap after bringing services online.

11. Long Term Significance

Real time tracking and surveillance for Yatra management through RFID technology and CCTV network and Digitalisation of Pilgrim services by Shri Mata Vaishno Devi

Shrine Board has shown that Shri Mata Vaishno Devi Shrine Board has the capability to not only improve the service delivery but adopt a data driven approach in all its activities. The system is expected to enhance the transparency within the system which is further expected to result in work efficiency among the officials so that pilgrim service delivery is also improved.

12. Future Roadmap

• Implementation of ERP module for Shrine operations to achieve end-to-end digitization and real time Administrative/Financial reports. This shall also include Purchases and vendor management, linking of store inventory with sale points, HR management, fleet management and Works management modules.

• Next Gen Website (including RWD version) with user friendly features including quota availability for services, pilgrim feedback, grievance mechanism and bilingual chatbot.

• State-of-art Call center functioning 24*7 with 10-seater capacity with features like IVRS, Automatic Call detection, WhatsApp bot for automated replies and ticketing mechanism for each grievance.

***

MOR Raipur CITY APP

By: Raipur Smart City Ltd.

Abstract

Enhance the efficiency and convenience of urban living in Raipur by providing residents with a comprehensive platform for accessing city services, real-time information, digital payments, and personalized notifications, ultimately promoting a smarter and more connected city experience.

The objective of the MOR Raipur Smart App is to enhance the efficiency and convenience of urban living in Raipur by providing residents with a comprehensive platform for accessing city services, real-time information, digital payments, and personalized notifications, ultimately promoting a smarter and more connected city experience.

The MOR Raipur App is a district-level initiative that aims to transform Raipur into a technologically advanced and inclusive urban environment through e-governance. It focuses on leveraging digital technologies to enhance the delivery of public services, promote citizen engagement, and streamline administrative processes. At the core of the App is the MOR Raipur App, a comprehensive platform that serves as a one-stop solution for residents to access various city services and information.

The app provides functionalities such as online payment of bills, applying for permits and licenses, tracking service requests, and accessing real-time data on traffic, weather, and public transportation.

One of the key aspects of the App is the digitization of administrative processes. Traditional manual paperwork is being replaced with online applications and digital workflows and enhancing efficiency. This includes services like issuing and door step delivery of birth and death certificates, property tax assessments, and building plan approvals, which can now be conveniently accessed and processed through the app.

The App also emphasizes citizen participation and engagement.

The app incorporates features for feedback, suggestions, and complaint redressal, enabling residents to actively contribute to the improvement of urban

services. It also integrates with social media platforms to disseminate important announcements, updates, and community-driven initiatives, fostering a sense of ownership and collaboration among the citizens.

In terms of governance, the e-governance initiative enhances decision-making and resource allocation through data-driven insights. The app incorporates advanced analytics and predictive modeling to analyze data on various aspects of urban life, including energy consumption, traffic patterns, waste management, and water usage. This enables the government to make informed decisions, optimize urban planning, and ensure sustainable development. The App's district level focus ensures that the benefits of e-governance reach all sections of the population.

The district-level initiative in e-governance through the MOR Raipur Smart City app revolutionizes public service delivery, promotes citizen engagement, and enhances governance processes, ultimately creating a smarter and more connected city experience for the residents of Raipur.

1. Project Background

The MOR Raipur Smart City Initiative, championed by the Raipur Municipal Corporation (RMC), is a pioneering endeavor to transform Raipur into a technologically advanced and inclusive urban environment through e-governance. This district-level initiative focuses on harnessing digital technologies to enhance public service delivery, promote citizen engagement, and streamline administrative processes.

At its core is the MOR Raipur App, a comprehensive platform that serves as a one-stop solution for residents to access a myriad of city services and real-time information. It facilitates online payment of bills, permits and licenses applications, service request tracking, and offers real-time data on traffic, weather, and public transportation.

A critical facet of the initiative is the digitization of administrative processes, replacing cumbersome paperwork with online applications and digital workflows, building plan approvals and Water Connection, Property Tax, Property Mutation etc. are now conveniently accessible through the app.

Emphasizing citizen participation, the app incorporates feedback mechanisms and integrates with social media platforms for community-driven initiatives. The

initiative enhances decision-making and resource allocation through data-driven insights, employing advanced analytics and predictive modeling for sustainable urban planning.

Accessibility is a priority, with the app designed for diverse demographics, including the elderly and people with disabilities. By revolutionizing public service delivery, fostering citizen engagement, and enhancing governance processes, the MOR Raipur Smart City Initiative envisions creating a smarter and more connected urban experience for Raipur residents.

Through a holistic approach that combines e-governance, citizen-centricity, and data-driven governance, this initiative has reshaped Raipur, making it more efficient, connected, and citizen-centric.

2. **Beneficiary of the Project:**

The beneficiaries of this initiative are categorized as:

- Public : Citizens of RMC
- Government : RMC/RSCL, Departments, Administration, Officers

3. **Pain Points/Grievances**

Inefficient Administrative Processes: The district experienced bureaucratic inefficiencies and lengthy administrative processes. Manual paperwork, long queues, and multiple visits to government offices were common, leading to delays, errors, and inconvenience for residents.

Lack of Information Accessibility: There was a lack of real-time information available to residents regarding traffic updates, weather conditions, public transportation schedules, and other essential city services. This resulted in inefficient travel planning and limited access to vital information.

Limited Citizen Engagement: There was a gap in citizen participation and engagement in the governance processes. Residents had limited channels to provide feedback, suggestions, or voice their concerns, hindering their ability to actively contribute to the development of the city.

Fragmented Service Delivery: Various city services such as permits, licenses, and bill payments were fragmented across different departments and required multiple visits or interactions. This led to confusion, duplication of efforts, and increased costs for both residents and the government.

The trigger for conceptualizing the MOR Raipur Smart City App was the recognition of these challenges and the realization that digital transformation and e-governance could address them effectively. The district aimed to leverage technology to streamline administrative processes, enhance service delivery, and improve citizen engagement. The need for a comprehensive platform that integrates various services, provides real-time information, and enables efficient communication with residents spurred the district to initiate this App as a holistic solution to the existing bottlenecks and constraints.

4. Planning for the new Project/System and the Role of the Organization

The roll-out and implementation model of the MOR Raipur Smart City initiative involved a phased approach. It began with comprehensive planning and stakeholder engagement to identify priorities and define project goals. The implementation included the development and deployment of the MOR Raipur Smart City App, integrating various city services, real-time information, and citizen engagement features. The model focused on collaboration between government departments, technology partners, and citizens to ensure seamless integration and adoption. Continuous monitoring, evaluation, and feedback mechanisms were established to assess progress and make necessary improvements. The roll-out model aimed to ensure a smooth transition to a smart city by prioritizing user experience, scalability, and sustainability.

Process Flow:

User Interaction: The process begins with users interacting with the MOR Raipur Smart City App through their mobile devices or computers.

Service Selection: Users select the desired service from the app, such as applying for permits, licenses, or making payments.

Data Input: Users provide the necessary information and data required for the selected service, such as personal details, documents, or payment information.

Data Validation: The app validates the input data to ensure accuracy and completeness. It may include checks for data consistency, verification against existing records, or compliance with specific requirements.

Service Processing: The validated data is processed by the relevant government department responsible for the specific service requested. This may involve further verification, assessment, or approval processes.

Notification and Updates: Users receive notifications and updates regarding the status of their service request, such as approval, rejection, or additional requirements.

Service Delivery: Once the service request is approved, the relevant output or deliverable, such as permits, licenses, or payment receipts, is generated and made available to the user through the app.

Data Flow:

User Data: Users provide their personal data, contact information, and other relevant details during the interaction with the app.

Service-specific Data: Users input service-specific data, such as property details, payment information, or supporting documents, as required by the selected service.

Data Validation: The app validates and verifies the user and service-specific data for accuracy, completeness, and compliance.

Data Integration: The validated data is integrated with existing government databases, systems, or processes to ensure seamless processing and access to relevant information.

Data Processing: The processed data flows through the various stages of service processing, including assessments, verifications, approvals, and notifications.

Data Output: The final output data, such as approved permits, licenses, or payment receipts, is generated and made available to the user through the app.

Data Analytics: The collected data can be analyzed to derive insights, trends, and patterns for informed decision-making, resource allocation, and urban planning.

Both the process flow and data flow of the MOR Raipur Smart City initiative aim to streamline service delivery, enhance user experience, and ensure efficient governance through the effective utilization of digital technologies and data management practices.

➢ Raipur Heritage

➢ Eateries

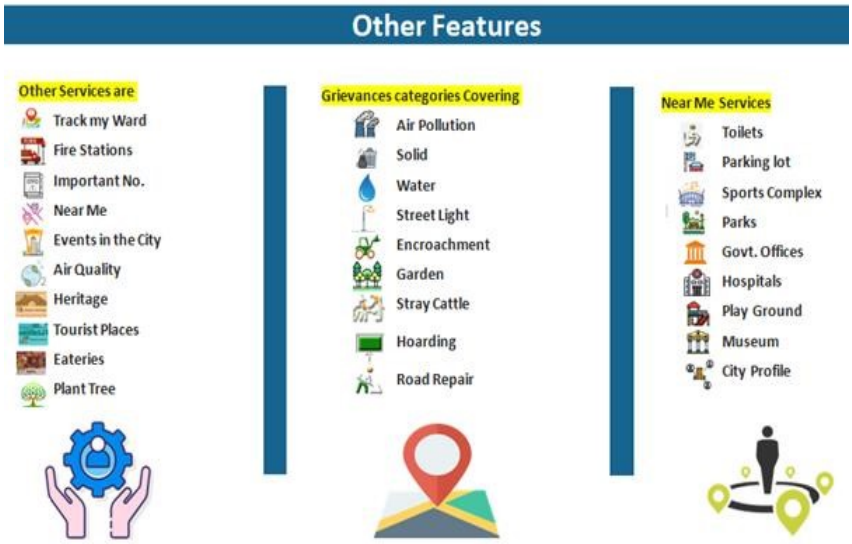
➢ Event in City

5. Objective and the Scope of the Project

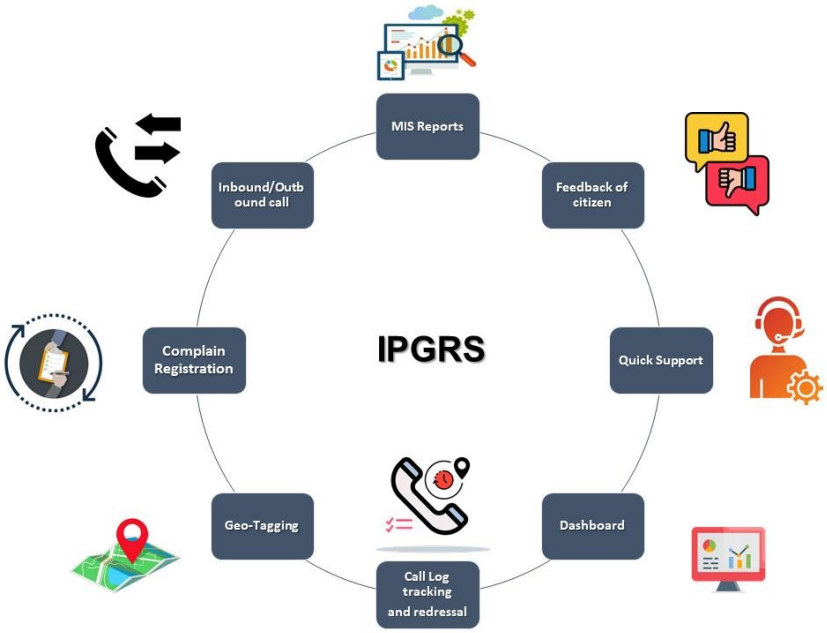
The objective of the MOR Raipur Smart App is to enhance the efficiency and convenience of urban living in Raipur by providing residents with a comprehensive platform for accessing city services, real-time information, digital payments, and personalized notifications, ultimately promoting a smarter and more connected city experience.

6. Salient Features

It involves streamlining and automating various administrative processes to eliminate manual paperwork. This includes digitizing applications for services like Building Permission, Namantran, and property tax payments, making them accessible and convenient for citizens. The app incorporates advanced data analytics and predictive modeling to optimize urban planning and resource allocation. By analyzing data on energy consumption, waste management, and water usage, the app enables smarter decision-making and facilitates sustainable development. It promotes citizen participation and engagement through interactive features. It includes channels for feedback, suggestions, and complaint redressal, allowing residents to actively contribute to the improvement of urban services. To ensure inclusivity, the app is designed with a user-friendly interface that caters to diverse sections of the population. It aims to create an efficient, citizen-centric, and technologically advanced urban environment, enhancing the quality of life for residents.



The Public grievances are coming directly from Mor Raipur Mobile app in various categories, these grievances are moving towards the concern department's concerned person who is the person responsible for looking after the particular grievance. Depending on the specified time limit the responsible official has to resolve those complaints and if not resolved by him, the same grievance will be escalated to another level. Level 3 is the last officer for escalating grievances in Raipur Grievances Cell.



Category of Public Grievances covered in MoR Raipur App for citizen

- Air Pollution
- Solid waste
- Water Supply
- Street Light
- Encroachment
- Stray cattle
- Illegal Holding
- Road repair

New feature introducing chatbot through WhatsApp

7. Potential Impact of the service:

- Accessibility and Convenience
- Real-time Assistance
- 24/7 Availability
- Personalized Interaction
- Reduced Workload on Customer Support
- Scalability and Cost-efficiency
- Data Collection and Analytics

Raipur Municipal Corporation Section Wise Performance Report of Grievances Redressed

The Raipur has developed a dedicated Mobile Application MOR Raipur Smart City App that serves as the primary interface for citizens to access various city services, make payments, receive notifications, and engage with the government. The app is designed for both in Android and iOS as well as in Web platforms, ensuring wider accessibility. Few of the innovative apps features include:

✓ Digital Addressing Numbering System
✓ GIS based Online Property Tax System
✓ Near By Me
✓ Tourist Places
✓ Raipur Heritage
✓ Eateries
✓ Event in City

Ex- This project introduced 1 of the innovative way to improve the Citizen Centric Delivery i.e. GIS based Services in Property Tax

Geographic Information System (GIS)-based property tax system is a technology driven approach to property tax management that utilizes GIS software and spatial data to assess and manage property taxes. This system integrates property information, such as ownership details, parcel boundaries, property characteristics, and market values, with geospatial data, allowing for a more efficient and accurate property tax assessment and administration process.

- Property tax is the largest source of 'Own Source Revenue (OSR)' for Raipur Municipal Corporation
- Providing GIS based decision support system for city development

- GIS Based Drone Survey
- Creation of GIS enabled digital records of all properties using GIS and door to door services.

Our implemented GIS-based property tax system can greatly enhance citizen centric delivery in several ways:

Transparent and Accessible Information: GIS technology enables easy access to property-related information for citizens. By integrating GIS with a user-friendly interface, taxpayers can view their property details, tax assessment values, payment history, and related documents online. This transparency promotes trust and empowers citizens to make informed decisions.

Online Services and Self-Service Portals: A GIS-based property tax system can provide online services and self-service portals, allowing citizens to complete various tasks conveniently. They can file tax returns, apply for exemptions, request property valuation reviews, and access payment options online. This eliminates the need for physical visits to tax offices and enhances citizen satisfaction.

Personalized Communication: GIS technology allows for personalized communication with taxpayers. Authorities can send targeted messages, notifications, and reminders based on specific property characteristics or taxpayer profiles. This tailored approach ensures that citizens receive relevant information, such as changes in tax rates or upcoming deadlines, improving overall communication and engagement.

Automated Assessments and Valuations: By integrating GIS with property data, authorities can automate property assessments and valuations. GIS can analyze property attributes, land use, location, and other relevant factors to determine accurate tax assessments. Automating these processes not only reduces human errors but also speeds up the assessment and valuation process, improving efficiency.

Enhanced Revenue Collection: GIS-based property tax systems can enhance revenue collection through improved monitoring and enforcement. Authorities can use GIS to identify non-compliant properties, track tax delinquencies, and prioritize collection efforts based on geographic patterns or specific criteria. This proactive approach increases compliance and revenue collection, benefiting both citizens and the government.

Integration with Other Services: A GIS-based property tax system can be integrated with other municipal services, such as water, waste management, or transportation. This integration enables authorities to optimize resource allocation and service delivery based on property tax revenue. For example, tax data can inform infrastructure investment decisions or help identify areas that require additional services, enhancing overall citizen satisfaction.

The implementation of MoR Raipur App has impacted huge improvement of people's lives, the quantifiable improvements highlight the tangible benefits that smart city solutions have brought to people's lives. Through leveraging technology, data, and innovative approaches, smart cities are creating more sustainable, efficient, and livable urban environments for their residents.

Some of the points are provided below which causes due to the Mor Raipur App the citizens service improvised.

Reduced Cost – Availability of online App and Web based solution of Mor Raipur App has given drastically improvement to citizens lives, by saving more m1y instead of visiting government departments now a days with the help of the Mor Raipur App the citizen can do their municipal related works such as water Tax, property tax, mutation of property, new water connection etc. at their home or at office in leisure time by suing smart mobile or by laptop / desktop.

Time Saving - The citizens time is in compare to earlier era has totally improved, and saving much and more time by using smart mobile app and web solutions, all the services are taking genuine to move the documents from 1 place to another or from department to department in very less time. Quick services are to reach citizens directly without visiting municipal offices.

Easy Reach –With easy functionalities have been implemented by smart city Raipur's App Mor Raipur for people, we can see that now a days almost people are having smart ph1s and they can frequency using the municipal services via mobile. Due to an online solution May I help you desk is not in functional in some of the offices by using chat option citizens can raise their queries and they can get their relevant answers.

Improved Services – The peoples are getting improved services from the municipal offices/departments, services are more improved now due to good initiatives of Raipur smart city Mor Raipur smart App. No table-to-table visits and

no need to spend m1y for moving the files from 1 department to other department.

Some of the Major Services are:

- Property Tax
- Building permission
- Mutation
- Water connection
- DDN
- Nearby me
- Grievance

Online Payment – With the help of Mor Raipur app, citizens can pay their services cost payment online via various modes of transactions such as debit card, credit card, wallets, online banking etc. This facility is available in an easy way without affecting people's daily life and their precious time. This module is also a time saving function that saves people time to visit ATM cash withdrawal for giving payment to the department for taking government citizen centric services.

8. Long Term Significance

The implementation of Mor Raipur App has impacted huge improvements in people's lives, the quantifiable improvements highlight the tangible benefits that smart city solutions have brought to people's lives. Through leveraging technology, data, and innovative approaches, smart cities are creating more sustainable, efficient, and livable urban environments for their residents.

Some of the points are provided below which causes due to the Mor Raipur App the citizens service improvised.

Reduced Cost – Availability of online App and Web based solution of Mor Raipur App has given drastically improvement to citizens lives, by saving more m1y instead of visiting government departments now a days with the help of the Mor Raipur App the citizen can do their municipal related works such as water Tax, property tax, mutation of property, new water connection etc. at their home or at office in leisure time by suing smart mobile or by laptop / desktop.

Time Saving - The citizens' time in comparison to earlier eras has totally improved, and saving much and more time by using smart mobile app and web solutions, all the services are taking genuine steps to move the documents from 1 place to another or from department to department in very less time. Quick services are to reach citizens directly without visiting municipal offices.

Easy Reach –With easy functionalities have been implemented by smart city Raipur's App Mor Raipur for people, we can see that nowadays almost all people are having smart ph1s and they can frequently use the municipal services via mobile. Due to an online solution, help desks are not functional in some of the offices. By using the chat option citizens can raise their queries and they can get their relevant answers.

Improved Services – The people are getting improved services from the municipal offices/departments, services are more improved now due to good initiatives of Raipur smart city Mor Raipur smart App. No table to table visits and no need to spend m1y for moving the files from 1 department to another department.

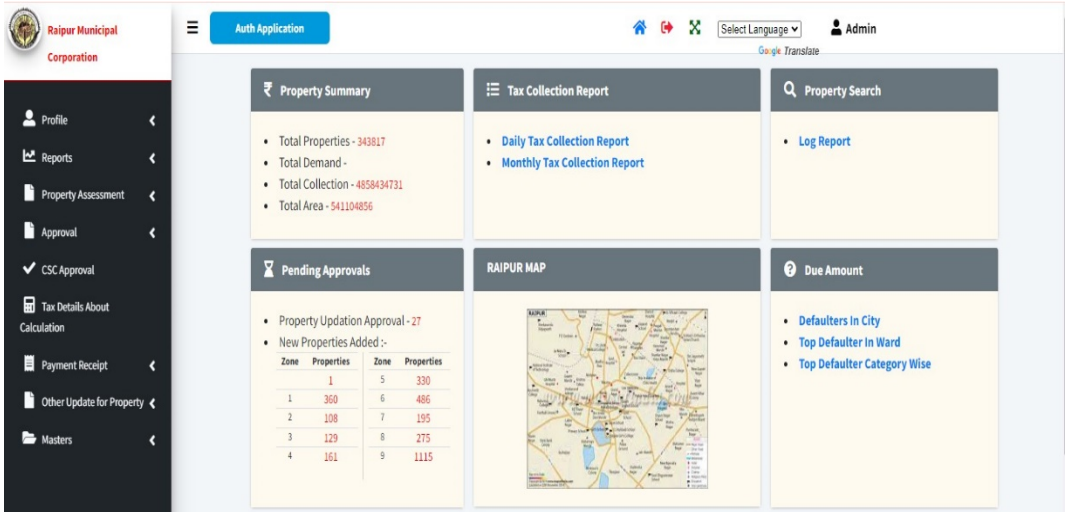
Some of the Major Services are:

- Property Tax
- Building permission
- Mutation
- Water connection
- DDN
- Nearby me
- Grievance

Online Payment – With the help of Mor Raipur app, citizens can pay their services cost payment online via various modes of transactions such as debit card, credit card, wallets, online banking etc. This facility is available in an easy way without affecting people's daily life and their precious time. This module is also a time saving function that saves people time to visit ATM cash withdrawal for giving payment to the department for taking government citizen centric services.

Property Increase	
2021-22 (before System Implementation)	2.93 lakh

2022-23 (After System Implementation)	3.30lakh



Online Payment Collection Increase		
Year	No of Tax Payer	Amount
2021-22 (before System Implementation)	9824	78382537
2022-23 (After System Implementation)	23695	338320704

Data Security - it is essential to prioritize the protection of personal information and ensure the privacy and security of citizens' data. Here are some measures that are commonly implemented to address citizens' data security concerns:

- Secure Authentication
- Enforcing a password policy • Monitoring suspicious activities
- OTP based authentication etc.

Our application has the following features making the app as secure as possible. Some of the features are listed below:

Authentication

Authentication is the process of verifying the user's identity. This works based on the identifier (e.g. a username or an email address) and a secret token (e.g. a password or an access token) to confirm the user. Authentication is the stepping stone of the login feature.

Our project has an extensive authentication framework which includes vivid components to support login. To use this authentication.

Authorization

Authorization is the process of verifying and permitting that the user has access and can work upon a certain part of the application. In our project provides two authorization methods:

I. Access Control Filter (ACF)

Access Control Filter (ACF) is a simple authorization method. It is used by applications that only need some simple access control, it is an action filter that can be used in a controller or a module. ACF works by checking the list of access rules when a user is requesting to execute an action.

II. Role-Based Access Control (RBAC)

Role-Based Access Control (RBAC) provides centralized access control. Project implements a General Hierarchical RBAC which follows the NIST RBAC model providing the RBAC functionality through the auth Manager Application component. RBAC usage involves two fundamental steps: The first one is to create the RBAC authorization data and the second step is to use this authorization data to perform access checks at various places, wherever required. Auth Clients in Project also provides official extensions that allow you to authenticate & authorize using external services.

III. Working with Passwords

With the increasing brute force attacks that can reverse the aforementioned hashed algorithms, it now becomes mandatory for the developers to avoid the passwords to be saved as plain text. Project provides increased security to this scenario by supporting one the best hashing algorithms – bcrypt. Project provides two helper functions that help bcrypt to securely generate & check the hashes easily.

IV. Cryptography Mechanism

The cryptography mechanism of the project is very strong to protect easy encryption of crucial data. For example, when the user is trying to reset the password via email, it follows a step- by- step mechanism of generating a token, saves it to the database, sends it to the user via email allowing the password resetting to be possible. It is important that data like this – token and other data be highly coded so that the attacker cannot guess, predict or decode it. In such situations, Project generates pseudo-random data and also provides a function to support the encryption & decryption of this data using a secret key. Project also provided a function to confirm the data integrity & verify that the data does not tamper, which is essential in certain cases.

V. Views Security

In our project implements the model-view-controller (MVC) design pattern and Views are part of this MVC architecture, widely adopted by web programming. Basically, views are the code responsible for presenting data to end users. Views are usually created in terms of view templates which are PHP script files containing mainly HTML code and presentational PHP code.

VI. Security Best Practices

Following the Security Best practices, you can avoid the security threats while using a project. The security best practices work upon the fundamental principle of filtering all the inputs & escaping all the output. Some of the general best practices involve: avoiding SQL injections, avoiding XSS, avoiding cross-site request forgery, avoiding debug info and tools in production, Using secure connection over TLS and secure server connections and more.

Our project is considered amongst one of the most result oriented, open source and secure framework. It is highly flexible with features of error-handling capacity, security against cyber-attack, plenty of structures and themes, smart caching system and many more

(a) Enhanced User Interface: Improve the overall user experience by making the application more intuitive, user-friendly, and visually appealing.

(b) Expanded Service Offerings: Integrate additional services that citizens frequently require, such as online bill payment, property tax payment, birth and death certificate requests, and building permit applications.

(c) Real-time Updates: Implement a notification system to provide citizens with real-time updates on service requests, status changes, and important announcements.

(d) Feedback and Rating System: Incorporate a feedback and rating system to allow citizens to provide feedback on the services they receive, helping the municipal corporation to identify areas for improvement.

(e) Integration with Other Systems: Integrate the application with other government systems, such as traffic management, waste management, and emergency services, to provide a comprehensive platform for citizens to access all relevant services.

(f) Collaboration with Other Government Agencies: Collaborate with other government agencies to provide a seamless experience for citizens, allowing them to access services from multiple agencies through a single application.

(g) Continuous Improvement: Regularly gather feedback from citizens and stakeholders to identify areas for improvement and implement updates and enhancements to meet evolving needs.

***

Cold Storage Information System (CSIS)

By: District Administration, Firozabad, Government of Uttar Pradesh

Abstract

In Firozabad, renowned for its glass industry and potato agriculture, the intersection of multiple factors, including the district's glass industry and potato agriculture, gives rise to a multitude of cold storage facilities. Primarily catering to perishable goods such as potatoes and other produce, these storage units play a crucial role in supporting the local agricultural ecosystem.

However, the agricultural community in Firozabad faces significant hurdles during peak harvest seasons. The limited availability of cold storage space compels farmers to sell their produce at lower prices, resulting in substantial losses. Inefficient management practices within these storage facilities further exacerbate the problem, leading to spoilage and additional financial setbacks for the farmers.

Moreover, the disorganization within the cold storage sector contributes to missed business opportunities for cold storage owners, translating to revenue loss. The absence of proper oversight from the district administration complicates the management process, creating governance challenges.

Additionally, issues related to storage charges and comparatively lower market prices add to the plight of farmers and cold storage owners alike. Recognizing these challenges, the Firozabad District Administration undertook the development of a Cold Storage Information System (CSIS).

The CSIS project is a strategic response to the complex issues faced by the local agricultural community. It is a comprehensive digital solution aimed at revolutionizing the agricultural landscape in Firozabad. By implementing this digital cold storage information management system, the objective is to alleviate the challenges faced by farmers, facilitate ease of doing business for cold storage owners, and enhance governance capabilities for the district administration.

1. Project Background

The e-governance initiative in Firozabad, India addresses challenges faced by farmers and cold storage owners through a Cold Storage Information System. Firozabad has numerous cold storage facilities, but farmers struggle with limited

space during peak harvest seasons, leading to losses and lower prices. Inefficient management in cold storages adds to spoilage and losses.

The Firozabad District Administration has implemented a digital solution to address these issues. The Cold Storage Information System streamlines processes, enhances monitoring, reduces wastage, improves market access, and increases profitability for cold storage owners. It empowers farmers with a comprehensive list of facilities, easy cold storage space reservation, tracking status, and feedback submission.

The initiative benefits both farmers and the district administration. It enables efficient management, ensures compliance with food safety standards, and enhances transparency. Data collection improves planning and management, and a user-friendly mobile app improves public service. Audits, compliance monitoring, and facility usage analysis are streamlined.

This e-governance project contributes to agricultural sector growth in Firozabad. The Cold Storage Information System minimizes losses, increases efficiency, and fosters economic development. It strengthens the ease of doing business and governance by facilitating interactions between farmers and cold storage owners.

2. The Current (AS IS Process) and the Critical Stakeholders

Critical Stakeholders

Farmers:

Farmers stand at the forefront of the Cold Storage Information System (CSIS) project, experiencing a transformative shift in how they manage their produce. With CSIS, the once complex and time-consuming task of reserving storage space has become seamless. Real-time access to information about storage facilities empowers farmers to make informed decisions, reducing the risk of financial losses. Additionally, the enhanced customer service provided through CSIS further supports farmers, ensuring a more efficient and profitable agricultural experience.

Cold Storage Owners:

For cold storage owners, CSIS has ushered in a new era of business optimization. The project translates into increased opportunities and operational efficiency.

Streamlined processes and digital management not only benefit the storage owners themselves but also enhance services for their primary clients—the farmers. CSIS aligns with broader initiatives promoting the Ease of Doing Business, fostering a conducive environment for storage owners to thrive and contribute to the agricultural value chain.

District Administration:

The district administration emerges as a key beneficiary, gaining multifaceted benefits from the CSIS project. This transformative system delivers efficiency, transparency, and invaluable insights for decision-making. The tools provided by CSIS empower the administration with oversight capabilities, streamlined operations, and robust compliance monitoring. This newfound technological capacity enables the district administration to plan more effectively, allocate resources judiciously, and ensure regulatory compliance, thereby elevating governance standards in the agricultural sector.

Holistic Collaboration:

CSIS serves as a catalyst for collaborative synergy among these critical stakeholders. By addressing the unique needs of farmers, storage owners, and the district administration, the project creates a harmonious ecosystem where each group benefits. This holistic collaboration ensures a resilient and efficient agricultural sector, reflecting the broader positive impacts of the CSIS initiative.

Overview of the Current Process:

The current process of cold storage management is entrenched in traditional practices. Farmers and traders engage in direct interactions with cold storage owners, often relying on direct in-person visits or phone calls to secure storage space for their agricultural produce. This conventional approach involves manual record-keeping by cold storage owners, resulting in a paperwork-intensive process that is susceptible to errors.

Limited Visibility and Transparency:

A significant challenge in the current system is the limited visibility and transparency. Farmers and traders face difficulties in accessing real-time information about available storage space, prevailing rates, and the status of

their reservations. The lack of a centralized system leads to opaque processes, contributing to inefficiencies and disputes within the cold storage industry.

Paper-Based Transactions:

The cold storage industry is burdened by paper-based transactions, introducing challenges in documentation and processing. This reliance on paperwork, including receipts, invoices, and manual ledgers, contributes to delays and inefficiencies in the overall transactional workflow. The absence of a digital platform hinders the sector's ability to streamline communication and transactions effectively.

Limited Technological Integration:

The current cold storage landscape lacks widespread integration of digital platforms. This deficiency results in a dependency on manual methods for communication between stakeholders, leading to delays and potential misunderstandings. The absence of digital platforms impedes the industry's ability to embrace modern technological advancements for seamless operations.

Inefficient Resource Management:

Resource management in the current system faces inefficiencies. Due to a lack of real-time insights, some cold storage facilities may experience underutilization, while others may encounter overbooking issues. Manual resource allocation processes, including space reservations and coordination of transportation, contribute to inefficiencies across the board.

3. Problem areas and need for intervention

Stakeholders in the Current Process:

The primary stakeholders involved in the current cold storage process include farmers and traders, cold storage owners, and regulatory authorities. Farmers and traders initiate the process by contacting cold storage owners to reserve space, with cold storage owners managing reservations manually. Regulatory bodies, responsible for oversight, have limited real-time visibility and rely on periodic documentation checks to ensure compliance.

Pain Points in the Current Process:

Inefficiency, delays, and errors characterize the current cold storage process. The reliance on manual methods hampers the overall agility and effectiveness of the system, impacting the timely and accurate allocation of storage space. Limited information flow exacerbates the challenges, contributing to a lack of transparency and hindering informed decision-making. The system also grapples with resource underutilization, further underscoring the need for a comprehensive and streamlined solution.

Understanding these pain points emphasizes the urgency and importance of implementing the Cold Storage Information System (CSIS) project, aiming to revolutionize and optimize the cold storage management landscape.

Financial Losses Faced by Farmers:

The current cold storage process imposes significant financial losses on farmers. During peak harvest seasons, limited availability of storage space often compels farmers to sell their produce at lower-than-optimal prices. This forced selling is a direct consequence of the inadequate infrastructure and lack of real-time information on storage availability. As a result, farmers are unable to leverage market conditions for better pricing, leading to substantial financial setbacks.

Spoilage and Quality Deterioration:

In addition to financial losses, farmers frequently encounter losses related to the spoilage and deterioration of their agricultural produce. The lack of timely and guaranteed access to cold storage facilities means that, at times, harvested crops remain exposed to unfavorable environmental conditions. Without proper storage, perishable goods are susceptible to spoilage, diminishing both quantity and quality. This not only impacts the economic returns for farmers but also contributes to food wastage, exacerbating broader concerns related to sustainability.

Market Access and Competitive Disadvantage:

The inability to secure timely storage space puts farmers at a competitive disadvantage. Those who cannot access cold storage facilities when needed face challenges in complying with market demands. This hampers their ability to enter lucrative markets that require adherence to specific quality and shelf-life standards. Consequently, farmers are excluded from valuable market

opportunities, limiting their income potential and perpetuating economic disparities within the agricultural sector.

Addressing Farmer Losses through CSIS:

The CSIS project directly addresses these multifaceted challenges faced by farmers. By providing a user-friendly mobile application that facilitates seamless access to cold storage facilities at government-defined prices, CSIS empowers farmers to make informed decisions about when and where to store their produce. This intervention aims to alleviate financial losses, reduce spoilage, and enhance market access, ultimately contributing to the economic upliftment of the farming community. By understanding and addressing these losses, CSIS emerges as a transformative solution with the potential to revolutionize agricultural practices and improve livelihoods.

The project was triggered by these recurring issues, aiming to streamline processes, increase transparency, and facilitate ease of doing business. By providing a digital solution, the initiative addresses the bottlenecks and improves the ecosystem of potato produce storage and management in Firozabad district.

4. Planning for the New Project/System and the Role of the Organization

The planning of the Cold Storage Information System (CSIS) was a meticulous and collaborative process that involved a comprehensive analysis of existing challenges, stakeholder needs, and the technological landscape. The following provides an elaborate overview of how the entire system was planned by the District Administration along with our technology partner (Igile Technologies):

(a) Needs Assessment:

As a routine part of their daily responsibilities, the District Administration has consistently collaborated with diverse stakeholders in the agricultural supply chain. They have diligently documented the needs and requirements, comprehended the challenges faced, and gathered valuable feedback from these stakeholders. This wealth of knowledge was subsequently shared with our technology partner, Agile Technologies, through multiple requirement gathering sessions. This process ensured a comprehensive understanding of the perspectives and insights of farmers, traders, and cold storage owners.

(b) Baseline Analysis:

A baseline was established for a clear understanding of the existing processes, inefficiencies, and pain points within the agricultural supply chain. This formed the basis for setting project objectives and scope.

(c) Definition of Project Objectives and Scope:

Clear project objectives were defined, addressing the identified challenges and aligning with the overarching goal of enhancing the agricultural supply chain. The scope of the project was established, encompassing the development of a mobile app for farmers, a web platform for the district administration, and a comprehensive system for cold storage owners.

(d) Collaborative Planning Workshops:

To delineate the functionalities of the CSIS project, planning workshops were orchestrated, bringing together stakeholders and technology experts. Key contributors to this process were officials from the Firozabad district administration and technology partners, Igile Technologies. Actively engaged in the planning phase, collaborative sessions were conducted to pinpoint pain points and garner insights into the desired system functionalities. The collaborative effort extended to the creation of wireframes, prototypes, and process flows, providing a visual representation of the end-to-end system.

(e) Role of Igile Technologies:

In its capacity as the technology partner, Igile Technologies (https://igile.in/) assumed a pivotal role in translating identified needs into a technological solution. Leveraging their proprietary ProSCMS software framework designed for streamlining agricultural supply chain processes, they offered an efficient transaction management solution. Additionally, it incorporates a comprehensive dashboard that empowers district administrations to monitor and supervise transactions. ProSCMS was instrumental in promoting transparency and accountability within the agricultural sector, ensuring sustainable growth. Their expertise guided the technical aspects of the system, ensuring scalability, security, and usability.

(f) Technology Stack Selection:

The planning phase involved selecting an appropriate technology stack based on the project requirements. Considerations included the scalability of the solution, integration capabilities, and alignment with the skill set of potential users.

(g) User Training and Adoption Strategy:

Comprehensive strategy for user training and adoption was developed to address potential resistance to change. Training programs were designed for farmers, traders, & cold storage owners to ensure effective utilization of the new system.

(h) Iterative Planning:

The District Administration played pivotal roles in the planning of the Cold Storage Information System (CSIS), contributing significantly to the project's success. The planning process embraced an iterative approach, allowing for continuous refinement based on feedback from stakeholders. Regular review sessions ensured that the evolving system met the dynamic needs of the agricultural community. Igile Technologies embraced the Agile mindset throughout the development process. At the heart of Agile lies a value-driven approach, putting customer satisfaction front and center. This approach prioritizes flexibility and adaptability, encouraging iterative development cycles, frequent collaboration, and responsiveness to changing requirements. Igile followed Scrum framework to ensure a dynamic and efficient development environment. This enabled the team to deliver incremental updates and respond swiftly to evolving needs, fostering a more responsive and client centric development process.

(i) Risk Management and Mitigation:

Contingency plans were established to tackle unforeseen challenges during implementation, such as the risk of the solution deployment timeline conflicting with the potato harvesting season. Additionally, measures were taken to address potential resistance from cold storage owners in adopting the new process and solution, including proactive sensitization efforts before full deployment.

***

Innovative and Transformative Smart Farming using Artificial Intelligence

By: Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh)

Abstract

Crop Doctor 2.0 - Innovative and Transformative smart farming using artificial intelligence is an Agriculture 4.0 project developed by Indira Gandhi Agriculture University Raipur. Implemented in Chhattisgarh state and other regions of the country, this project offers a comprehensive range of services to farmers. By leveraging artificial intelligence and machine learning, Crop Doctor 2.0 aims to revolutionize agricultural practices and enhance productivity.

The project provides advanced features such as insect and pest identification, expert systems for diagnosing insect pests and nutrient deficiencies in various crops, and effective weed management strategies for major crops in Chhattisgarh. Additionally, it offers an online agri-marketing platform that connects farmers directly with buyers, facilitating transparent and efficient agricultural trade. The project also assists farmers in developing integrated farm plans, considering factors like soil health, climate conditions, and market demand.

It provides access to land and rental services for farm implements, reducing the manual burden on farmers. Through weather advisories from the Indian Meteorological department, Crop Doctor 2.0 helps farmers make informed decisions about sowing, irrigation, and crop protection. It also offers an agro almanac, farmers' query redressal stem, knowledge dissemination through videos, block-level crop advisories, Formation on government schemes, online expert advice, agrinews, social media platforms, and market price information. In summary, Crop Doctor 2.0 is a transformative initiative that empowers farmers with cutting-edge technologies and services, facilitating stainable and efficient agricultural practices in Chhattisgarh and beyond.

1. Project Background

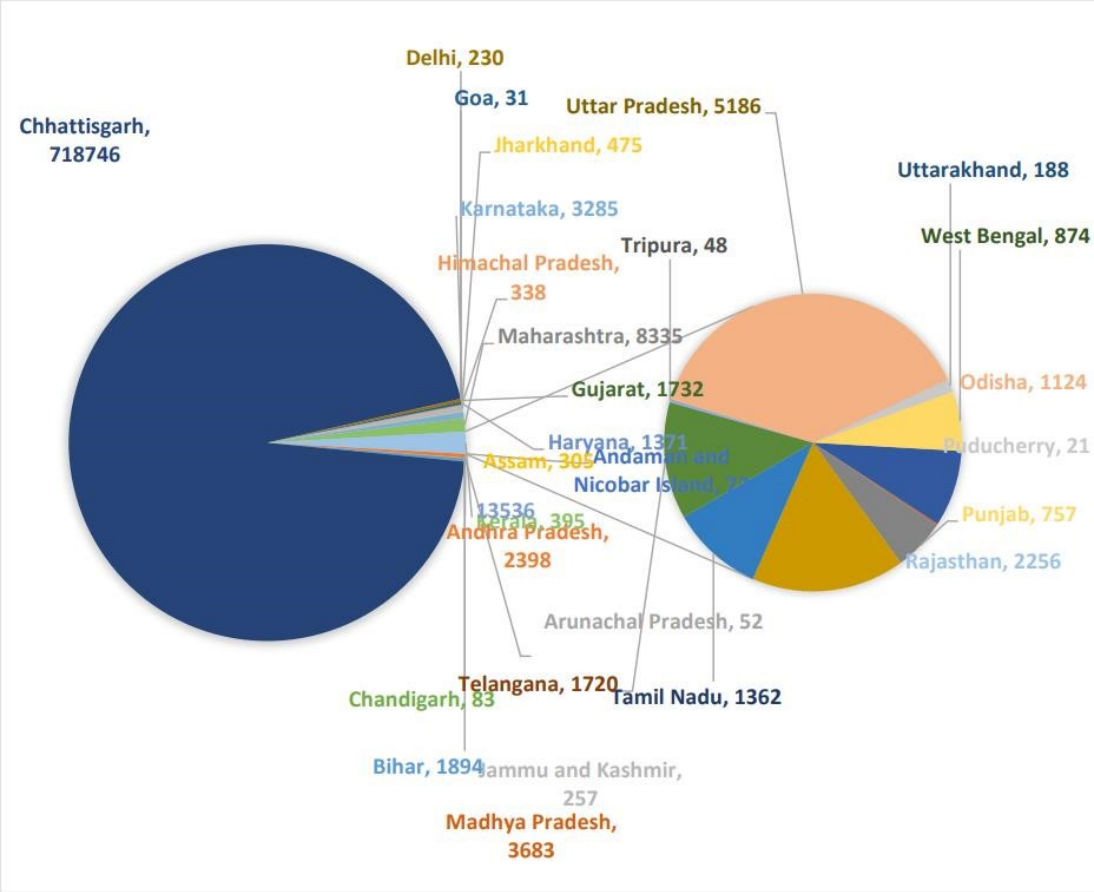
The “Innovative and Transformative Smart Farming using Artificial Intelligence” project developed by Indira Gandhi Agriculture University is a comprehensive farmer-centric service that utilizes emerging technologies to empower farmers in Chhattisgarh and across India. The project incorporates AI-based pest and disease

identification, weather forecasts, farming advisories, market access, and expert advisory systems. With approximately 7,58,897 registered farmers benefiting from the app, it has revolutionized agricultural practices and improved productivity. One notable feature is the integration of the app with the land record database of the Government of Chhattisgarh, which contains detailed information about nearly 3.7 million farmers in the state. This integration enhances the app's capabilities by providing farmers with personalized insights and tailored recommendations based on their specific land records and farming profiles. It enables a more precise and targeted approach to agricultural support, catering to the unique needs of each farmer. By combining cutting-edge technologies, expert guidance, and integration with the government's land record database, the "Crop Doctor 2.0" app has become an indispensable tool for farmers. It not only assists in pest identification, weather forecasting, and farming advisories but also provides a holistic view of the farmers' land holdings and historical data. This comprehensive approach helps farmers make informed decisions, optimize resource allocation, and achieve sustainable agricultural practices.

2. The Current (AS IS Process) and the Critical Stakeholders

The “Innovative and Transformative Smart Farming Using Artificial Intelligence” has Crop Doctor 2.0 published on the Play Store, has achieved widespread geographic and demographic coverage. Approximately 8 lakh farmers have downloaded the app from all states of India, indicating its popularity and adoption across the country. Furthermore, the app has reached farmers in nearly 740 different districts of India, demonstrating its extensive reach within the country. Additionally, the app has gained traction globally, with downloads from 126 different countries. This indicates its relevance and usefulness beyond India's borders.

State wise Downloads of Mobile App status



3. Problem areas and need for intervention

The research began with a comprehensive baseline study to understand the existing challenges and gaps in the agricultural sector. This study involved an in-depth analysis of the current state of farming practices, market access, knowledge dissemination, and technology adoption. It served as a foundation for identifying the areas that required improvement and informed the subsequent research steps.

Stakeholder Consultation: The institution actively engaged through Krishi Vigyan Kendra situated at almost all district of state with stakeholders, including farmers, agricultural experts, policymakers, and industry representatives. Consultation sessions were conducted to gather insights, understand their needs and expectations, and incorporate their feedback into the research process. These consultations played a crucial role in aligning the research objectives with the actual requirements of the farming community.

Problem Statement Formulation: Based on the findings from the baseline study and stakeholder consultations, a problem statement was formulated. The problem statement defined the specific challenges and gaps to be addressed through the research project. It provided a clear direction and focus for the subsequent research activities.

Sampling Details: The research involved sampling to ensure representative data collection and analysis. The sampling framework was designed to include farmers from different regions, crop types, farm sizes, and socio-economic backgrounds. This diverse sampling approach aimed to capture a comprehensive picture of the agricultural landscape and the challenges faced by different farmer segments.

Hypothesis Development: Hypotheses were developed to test specific assumptions and research questions related to the project. These hypotheses served as the basis for formulating research objectives and guiding the data collection and analysis process.

Deployment: The research findings and hypotheses were then deployed in the development of the "Crop Doctor 2.0" app and other citizen-centric services.

Problems Faced by Various Stakeholders in the Current Process

Before the Crop Doctor 2.0 project was initiated, the agriculture sector in Chhattisgarh faced several challenges and limitations. Some of the key aspects of the pre-project scenario were:

(i) Traditional Farming Practices: Farmers relied on conventional farming methods, which lacked the integration of modern technologies and scientific approaches.

(ii) Limited Access to Information: Farmers had limited access to timely and accurate agricultural information, including weather forecasts, pest management techniques, and expert advice. Lack of knowledge hindered their ability to make informed decisions.

(iii) Weather-Dependent Farming: Agriculture in the region was highly dependent on seasonal weather patterns. Unpredictable weather events, such as droughts or floods, posed significant risks to crop yields and farm incomes.

(iv) Middlemen and Price Fluctuations: Farmers often had to rely on middlemen for selling their produce, leading to price fluctuations and reduced profitability.

The absence of direct market linkages affected farmers' income and bargaining power.

(v) Limited Awareness of Government Schemes: Many farmers were unaware of the various government schemes and subsidies available to support agriculture. Lack of awareness prevented them from availing these benefits.

(vi) Inadequate Crop Protection: Pest and disease management were major challenges, and farmers faced difficulties in identifying and controlling crop pests effectively. This resulted in significant crop losses and reduced productivity.

(vii) Resource Inefficiency: Inefficient use of resources such as water and fertilizers led to wastage and increased production costs. Sustainable practices were not widely adopted due to limited knowledge and guidance.

(viii)Low Farm Income and Economic Struggles: The prevailing challenges in agriculture contributed to low farm incomes, leading to economic hardships for many farming families.

4. Planning for the New Project/System and the Role of the Organization

Being an agriculture university, Indira Gandhi Krishi Vishwavidyalaya, Raipur planned this project based on the baseline survey and the problem faced by the various stakeholders, several discussions were held with the important stakeholders with farmers, agricultural experts, and local agricultural communities to understand their specific challenges and requirements. Conducted on-site surveys to gather data on prevalent crop diseases, pest issues, soil health concerns, and existing farming practices.

Following problems have been identified:

- Identified common crop health issues, such as diseases and nutrient deficiencies that significantly affect yield.
- Understood the types of pests that farmers frequently encounter and the challenges in effective pest management.
- Identified areas where resource utilization, including water and fertilizers, can be optimized for better efficiency.
- Integrated data to monitor crop health, identify anomalies, and predict potential issues.

- Gathered historical data on crop performance, weather patterns, and disease outbreaks for training AI algorithms.
- To overcome the problems developed machine learning models, including neural networks and predictive analytics, to analyze the integrated data and generate actionable insights have been planned.
- Planned to design user friendly interface and accessible mobile and web applications for farmers to easily access.
- Ensured that the interface supports multiple languages Hindi and English to cater to the diverse linguistic needs of farmers.
- Planned to integrate real-time weather forecasts to enhance the accuracy of predictive models and provide timely recommendations.
- Planned to conduct workshops and training programs to educate farmers on the utilization of Crop Doctor 2.0.

By addressing the specific challenges faced by farmers through Crop Doctor 2.0, the project plans to not only provide immediate solutions but also contribute to the long-term sustainability and resilience of agricultural practices.

Role of the Organization:

IGKV might play in the development of agricultural technologies or tools:

(a) Research and Development: Agricultural universities often engage in research activities aimed at developing innovative technologies and tools for crop management, disease diagnosis, and overall agricultural improvement.

(b) Technology Transfer: Universities can act as a bridge between research findings and practical applications in the field. They may collaborate with government agencies, NGOs, and private sector partners to transfer technologies to farmers.

(c) Training and Education: Agricultural universities play a crucial role in educating and training the next generation of farmers and agricultural professionals. They can incorporate new technologies and tools into their curriculum, ensuring that graduates are well-equipped with the latest knowledge.

(d) Field Trials and Validation: Universities may conduct field trials to test the effectiveness of new technologies in real-world agricultural settings. This validation process helps ensure that the tools are practical and beneficial for farmers.

(e) Collaboration with Stakeholders: Collaboration with various stakeholders, including farmers, government bodies, and industry players, is essential for the

success of any agricultural technology initiative. Universities can facilitate these collaborations.

5. Objectives and Scope of the Project

Objectives -To leverage emerging technologies artificial intelligence, machine learning, and data analytics to empower farmers with advanced digital tools and real-time agricultural information to enhance their farming practices, increase crop productivity, and improve overall agricultural sustainability.

Scope of the Project-One crucial area of research is the development and implementation of advanced technological tools. This includes exploring emerging technologies such as artificial intelligence (AI), machine learning, and data analytics to create sophisticated systems. These technologies are applied to tasks such as pest and disease identification, weather forecasting, and crop-specific farming advisories. Another significant aspect to create online platforms and applications that connect especially small and marginal farmers directly with buyers, eliminating intermediaries and promoting fair trade. These digital platforms facilitate e-commerce, allowing farmers to showcase and sell their agricultural produce to a wider market, thereby enhancing their income and market reach. The institution focuses on developing systems that enable farmers to access and rent farm machinery easily, promoting efficient and sustainable farming practices. Expert advisory systems are designed to connect farmers with experienced scientists and researchers, facilitating knowledge exchange and providing timely guidance. The research conducted by the institution extends beyond the boundaries of Chhattisgarh, potentially benefiting farmers in other states of India as well. By addressing the multifaceted needs of farmers and harnessing technology, the institution's research aims to enhance agricultural productivity, empower farmers, improve market access, and promote sustainable agricultural practices.

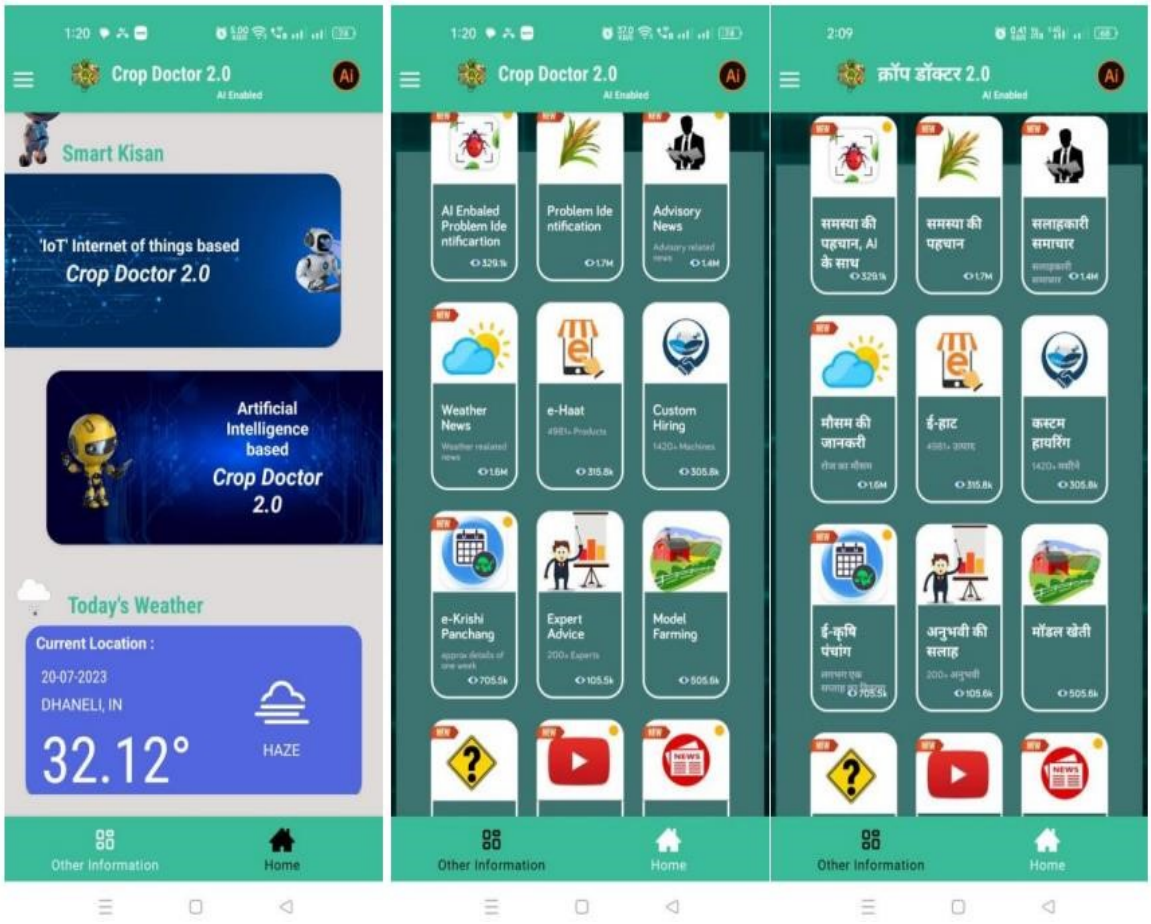
6 The redesigned Process and the Role of ICT

The project has undergone significant process reengineering to enhance the efficiency and effectiveness of its services. The following are the key process reengineering steps implemented in the project:

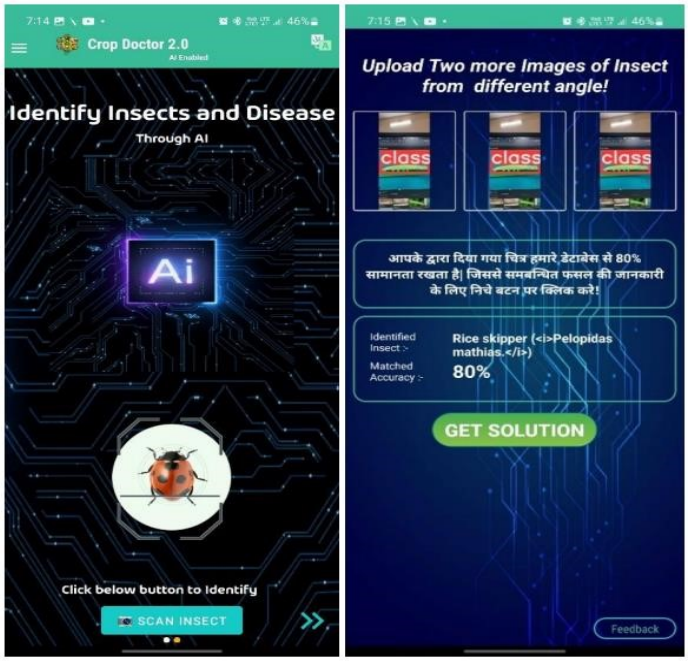
· **Service Integration**: The reengineered process involves integrating multiple services into a unified platform. Services such as AI-based insect and pest identification, expert systems for crop health analysis, weed management, online Agri-marketing, weather advisory, and farmer query redressal are seamlessly

integrated into the Crop Doctor 2.0 mobile app. This integration enhances user experience and accessibility to a comprehensive range of agricultural services.

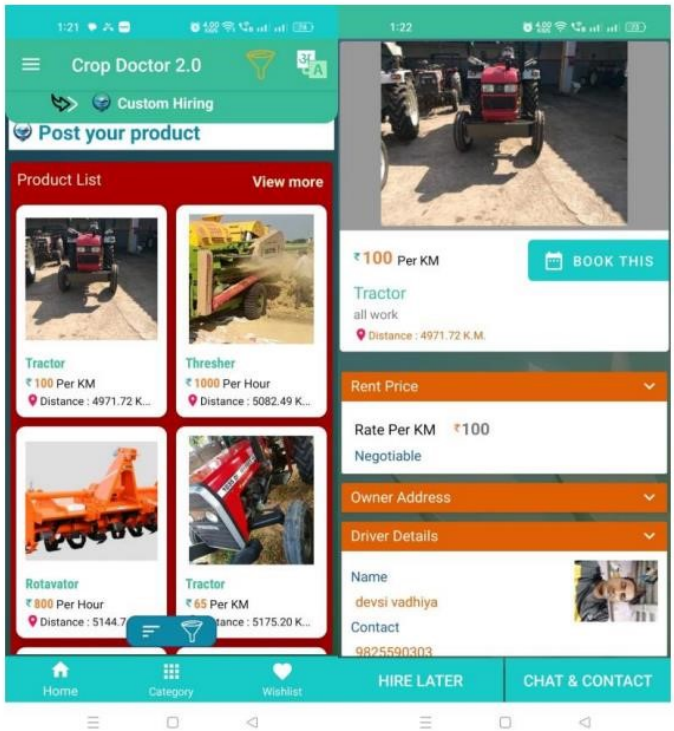
· **User-Friendly Interface**: The reengineered process focuses on developing a user- friendly interface for the mobile app. The interface is designed to be intuitive, visually appealing, and easy to navigate, ensuring that farmers, agricultural students, and other stakeholders can easily access and utilize the services offered by project.



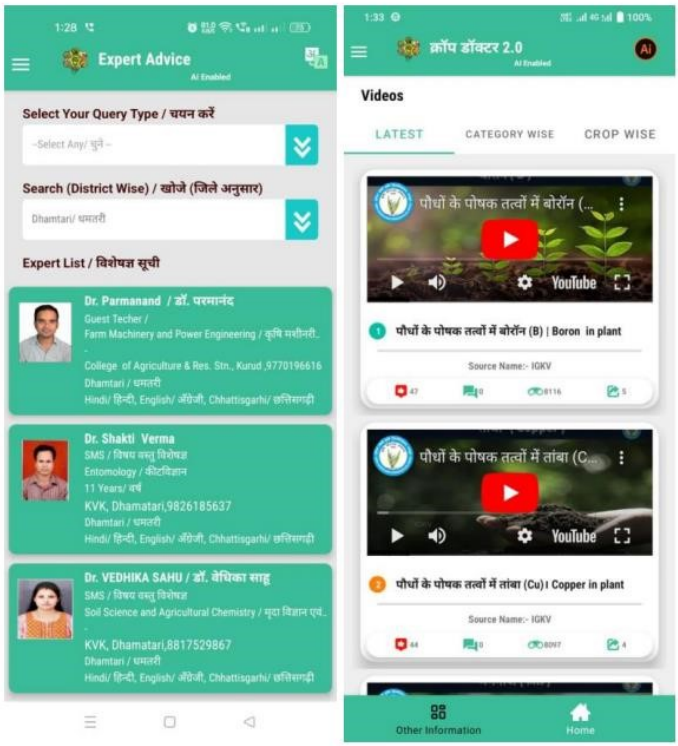
· **Image-Based Identification**: The process reengineering introduces image-based identification in the services provided by project. Farmers can capture and upload images of insects, pests, diseases, nutrient deficiencies, and weeds directly through the app. The image recognition technology analyzes the images and provides instant identification and recommendations for appropriate remedies.



• **AI enabled lending and renting of farm implements Services:** Developed service to reduce upfront investment costs. This allows for cost effective mechanization, improved resource utilization and improved efficiency of the farm. It helps small farmers who cannot afford to purchase such machinery to find their needs nearby online and utilize them for their farming activities. A comprehensive equipment database management system is implemented to track and manage the availability, condition, and details of farm implements. This system ensures that farmers have up-to-date information on the available equipment, facilitating efficient renting and lending transactions.



Enhanced User Support "Farmers Query Redressal System": The reengineered process prioritizes user support and assistance within project. Farmers can access a comprehensive support system, including online forums to address their queries, concerns, and technical issues. This enhances user satisfaction and ensures a seamless experience while using the app.

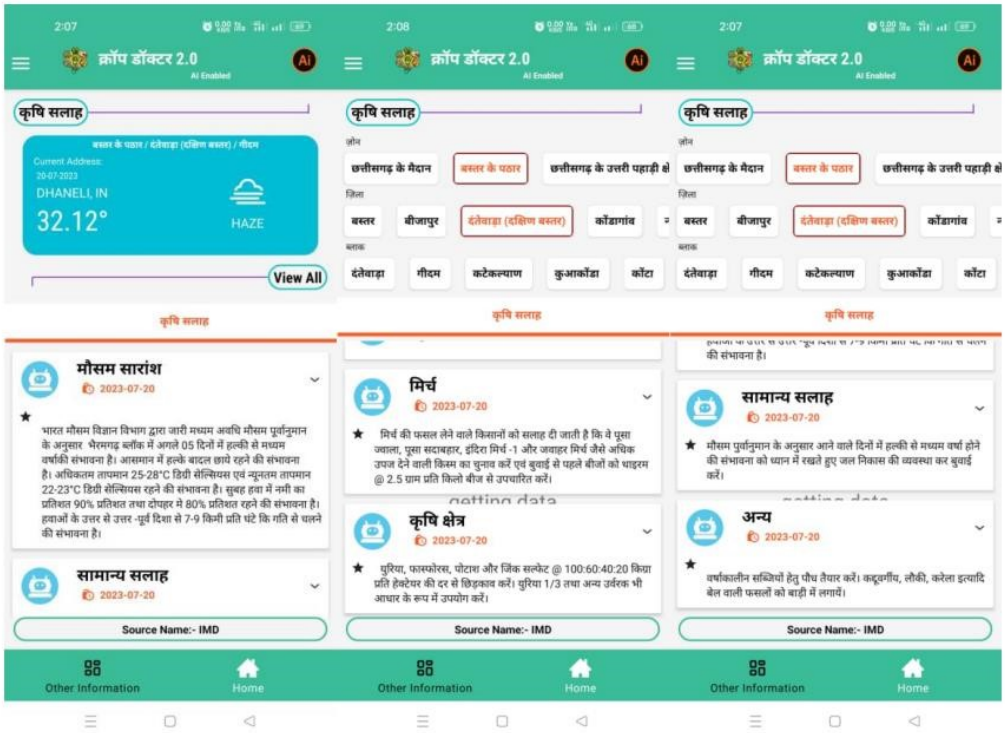


Expert Advice and Knowledge Videos: The reengineered process ensures that expert guidance and recommendations are an integral part of the services provided by project. Developed many Knowledge videos to help and guide farmers. The app incorporates knowledge from agricultural experts and researchers to offer accurate diagnoses, effective pest management strategies,

nutrient deficiency remedies, and weed control methods. This expert guidance assists farmers in making informed decisions for crop protection and management.

Enhance Weather-based Decision Making: Crop Doctor 2.0 leverages weather advisories from the Indian Meteorological Department to provide farmers with accurate and timely weather information. By integrating weather data into decision-making processes, it enables farmers to optimize their farming practices, including sowing, irrigation, and crop protection.

Weather Advisory and Integration: ICT is leveraged to integrate weather data from the Indian Meteorological Department into the mobile app. Real-time weather updates, localized forecasts, and block-level advisory services are provided to farmers. This integration enables farmers to make informed decisions regarding farming activities based on weather conditions and forecasts. This helps farmers mitigate weather-related risks, optimize irrigation practices, and adapt their farming strategies to changing weather patterns, contributing to climate resilient agriculture.



Collaboration with Agricultural Experts: The reengineered process involves collaboration with agricultural experts, research institutions, and agricultural extension services. This collaboration ensures the inclusion of the latest research findings, best practices, and government schemes within mobile app. By

leveraging expert knowledge and collaboration, the app provides farmers with accurate and up-to-date information for effective crop management.

· **Continuous Improvement and Updates**: The reengineered process incorporates a feedback mechanism to gather user feedback and suggestions. This feedback is utilized to continuously improve the app's functionalities, enhance service quality, and address any issues or challenges faced by the users. Regular updates and feature enhancements are released to keep the app up-to-date with the latest advancements and user requirements.

· **Data Privacy and Security**: The reengineered process emphasizes data privacy and res within project. Farmers' data and information are protected through robust encryption and strict privacy protocols. This ensures that farmers can confidently use the app without concerns about data breaches or misuse of personal information.

7. What is the change/ Transformation

a *Pest and Disease Identification*: Farmers can use the AI-based pest and disease identification feature of the app, receiving accurate and timely diagnoses. This empowers them to take proactive measures to control and manage pests and diseases effectively.

b *Weather Forecasting*: Farmers have access to block level weather forecasts through the app, enabling them to plan their farming activities with precision. This allows for optimized irrigation, timely pest management, and improved overall farm management.

c *Farming Advisories*: Farmers receive crop-specific farming advisories through the app at each stage of cultivation. These advisories provide guidance on optimal techniques, fertilization schedules, and pest control measures, leading to improved yields and sustainable practices.

d *Market Access:* Farmers can leverage the e-Haat application to directly connect with potential buyers, expanding their market reach and bypassing middlemen. This facilitates fair trade practices, better prices for their produce, and improved profitability.

e *Farm Machinery Rental*: Farmers can access the custom hiring system within the app to rent or lend farm machinery, reducing the financial burden of ownership. This allows for cost-effective mechanization, increased productivity, and improved efficiency on the farm.

- **f** *Query redressal system*: Farmer can send the picture and text-based queries in mobile app.

8. Implementation Processes

The project involved the collaboration of several internal departments and external partners to achieve its goals. The research conducted in the Crop Doctor 2.0 project has been implemented and tested in various locations and platforms. Here are some of the roles and involvement of these departments and partners:

(i) Krishi Vigyan Kendra (KVKs): The project has been implemented and tested in different KVKs associated with the Indira Gandhi Agriculture University. These KVKs serve as on-ground research and extension centers, where the project's services and technologies have been demonstrated and tested with the involvement of agricultural experts and farmers.

(ii) Associated Colleges and Research Stations: The research has been implemented and tested in associated colleges and research stations affiliated with the Indira Gandhi Agriculture University. These institutions provide platforms for field trials, data collection, and assessment of the project's effectiveness in different agricultural contexts.

(iii) Agriculture Department: The project has been implemented and tested in collaboration with the Agriculture Department. This involvement allows for integration with existing agricultural extension services and government initiatives, ensuring the research's alignment with regional agricultural development priorities.

(iv) Self-Help Groups: The project has been demonstrated and tested with self-help groups such as Kabir Kisan, which is a self-help group linked with UNICEF, and self-help groups associated with KVKs. This engagement allows for direct interaction with farmers at the grassroots level and provides insights into the project's impact on farmers' practices and livelihoods.

(v) Agricultural Events: The project has been showcased and demonstrated in various agricultural events such as KISAN melas, Agri Carnivals (state-level functions), and AKTI festivals. These events serve as platforms for knowledge exchange, networking, and dissemination of project findings and innovations to a wider audience of farmers, policymakers, and stakeholders.

(vi) Webinars and Workshops: The research team has conducted online and offline webinars and workshops to demonstrate the advantages and capabilities of the project. These knowledge-sharing events allow for interactive sessions, training, and capacity building among farmers, extension workers, and other participants.

(vii) Field Visits: The research team has conducted field visits to villages, interacting directly with different farmers. These visits provide opportunities to understand farmers' needs, collect feedback, and assess the on-ground impact of the project's services.

9. Constraints and Challenges Faced and Overcome

There were several challenges faced during the implementation phase, including:

- **Adoption of new technologies**: The project involved the use of new technologies such as Mobile App and API Integration, Expert System which can be challenging for farmers who may not have experience with these technologies. To overcome this challenge, the project provided Software as a Service to farmers on the use of technology and best practices in agriculture.

- **Infrastructure limitations**: Providing reliable connectivity and infrastructure in rural areas can be a challenge, and the project faced similar challenges. To overcome this, the project developed in such a way so that it will run without internet in the farm field.

- **Data quality and management**: Ensuring the quality and accuracy of the data collected was crucial for the success of the project. To overcome this challenge, the project team developed data management systems and worked with Agriculture experts of IGKV in the field to develop accurate models and algorithms.

- **Cultural barriers**: The project team faced cultural barriers while working with farmers from different regions of India including Chhattisgarh. To overcome this challenge, the team collaborated with Krishi Vigyan Kendra and Research station to ensure that the project was culturally appropriate and acceptable.

10. Impact of the Project-Tangible/ Intangible (with data), Social Impact

The adoption of the project supported by Krishi Vigyan Kendra (KVK) and accessible via a mobile app, has resulted in significant positive impacts on

farmers. The following observations highlight the transformative outcomes experienced by farmers:

- Farmers who have adopted the service of this project have witnessed a remarkable reduction in crop losses. By accurately identifying and diagnosing pests and diseases in real-time, farmers can implement timely and targeted interventions. This has minimized the impact of infestations and diseases, resulting in improved crop health and reduced losses.

- The service provides farmers with precise pest management strategies based on AI algorithms and expert recommendations. Farmers made informed decisions regarding the selection and application of appropriate pesticides, insecticides, or bio-control methods. This targeted approach minimizes the use of chemicals, reduces environmental impact, and ensures effective pest management.

- The adoption of the system has resulted in enhanced crop productivity and increased yields. Timely and precise pest management practices have contributed to improved crop health and vigor. This, in turn, has led to higher yields, improved crop quality, and increased income for farmers.

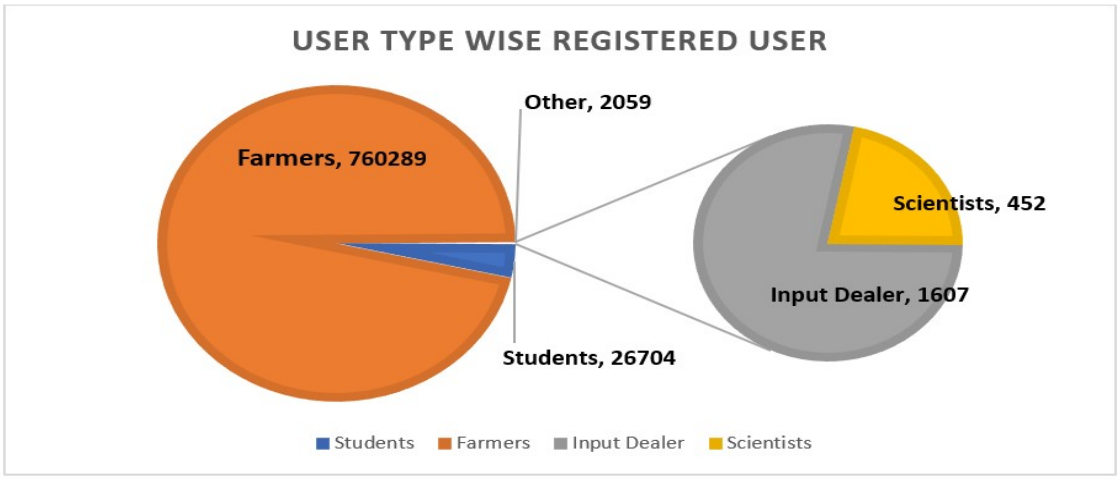
- By accurately identifying pests and diseases, farmers adopted integrated pest management strategies. This approach focuses on minimizing the use of chemical pesticides and promoting alternative pest control methods, such as biological control, cultural practices, and crop rotation.

- The mobile app-based service ensures easy accessibility for farmers. The user-friendly interface allows farmers to capture and upload images of pests or diseases directly from their smartphones. The AI-powered analysis provides quick and accurate results, empowering farmers with real-time information and actionable recommendations.

- Farmers adopted targeted pest management strategies. This leads to a reduction in unnecessary pesticide applications and associated costs. The sustainable approach promoted by the service aligns with environmentally friendly farming practices, reducing the ecological impact of farming operations. The System-based service has been adopted by a significant number of farmers, reflecting its effectiveness and acceptance. The service's impact has been observed across various regions and crops, benefiting small-scale and large-scale farmers alike.

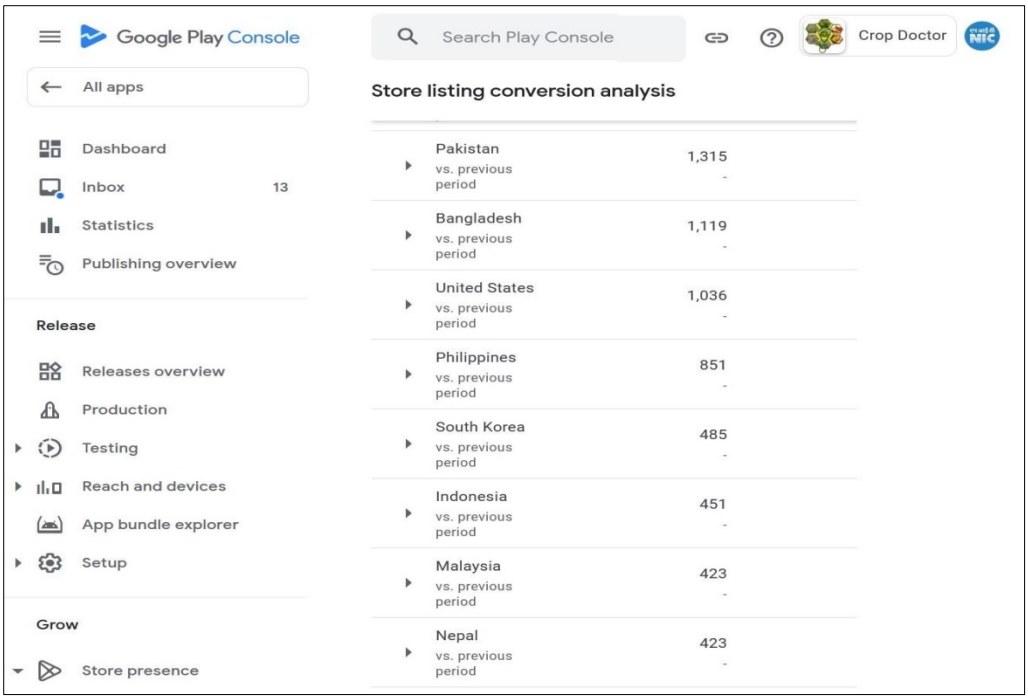
1. Demographical Change

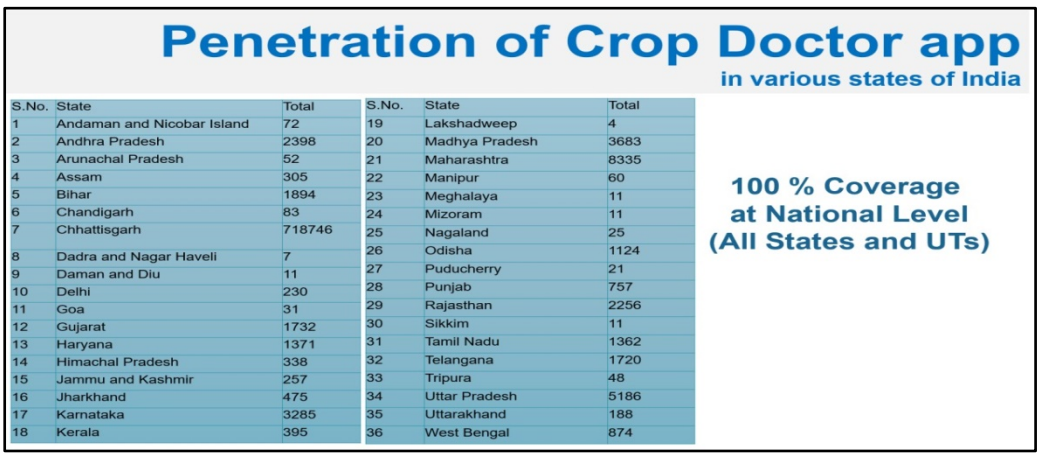
a. In the project various types of users like Students, Scientists, Input dealer etc. are associated apart from the farmers



2. Geographical Coverage

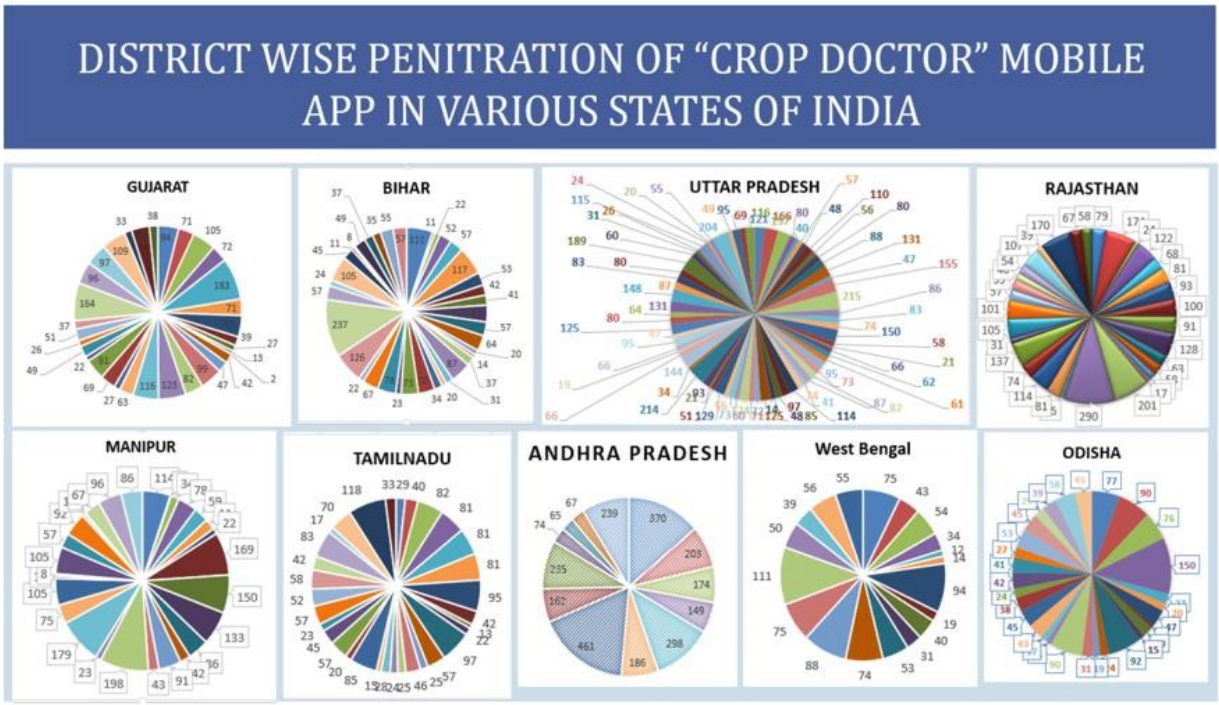
a. Country Wise Downloads of Mobile App and Website Status





S.No.	State	Total
1	Andaman and Nicobar Island	72
2	Andhra Pradesh	2398
3	Arunachal Pradesh	52
4	Assam	305
5	Bihar	1894
6	Chandigarh	83
7	Chhattisgarh	718746
8	Dadra and Nagar Haveli	7
9	Daman and Diu	11
10	Delhi	230
11	Goa	31
12	Gujarat	1732
13	Haryana	1371
14	Himachal Pradesh	338
15	Jammu and Kashmir	257
16	Jharkhand	475
17	Karnataka	3285
18	Kerala	395

S.No.	State	Total
19	Lakshadweep	4
20	Madhya Pradesh	3683
21	Maharashtra	8335
22	Manipur	60
23	Meghalaya	11
24	Mizoram	11
25	Nagaland	25
26	Odisha	1124
27	Puducherry	21
28	Punjab	757
29	Rajasthan	2256
30	Sikkim	11
31	Tamil Nadu	1362
32	Telangana	1720
33	Tripura	48
34	Uttar Pradesh	5186
35	Uttarakhand	188
36	West Bengal	874



State Wise Downloads of Mobile App and Website Status

11. Lessons Learnt

- Accurate and reliable data is essential for any system related to crop management. We need ensure that the data used by the Crop Doctor app is up-to date, relevant, and of high quality.
- To enhance the accuracy of the diagnosis provided by the Crop Doctor it is crucial to continuously improve the algorithms and models to enhance the precision of identifying crop diseases, pests, and other issues.
- Farmers and users are not of technical background. Designing an intuitive and user-friendly interface for the Crop Doctor system can enhance its usability and adoption.
- Crop diseases and pests varies significantly based on geographic locations and climate conditions. We need to ensure that the Crop Doctor application can be adapted to different regions and provide relevant information for local crops and conditions.
- Agriculture is a dynamic field with changes in seasons, climate, and farming practices. Regular updates to the Crop Doctor app , incorporating new data and research findings, are essential for its continued relevance and effectiveness.

- Providing adequate training and educational resources to farmers and agricultural professionals on how to use the Crop Doctor app can significantly impact its success.

- Implement a feedback loop where users can provide feedback on the accuracy of diagnoses and suggest improvements. This can help in refining the system over time.

12. Long Term Significance

The long-term significance of using a mobile application Crop Doctor 2.0 in agriculture can be substantial, bringing positive impacts to various stakeholders, including farmers, agricultural extension services, and the broader agricultural sector. Several potential long-term benefits are:

(a) Improved Crop Management:
Farmers can receive real-time information about crop health, weather conditions, and pest/disease outbreaks. This allows for proactive management strategies, leading to improved crop yields and reduced losses.

(b) Precision Agriculture:
The use of technologies like Crop Doctor 2.0 can contribute to precision agriculture, where resources such as water, fertilizers, and pesticides are applied more efficiently. This can lead to cost savings and reduced environmental impact.

(c) Disease Prevention and Control:
Early detection and timely intervention based on the information provided by the application can help prevent the spread of diseases and control pests, minimizing the need for chemical inputs.

(d) Data-Driven Decision Making:
The application facilitates data-driven decision-making for farmers. Over time, as more data is collected and analyzed, the insights generated can lead to better informed decisions and improved farming practices.

(e) Increased Productivity:
By optimizing farming practices and providing personalized recommendations, Crop Doctor 2.0 can contribute to increased agricultural productivity. This is

crucial for ensuring food security, especially as global populations continue to grow.

(f) Cost Savings for Farmers:

Farmers can potentially reduce costs associated with overuse of inputs, as the application provides tailored recommendations based on specific conditions. This can lead to more sustainable and economically viable farming practices.

(g) Enhanced Farmer Knowledge and Skills:

The application, through its educational features, can contribute to continuous learning among farmers. As users become more familiar with the technology, they can develop better agricultural skills and practices.

(h) Digital Inclusion in Agriculture:

The adoption of Crop Doctor 2.0 can contribute to digital inclusion in agriculture, ensuring that farmers, regardless of their location or size of operation, have access to modern agricultural technologies.

(i) Support for Sustainable Agriculture:

Crop Doctor 2.0 can support sustainable agriculture practices by promoting environmentally friendly approaches to pest control, reducing chemical usage, and optimizing resource utilization.

(j) Data for Agricultural Research:

Aggregated and anonymized data from the application can contribute to agricultural research. Researchers can use this data to study trends, identify challenges, and develop solutions for broader agricultural issues.

(k) Resilience to Climate Change:

The application can help farmers adapt to changing climate conditions by providing real-time information on weather patterns and suggesting appropriate strategies for climate-resilient agriculture.

(l) Market Access and Traceability:

Technologies like Crop Doctor 2.0 can contribute to establishing transparent and traceable supply chains, potentially improving market access for farmers and enhancing the quality of agricultural products.

It's important to note that the success and long-term significance of Crop Doctor 2.0 will depend on factors such as user adoption, ongoing support and updates, integration into existing agricultural practices, and the ability to address evolving challenges in the agricultural sector. Continuous monitoring, evaluation, and adaptation will be key to ensuring sustained positive impacts over the long term.

13.Future Roadmap

The future roadmap of the project may include:

(i) Enhanced Data Integration:
Improving the integration of diverse data sources, including satellite imagery, IoT sensors, and user-generated data, to provide more comprehensive insights into crop health and environmental conditions.

(ii) Advanced Machine Learning Algorithms:
Continued development of machine learning models to enhance the accuracy and predictive capabilities of the application in diagnosing diseases, predicting crop yields, and providing personalized recommendations.

(iii) Expansion of Crop Coverage:
Adding support for a wider range of crops, ensuring that the application is relevant and beneficial to a larger agricultural community.

(iv) Localization and Customization:
Customizing recommendations based on regional variations in climate, soil types, and farming practices to ensure the relevance of advice to specific geographic areas.

(v) User Engagement and Education:
Enhancing user engagement features, educational content, and interactive elements to empower farmers with knowledge and encourage the adoption of recommended practices.

(vi) Mobile Technology Advancements:
Leveraging advancements in mobile technology, such as improved connectivity and the use of emerging technologies like augmented reality (AR) or virtual reality (VR) for more immersive user experiences.

(vii) Partnerships and Collaboration:

Collaborating with agricultural organizations, research institutions, and government agencies to expand the reach and impact of the application.

(viii) Offline Functionality:

Developing features that allow farmers to access essential information and use the application even in areas with limited or no internet connectivity.

(ix) Feedback Mechanisms:

Implementing effective feedback mechanisms to gather user insights, address user needs, and continuously improve the application based on user experiences.

(x) Climate-Smart Agriculture:

Incorporating climate-smart agriculture practices and recommendations to help farmers adapt to changing climate conditions and contribute to sustainability.

***

SAMPURNA SHIKSHA KAVACH

By: Filo EdTech Pvt Ltd

Abstract

The pursuit of 'Education for All' has been a fundamental goal for Indian education policy. Solving the problem on a large scale for students with different socioeconomic backgrounds and unique style of learning is complex and demands deep innovation.

The biggest challenge in the current education ecosystem is to solve for persistent learning gaps faced by students in rural regions of India. Indicators like National Achievement Survey (NAS) 2021, showed a significant decline in the learning levels of students with a reported average learning level of 59% in grade 3, 49% in grade 5, 42% in grade 8, and only 36% in grade 10. Various learning enhancement programs or remediation programs have been introduced at the district, state and national level as an approach for bridging learning gaps among students aggregated over the years. With some states relying on old approaches such as holding students back a grade or remediation learning to reteach concepts, research has shown that these methods are ineffective and can actually exacerbate learning loss.

In this context, this case study presents the tech-driven innovation 'Sampurna Shiksha Kavach by Filo' based on the emerging concept of 'Learning Acceleration' to provide just-in time learning support to students and help students improve their learning levels. The results of the program in Dumka District showed an overall improvement in the passing percentage of students in State Board examinations. Average Pass Percentage of the district in Academic Session 202223 for Grade 12 Science students is 67.1%, whereas pass percentage for FILO Schools in the district is 78%. The evidence from the Sampurna Shiksha Kavach program can act as a case study for policy makers to use learning acceleration as an effective tool to bridge learning gaps aggregated over years among students.

1. Project Background

Conventionally, in India, programs for learning recovery focused on remediation as an approach which includes re-teaching a group of students who have consistently struggled in a core academic area, rather than student centered learning and focusing on the needs of each and every student. Various studies have shown that this approach is not very effective to cater to varied learning

levels and can actually exacerbate learning loss. An emerging practice to effectively and equitable close learning gaps is learning acceleration.

Sampurna Shiksha Kavach Program is India's only tech-driven learning acceleration program which focuses on getting students ready for their new grade-level learning without holding them back for their pre-existing learning gaps. Learning acceleration emphasizes building on students' existing knowledge, and using a range of evidence-based instructional strategies to promote student learning.

In Dumka District (Jharkhand State), an innovative learning intervention is introduced by providing tech-driven learning acceleration to students in an effort to bridge the learning gaps in schools and support learning recovery. The project provides unlimited instant access to live teachers who are available 24x7 to all the students, in an effort to make education more inclusive and resilient. The features of the program include:

- Provide personalized learning focusing on "just-in-time" interventions — the right type or amount of support at the right time
- Identify student's learning ability for a particular topic and provide required learning support just at the right time
- Introduce student-centered learning approaches to further improve existing learning outcomes
- Provide one-on-one student-teacher interactions through online live tutoring sessions
- Provide virtual 24x7 learning support to help students get a strong grasp on foundational concepts
- Enables customization of live sessions in regional language making it more accessible to students

The program was introduced for students from 26 government schools in the district with Science Stream in Grade 11 and 12. Presently, more than 3.4 lakh students from Grade 6-12 students of Bihar and Rajasthan State are benefiting with this learning acceleration program.

2. The Current (AS IS Process) and the Critical Stakeholders

The present educational landscape faces a critical question- How do you enable grade 10 students to learn grade 10 subjects? According to NAS 2021 for Dumka District, 32% students were at the below basic level of performance and 47% were at the basic level. Only 18% students were at the proficient level in

Mathematics. The learning gap for students has compounded over the years due to several reasons. In traditional linear learning, it is often assumed that students acquire knowledge in a sequential and steady manner, building on what they learned previously. However, in reality, individuals may have gaps or inconsistencies in their knowledge. Students in a classroom come from a diverse socio-economic background and each student begins at a different level of learning with their own learning pace. Irregular attendance throughout the academic year, coupled with a nearly non-existent academic support system outside of school, further exacerbates these educational disparities. Addressing these nonlinear learning gaps requires innovative methods that are tailored to the needs of each student.

Critical Stakeholders:

- District Administration, education departmental officials, and school teachers provided crucial inputs and constant feedback which helped effective implementation of the project
- Filo Team - The project was designed and implemented by Team Filo in Dumka District. Filo Teachers worked tirelessly to provide 24x7 on-demand learning support to students, even at 4 am on a Sunday morning.

3. Problem area and need for intervention

The district faces multifaceted challenges to provide equitable access to learning opportunities. The problems identified from the baseline survey analysis includes:

- **Non-Linear Learning Gaps among students:** In a classroom not all the students are at equal level of understanding of a subject/topic. For instance, more than 30% students from grade 12 struggles to obtain passing scores and a majority lies between 35-55% and a very few students are high performing students with more than 75% scores.
- **Bridging Foundational Learning Gaps and providing grade appropriate learning to students:** The district consistently reports poor educational outcomes where more than 63% of students of Secondary Grades are not able to solve simple division problems (ASER 2022). More than 25% students from Grade 12 exhibited foundational learning gaps in Mathematics. These foundational learning gaps among students keep accumulating over the years and results in overall decline of academic performance in higher grades.

- **Shortage of Subject-Specific Teachers in Schools**: Huge shortage of subject teachers in the district, especially for Science Stream Students. Only 3 physics teachers for 26 higher secondary government schools for around 2100 science students in the district. The dismal situation adversely affects the learning outcomes of students.
- **Socio-Economic Challenges in the District:** District has majority higher secondary government school students from rural regions (~60%), less than INR 10,000 per month family income (~65%), majority students from OBC, SC, ST category and many students are first generation learner with limited learning support at home.
- Overall Academic Performance: Control and treatment group students from Grade 11 and 12 scored nearly 55% in mathematics on the recent topics studied in the baseline assessment.
- **Absence of after school help:** More than 21% of students lack parental support for their educational achievement (NAS 2021). Also, many students are first generation learners with limited learning support at home.

4. Planning for the New Project/System

- The Sampurna Shiksha Kavach Program aims to expand its reach to the last mile. The objective is to ensure that the proposed solution reaches even the most remote and underserved areas, effectively bridging the educational divide. In this regard, Sampurna Shiksha Kavach by Filo plans to seek strategic partnerships with both state and national governments, as well as engaging with various stakeholders, including private organizations. The program will also seek support from third party funding partners. Our focus throughout the program will be on achieving last-mile reach and enhancing learning outcomes for all students under its purview.

- To have a holistic approach to improve learning outcomes, the program plans to integrate emerging technologies to implement continuous professional development programs for teachers. This will include a 24x7 access to the training material, direct connections with Training Experts to help resolve teachers' doubts and live demo sessions with the support of Training Experts to help teachers practice what they learn in the training programs.

- The program will also include a tech-driven, Competency based assessment framework for students so that the learning levels of each and every student can be assessed on key competencies.

5. Objectives and scope of the project:

- Improving academic performance of students at grade level
- Building equity by improving performance of underserved and underprivileged students
- Helping students overcome non-linear learning gaps aggregated over the years
- Supporting high-risk students and at the same time creating impact beyond high intent and high performing students in the class
- Providing personalized support to every student accounting for their unique learning needs.

6. Scope of the project:

The program has been designed to enhance learning levels of students from Grade 6 to Grade 12encompassing both urban and rural areas. The program employs regional-bilingual teachers to ensure students can learn in the language they understand. Presently, Filo has more than 60,000 teachers from across all states in India and can speak more than 10 languages.

7. The Redesigned Process and the Role of ICT

To effectively and equitably close learning gaps, Sampurna Shiksha Kavach program adopted the emerging global practice of Learning acceleration. Learning Acceleration focuses on getting students ready for their new grade-level learning without holding them back for their pre-existing learning gaps. Studies have shown that students who participated in accelerated learning programs completed 27% more lessons than students who took part in remediation. Learning acceleration was particularly effective for students from low-income families.

Role of ICT

Through Sampurna Shiksha Kavach, for the first time in the world, learning acceleration has been implemented on a big scale in an affordable manner. 24x7 instant access to live teachers to every student covered under the project. AI technology identifies learning gaps that have accumulated over the years and provides the right amount of learning support at the right time. This tech-driven learning acceleration intervention to students aims to bridge the learning gaps in schools and support learning recovery.

- Filo invented the world's first instant-teaching platform, with tech-driven scalability built-in, which has successfully operated at the scale of 35 lakh students across 15 countries. This required us to invent multiple concepts in different fields.
- Algorithmic innovation: Proprietary AI algorithms (4 patents awarded in US and India) invented at Filo are based on the emerging concept of Learning Acceleration. Filo team pioneered the concept of matching thousands of students on scale to thousands of teachers in real time w.r.t.
    - Student's academic and socio-economic profile
    - Metadata generated from the question or the query shared by the student
    - Teacher's academic, pedagogical and socio-economic background aggregated at a topic level.
- Academic innovation: In order to achieve this on scale we had to evaluate teacher pedagogical proficiency through algorithms. Filo team created the first of its kind data driven model for evaluating pedagogy of a class based on analysis of a live video.
- Deep contextualization for students of every background. Majority of the teachers have been bilingual, expert in formative assessment of the student and open to any question that student brings in.
- Conversation learning at scale. For the students who do not even know how to frame a question in writing, simply being able to voice out their concerns has become one of the major factors for the effectiveness of the program.

8. What is the Change/Transformation?

Under the Sampurna Shiksha Kavach project, every student, regardless of their initial performance level or background, is provided with personalized learning support. The hallmark of this transformation is the concept of self-paced learning, where students are encouraged to progress at their own speed, unhindered by rigid timetables or uniform learning expectations. One of the cornerstones of this transformation is the 24x7 availability of dedicated teachers, making learning a continuous and interactive process. Students can access real-time assistance whenever they encounter challenges or seek clarification, fostering an environment where no question goes unanswered and no student is left behind.

In essence, the change brought about by Sampurna Shiksha Kavach project is a shift towards inclusive and personalized education, where the focus is not solely

on high-performing students but on empowering each student to reach their full potential, irrespective of their starting point. It redefines education as a dynamic, adaptable, and equitable process that caters to the unique learning needs of every individual, thereby revolutionizing the landscape of education in India and beyond.

9. Implementation Processes

The implementation of the project can be divided in the following stages:

● **Live Learning Sessions**: FILO has a pool of more than 60,000 teachers trained on various important parameters including pedagogical, communication, subject knowledge and learning gap identification and demo sessions. These qualified teachers conduct 24x7 live learning sessions for students based on the student's learning needs. Students are matched to the right teacher, speaking more than 10 languages, based on immediate requirement of the student, student's educational profile, student's local-social context, past preferences, teacher expertise in different academic & pedagogical fields and their own local-social context. These live learning sessions are conducted at home on FILO mobile platform and also, in schools where there is a shortage of subject specific teachers.

24x7 Instant-Teaching (At home):

Objective: Enhance learning levels of all students irrespective of their educational and socioeconomic backgrounds

Intervention: The students are connected to live subject experts through 1:1 video instant learning session on the FILO platform to help them get one-to-one personalized learning support with teachers in their local language. This provision facilitates students to ask as many questions and get his learning difficulties resolved instantly with the help of a teacher. ○ Classroom Sessions (In School):

Objective: Provide equitable access to learning for schools with shortage of subject teachers. The students with limited access to digital devices at home are also benefited from the intervention.

Intervention: The students are connected to subject experts through a LIVE CLASSROOM in a one-to-many model to help students learn in a classroom environment and facilitate cohort discussions.

- **Super 30 Program for JEE & NEET:**

The program also provides SUPER 30 students (the high intent and performing students of the district) to support and prepare them for competitive exam such

as JEE, NEET and CUET through a rigorous selection process, which included input from teachers and their past academic performance.

- **Continuous Assessment and Evaluation**: Regular assessment is crucial in identifying the progress of the student and taking corrective measures, as and when required. Continuous assessments are conducted after each learning session using a short quiz and students are encouraged to solve these questions. This process enables the student to apply the learning gained from the learning session to solve a question/problem. Immediate application of the learning enhances the retention level of students.

- **AI driven Learning Acceleration:** The platform identifies student's learning gaps based on the students' interaction with the platform. The teachers are trained to support students and build their foundational knowledge, and then provide grade appropriate conceptual understanding of the topic. The entire topic-wise learning journey of a student is mapped using a personalized learning curve reflecting the student's topic wise level of understanding. This is a highly personalized approach which facilitates accelerated learning.

10. Constraints and Challenges Faced and Overcome

- **Infrastructure Gaps and Enhancement Problem:** Varied schools faced infrastructure deficiencies, ranging from minor to major.
  Solution: District administration, working in collaboration with the Filo team on the ground conducted comprehensive infrastructure surveys across all schools. This meticulous process ensured that all necessary infrastructure like computer, projector, microphone, internet connectivity, speakers, power backup was in place before commencing classes. Regular visits to the schools are done by the district team led by SDEO, Education and the Filo team to ensure that classroom delivery is seamless.

- **Bridging the Connectivity Gap in Remote Area Problem**: Some schools are situated in remote areas with limited internet connectivity.
  Solution: Determined to leave no student behind, the program explored diverse solutions, including partnerships with multiple internet service providers and ensured that all internet related issues are resolved.

- **Navigating the Transition to Digital Learning Problem**: Transitioning to digital learning posed a learning curve for both students and teachers.

Solution: To ensure a seamless shift, the program conducted regular feedback sessions in schools and actively sought input from students. These insights guided us in refining the teaching methodology and overall program experience.

- **Resistance in Schools with Available Teachers Problem:** Initial apprehension prevailed among school teachers, fearing digital classes might replace their roles.

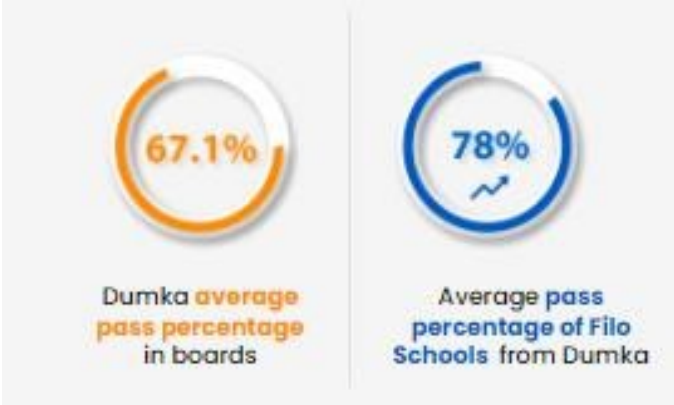
  Solution: The district administration engaged in open dialogues with teachers, emphasizing that digital classes were designed as supplements, not replacements. With the unwavering support of the education department, teachers embraced the program, becoming instrumental in its success.

  Each challenge presented an opportunity for growth and improvement. By addressing these obstacles head-on, the program tried to pave the way for a more inclusive and effective digital education environment in Dumka.

11. Impact of the Project-Tangible/Intangible (with data) & Social Impact

The intervention has brought about significant improvement in learning outcomes of students, especially from disadvantaged backgrounds in the district by providing them equitable access to quality education. The key achievement of the program in just one academic year includes:

- Improvement in Passing Percentage in State Board Examination (Academic Session 2022-23):
- Average Pass Percentage of the district for Class 12 Science students is 67.1%, whereas pass percentage for Schools under the program in the district is 78%.
- 99% of filo instant students passed the state board examination
- All the District toppers including Rank 1, Rank 2 and Rank 4 are students under this program.



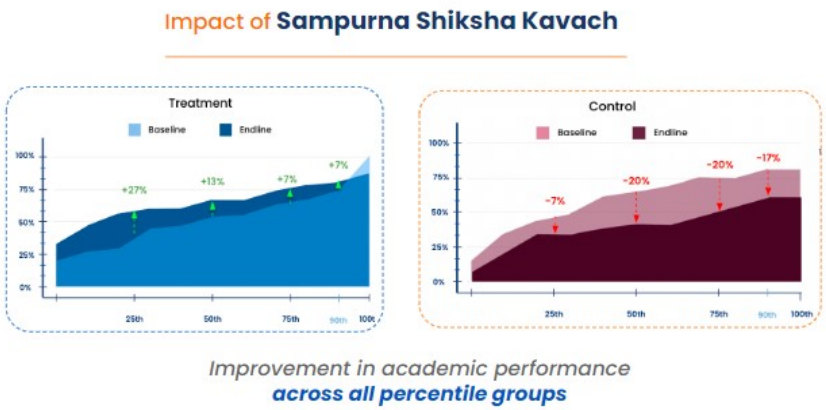
Under the super 30 program, the district had four selections in JEE Mains examinations.

The **impact assessment study** for Sampurna Shiksha Program (Link) in Dumka District shows:

(a) An overall improvement in Academic Performance by 14% in Mathematics 2. Building equity in learning for students from socio-economically and educationally disadvantaged backgrounds
   - Students from rural regions have shown 12% improvement in performance, whereas Control Group students showed decline by 15%
   - Low-income families: students from low-income families (<10k per month) improve their overall performance by 12% whereas control group students saw a decline of 12%.
   - SC/ST categories: ST Category students showed 24% improvement in scores, whereas Control Group ST students showed a decline of 25%
   - Female Students have shown18% improvement in performance
   - First generation learners have shown remarkable improvement of 21% in their performance

(b) Helping students overcome non-linear learning gaps by bridging their foundational learning gaps while also enhancing their overall understanding of the topic.

(c) Reduction of high-risk students who struggled to obtain passing scores and has seen transformational rise in the number of high-performing students



12. Lessons Learnt

- Equitable access to quality education is essential, particularly for disadvantaged students.
- Personalized and self-paced learning enhances student engagement and learning outcomes.

- Collaboration and open communication with teachers are critical for the success of digital learning programs.
- Regular assessment and feedback loops are vital for monitoring student progress and improving teaching methods.
- Effective use of technology can bridge learning gaps and transform education delivery.
- Engaging with communities and stakeholders builds trust and support for educational initiatives.
- Data-driven decision-making is crucial for shaping program strategies and interventions.
- Empowering disadvantaged students with educational opportunities can lead to significant academic improvements.
- Education has the transformative potential to change the lives of students and communities for the better.

13. Long Term Significance

- **National and Global Replication**: The success of the project positions it as a potential model for replication in other regions of India and even globally, potentially transforming the way education is delivered.
- **Closing Learning Gaps**: By effectively bridging learning gaps and equipping students with foundational knowledge, the project sets the stage for their continued educational journey, empowering them to excel in higher studies and future careers.

- The solution is **aligned with National Education Policy 2020** including quality teachers who can teach in local languages can make a huge difference; One-on one teaching is extremely effective for learning.

- **Empowerment of Disadvantaged Communities**: The program's commitment to inclusivity and equity has the potential to uplift entire communities by providing access to quality education, breaking the cycle of educational disadvantage.

- **Community and Stakeholder Engagement**: The long-term significance is also evident in the trust and support garnered from communities and stakeholders, setting a precedent for collaborative efforts in the education sector.

- **Digital Learning as a Catalyst**: The success of the program underscores the transformative potential of digital learning, which can continue to reshape educational delivery methods and foster innovation in the education sector.

14. Future Roadmap

As we embark on the new academic year, the program, now sanctioned by Niti Aayog, stands poised for continued evolution and success. The program's future roadmap is marked by a commitment to expanding its reach, leveraging technology, improving teacher capabilities, and actively engaging with stakeholders.

Scalability

A defining feature of the Sampurna Shiksha Kavach program is its tech-driven approach, making the program highly scalable. The processes involved in the implementation of the project are automated which makes it scalable and also, adaptive to the local requirements including language, social and environmental aspects. The scale at which the project is currently operating across 75 districts in Bihar, Rajasthan and Dumka District in a short span of around 1.5 years reflects the scalability and adaptability of the program.

The key enabling tech tools which makes the program easily adaptable includes:

- **AI driven matching algorithms** to connect students with the right teacher in less than 60 seconds based on immediate requirement of the student, student's educational profile, student's local-social context, past preferences, teacher's expertise in different academic & pedagogical fields and their own local-social context.

- **Tech-driven Professional Trainings** of onboarded subject experts on FILO Platform with automated shortlisting process including KYCs of subject's experts, their educational qualifications.

In order to solve for the massive requirements for teachers on scale, the teachers are screened, trained, tested and continuously evaluated on the platform through complete automation and then meaningfully incentivized for better pedagogical practices. Through careful consideration, students are matched to teachers on a topic level rather than a subject level. That allows to bring down the initial requirement of skilling for someone to start earning on the platform. A person with a strong knowledge of just Trigonometry can start

earning on Filo and grow from there. Which creates a potential pool of teachers that can cater to not just India but the entire world.

Present Reach: Within a short span of two and a half years, Filo's innovative technology and scalable approach have successfully served 35 lakh students across 15 countries with 60 thousand teachers on the platform. With more than 90 thousand live classes taking place on the platform every day, Filo is the largest platform in the world that caters to students on a one-to-one basis. The project in Bihar reached to almost 2 lakh students, in 38 districts, in a direct to student model. The same mode was then extended to Rajasthan with almost 1.5 lakh students across 33 districts. The project has also been adopted in the Jefferson County district schools in the US.

Moving forward, the Sampurna Shiksha Kavach program aims to enhance its scalability by forging strategic partnerships with both state and national governments, as well as engaging with various stakeholders, including private organizations. The program will also seek support from third party funding partners. Our focus throughout the program will be on achieving last-mile reach and enhancing learning outcomes for all students under its purview.

To ensure a holistic approach to education, the program will extend its efforts into other domains, including the development of technology-driven professional development programs for teachers and the implementation of a tech-driven student assessment system. The program’s commitment to quality education, innovation, and inclusive growth remains unwavering as it moves forward. Collaborating closely with partners, it aspires to shape a brighter educational future in our district, one where every student has the opportunity to thrive and succeed.

***

Mission Antyodaya

By: Department of Rural Development, Government of India

Abstract:

Mission Antyodaya Survey is an initiative undertaken by the Government of India to assess the socio-economic conditions of rural areas and identify areas of intervention for holistic development and transformation in lives and livelihoods on measurable outcomes in a convergence framework. The MA Survey provides a comprehensive understanding of Villages across India based on quality of life, Infrastructure, economic ability of a village, its sustainability and resilience and the impact of various initiatives. Under Mission Antyodaya, the Gram Panchayats is the focal point and the Annual survey of all Gram Panchayats (GPs) across the country is an important aspect of Mission Antyodaya. The data of Mission Antyodaya plays a significant role in supporting the Gram Panchayat Development Plan (GPDP) which is a participatory planning process at the level of gram panchayat (village-level local self-government), aimed at decentralized planning and inclusive development. It serves as a very useful tool for the gap analysis in 269253 GPs uploaded on e-Gram Swaraj portal of Ministry of Panchayati Raj.

The Survey has been conducted to collect data on 182 indicators and 216 data points covering the 21 sectors through detailed questionnaire (Annexure-D). The 21 sectors covered in MA Survey, 2023 are: (i) good governance; (ii) agriculture & land development, fuel & fodder; (iii) animal husbandry; (iv) fisheries; (v) rural housing; (vi) water & environmental sanitation; (viii) roads and communication; (ix) conventional & non-conventional energy; (x) financial and communication infrastructure; (xi) markets & fairs; (xii) public distribution system; (xiii) libraries; (xiv) recreation & sports; (xv) education/ vocational education; (xvi) health, nutrition, mother & child development and family welfare; (xvii) welfare of the weaker section; (xviii) poverty alleviation programme; (xix) khadi, village & cottage industries; (xx) social forestry; and (xxi) small-scale industries.

MA Survey, 2023 has been conducted by nearly 92,000 Cluster Resource Persons (CRPs) of National Rural Livelihood Mission (NRLM) with the help of a Mobile Application developed by NIC by using the state-of-art technology. Each village has been covered by one CRP in three days. The training for conducting the survey was rolled out in a cascading mode with the help of National Institute of Rural

Development & Panchayati Raj (NIRDPR). In the first lap, the training was imparted to State Teams of Trainers (SToTs) at NIRDPR and respective State Institute of Rural Developments (SIRDs)in hybrid mode.

This Case study delves into the key objectives, methodology, and impact of the Mission Antyodaya Survey and Government Process Reengineering in the journey of digital transformation of Mission Antyodaya has played a significant role in enhancing ease of living at rural India

1. Project Background:

The Mission Antyodaya Survey is undertaken by the Government of India to assess the socio-economic conditions of rural areas and identify areas of intervention for their holistic development so as to achieve the Sustainable Development Goals. The primary objective of this program is to collect the village government services & infrastructure data for all the villages in the GP across India which will improve service delivery, enhance citizenship, create pace for an alliance of people's institutions and groups and improve governance at the local level. It is envisaged as state-led initiative with Gram Panchayats as focal points of convergence efforts.

Annual survey in Gram Panchayats across the country is an important aspect of Mission Antyodaya framework. It is carried out coterminous with the People's Plan Campaign (PPC) of Ministry of Panchayat Raj and its' purpose is to lend support to the process of participatory planning for Gram Panchayat Development Plan (GPDP). The major beneficiaries of the project are 27 Ministries / Departments of Government of India who use Mission Antyodaya surveyed data in the planning and policy formation. The **coverage of project** is:

a. No. of States/UTs covered: 36
b. No of district covered: 765
c. Number of villages covered: 6.5 Lakhs

The primary objective of the survey is to ensure effective use of resources through convergence of various Government Schemes with Gram Panchayats as the basic unit of planning by assessing various parameters of ease of living such as poverty, education, health, infrastructure, and access to basic amenities, the scheme aims to prioritize resources and interventions in areas that need them the most. The other objectives are:

- Work with a focused micro plan for sustainable livelihood for every deprived household.
- Conduct an annual survey on measurable outcomes at Gram Panchayat level to monitor the progress in the development process across rural areas.
- Supporting the process of participatory planning for Gram Panchayat Development Plan (GPDP), which will improve service delivery, enhance citizenship, create pace for an alliance of people's institutions and groups and improve governance at the local level. the survey helps in designing targeted welfare schemes and programs to improve their living conditions and overall wellbeing.
- Encourages partnerships with network of professionals, institutions, and enterprises to further accelerate the transformation of rural livelihoods.

2. The Current (AS IS Process) and the Critical Stakeholders:

Before the Government Process Re-engineering in the Mission Antyodaya project, the process was flowing from Registration of uses to MIS reports as follows:

a. Registration: User used to register via MA Portal/Mobile Application
b. Enumeration: Data were collected through questionnaire using mobile application
c. Verification: Enumerated data/signed PDF/Geo tagged assets used to be verified by block development officer manually on the portal/ app.
d. GP Scoring & Ranking: Based on 48 input indicators calculation of GP score used to be processed and Ranking was generated.
e. MIS: Static relevant reports was published on the portal

Critical Stakeholder: Apart from the Ministry of Rural Development, the major stakeholders in the Mission Antyodaya Survey are the Ministry of Panchayati Raj, 27 other Ministries / Departments of Government of India from 21 development sectors who are part of Mission Antyodaya Survey. (Development Sector list is attached in Annexure B), States/ UTs of India Community resource persons (CRP) of NRLM, Block Development Officers (BDO) in States/UTs.

3. Problem area and need for intervention

Some of the major Pain Point and Problems faced by various stakeholders in the current process were Process complexity in MA, high survey conducting time

along with Ease of doing survey, Absence of Multilingual MIS and App, Pace to conduct survey, no provision of Real time data upload, multiple re-verification of data, Data Accuracy and better use of collected data by related stakeholders.

Some other problem was the need of Improved Questionnaire (more accurate and effective, dynamic questions for both infrastructure as well as access to service after discussion with all stakeholders) to take inputs for Multidimensional approach under Mission. Not using the Latest Technology for data handling, data security, data accuracy, increased transparency levels with improved citizen's focus and experience and reduced administrative burden was another problem to improved.

4. Planning for the New Project/System and the Role of the Organization

Mission Antyodaya Government Process Re-engineering (GPR) was planned by the Mission Antyodaya Division, MoRD under the supervision of a committee headed by Addl. Director General (Stats.) and the Chief Economic Adviser which was mandated to make strategy for the GPR and implement in the Mission Antyodaya survey. All 27 ministries/departments from 21 development sectors shared their questionnaires that was verified by committee and finalized after multiple discussion. After the finalization of improved questionnaire, Technology stack was discussed and finalized with ICT team. Following the development in new technology stack and testing of application, Capacity Building was planned for end users. Videos, documents, SLA, KPIs has been finalized and then being implemented at ground. The survey data is being shared with the Ministry of Panchayati Raj and other participated ministries.

5. Objectives and Scope of the Process Re-engineering

The process re-engineering objective for this project was to minimize the process complexity, cost and service delivery time along with Ease of doing survey, multilingual MIS and App, conduct survey in fast pace, real time data upload, less requirement of re-verification of data, Data Accuracy, better use of collected data by related stakeholders.

Other primary objective was use of Improved Questionnaire (more accurate and effective, dynamic questions for both infrastructure as well as access to service after discussion with all stakeholders) to take inputs for Multidimensional approach under Mission Antyodaya was another objective with Integrated

Monitoring Dashboard for Analytics & Insights along with Convergence & Saturation and Real time data sharing with stakeholders.

The other objective was to Use the Latest Technology for data handling, data security, data accuracy, Increased transparency levels with Improved citizens focus and experience and reduced administrative burden.

6. The redesigned Process and the Role of ICT:

ICT has played an import role in the successful implementation of this project. Data Capturing from ground is being done at real time with proper validation and check. Latest technology for data handling, data security, data accuracy and Workflow has Increased transparency levels and Improved citizens focus and experience and reduced administrative burden. Real Time Mission Antyodaya data sharing with inter and Intra department/ministry is also now possible. Cyber security aspects have also been covered off with proper access control, encryption methodology and auto log monitoring.

Step1: Details of baseline study
Step 2: Problems identified with the discussion all stakeholders and Committee
Step 3: Stakeholder Consultation carried out
Step 4: GPR in the MIS
Step 5: Capacity Building and Awareness & Communication Approach involvement
Step 6: Feedback Mechanism - Automated, Assisted and/or Physical Assessment

7. What is the change/ Transformation?

After the Government Process Re-engineering in 2021 in Mission Antyodaya, the following new processes have been introduced:

- **Registration:** User registration in MA Scheme through MA Portal/Mobile Application
- **Enumeration:** Dynamic survey-based questionnaire for data collection and process via Mobile App
- **Gram Panchayat Validated Copy Upload:** Upload of Gram Panchayat signed PDF based on enumerated data. Workflow with auto escalation
- **Geo Referencing:** Photo along with Geo-coordinates of assets identified during enumeration

- **Verification:** Verification of enumerated data/signed PDF/Geo tagged assets by block development officer
- **GS Video Upload**: Upload of videos recorded during Gram Sabha.
- **GP Scoring & Ranking:** Process of calculation of GP score based on input indictors and give appropriate rank.
- **GAP Analysis:** Process of GAP Analysis for planning for Gram Panchayat Development Plan (GPDP)
- **Data Sharing API Framework:** Data sharing framework for multiple schemes and inter departments.
- **LGD Updation Integration:** Dynamic Synchronization of LGD using For-Read operations
- **Data Reset Utility:** Data reset facility on different levels for State/Block coordinators.
- **MIS:** Analytical Dashboard along with relevant reports

The new data flow after the Government Process Re-engineering in the Mission Antyodaya has Questionnaire on 216 Infrastructure as well as service-oriented indicators from 27 ministries. The availability of base data has been removed to avoid data repetition. The facilities of "Save Draft" and signed copy of enumeration PDF have been enabled for verification while the access to Gram Sabha schedule has been revoked. After the GPR, the real time data processing has been enabled. Collection of GPS Coordinates along with assets images and Gram Sabha videos has enhanced the authenticity of process. Now automatic hassle-free Data sharing with multiple Ministries/ Departments along with Analytics are available.

The major activities incorporated through GPR of Mission Antyodaya include Upload of signed PDF of enumerated data of Gram Panchayat, real time data processing, Geo Referencing of photo along with Geo-coordinates of assets identified during enumeration, verification of enumerated data/signed PDF/Geo tagged assets by Block Development Officer, upload of videos recorded during Gram Sabha, Gap Analysis for Gram Panchayat Development Plan (GPDP), data sharing framework for multiple schemes, data reset facility on different levels for State/Block coordinators, update of master data automatically update in syn with LGD.

8. Implementation Processes:

Mission Antyodaya new reengineered survey framework was implemented through Service Level Agreement and proper capacity building includes documented user guide, App use videos and made them available on the MA portal. In the SLA the major parameters are uptime availability of portal and mobile apps, Monitoring process and service level reporting, Data sharing API availability with inter ministries, The steps for reporting issues with the service, Response and issue resolution time frame, The service's desired performance level, especially its reliability and responsiveness, Type of service to be provided, Standard Operating Procedure (SOP) and steps for uploading of Gram Sabha Video for Mission Antyodaya, Capacity building time for Community Resource Person

9. Constraints and Challenges Faced and Overcome

During high usage times we used to face too many client's error in Postgres and our Postgres server is limited with resources. Since we couldn't scale the Postgres server horizontally, we solved this by moving user session metadata to a NoSql database. Also, the language barrier in the mobile application was removed by applying multilingual interface for 14 Indian languages to ease data entry in local language by field staff.

To manage the load, the technical team shifted the load to Read Replicas for read operations of NoSQL databases. In all peak phase we are now able to manage our API load by increasing 2 additional web server nodes in load balancer.

10. Impact of the Project-Tangible/ Intangible (with data), Social Impact

- The MA Survey GPR has reduced the time for Community Resource persons (CRPs) to conduct the survey by more than 40%.
- All 27 Ministries can now plan more effectively at cluster level. This has also helped in the availability of resource envelope with the pooling resources for Gram Panchayat Development Plan (GPDP), working with set timelines and KPIs, Supporting institutions and professionals and Coordination structures. This has also helped in minimizing data re-verification and easy audit.
- Number of services taken up increased with 350 % from 48 to 216
- Number of positive feedbacks from the application users and stakeholders shot steep with 450%
- Average time for making a complete transaction (service-wise) (in Hours) decreased with 66 %

- Average time to close issues reported through online or offline means (service wise) (in Hours) is also decreased with 66 %

11. Other Salient features of GPR Process:

i. Improved Questionnaire (more accurate and effective, dynamic questions) to take inputs for Multidimensional approach under Mission Antyodaya

ii. Minimized process complexity, cost and service delivery time along with Ease of doing survey, conduct survey in fast pace, real time data upload, less requirement of re-verification of data, Data Accuracy, better use of collected data by related stakeholders.

iii. Use of Latest Technology for data handling, Information security, data accuracy, Increased transparency levels, and mobile app robustness.

iv. Creating value in the GP/ Clusters and raising household income

v. Multilingual MIS / Mobile app

vi. Integrated Monitoring Dashboard for Analytics & Insights along with Convergence & Saturation

vii. Data shared through APIs for Integrated view to stakeholders

viii. Government Service delivery & Infrastructure based inputs for effective strategy and ensuring the accurate preparation of GPDP.

ix. Improved citizens focus and experience and reduced administrative burden

12. Lessons Learnt

Government Process Reengineering (GPR) of Mission Antyodaya Survey framework involved a fundamental overhaul of existing processes and systems for data collection. The primary objective was to improve efficiency, reduce costs, reduce survey conduct time, ease of conducting survey for users and correct data. Lessons learned from GPR of Mission Antyodaya is invaluable for future projects. Here are some key lessons:

- Clear Objectives and Vision: Project Clearly define the objectives and vision for the reengineering effort. We ensured that all stakeholders understand and align with the goals of the project.
- Strong Leadership and Commitment: Leadership support is crucial for the success of GPR. Mission Antyodaya Senior officials and management was committed to driving change and provided the necessary resources.
- User-Centric Approach: This project prioritizes the needs and expectations of end-users (i.e. Community Resource Person who conduct survey) and other stakeholders. User satisfaction is a key success factor.

- Process Analysis: Conducted a comprehensive analysis of existing processes. Identified inefficiencies, redundancies, and bottlenecks in the current MIS to inform the redesign.
- Simplify and Standardize: We simplified processes where possible and standardize procedures to create consistency. This led to increased efficiency.
- Technology Integration: Mission Antyodaya ensured that the reengineered system effectively integrates new technology stacks.
- Change Management: Implemented a robust change management strategy to address resistance to change, educated users of system, and created a culture of adaptability and continuous improvement.

13. Long Term Significance

- **Data-driven planning:** Mission Antyodaya provides critical data and information through its survey process, which serves as a foundation for Gram Panchayat Development Plan (GPDP). The comprehensive data collected by Mission

Antyodaya helps gram panchayats understand the socio-economic conditions of their villages, identify areas of deprivation, and prioritize development interventions accordingly. This data-driven approach ensures that GPDP is based on accurate information and reflects the actual needs and aspirations of the local communities.

- **Monitoring and evaluation:** Mission Antyodaya's survey data serves as a valuable tool for monitoring and evaluating the progress of GPDP and for 27 other ministries. The data collected during the survey establishes baseline information, which can be used to measure the impact of development interventions implemented through GPDP. This enables gram panchayats to assess the effectiveness of their initiatives, identify areas that require further attention, and make informed decisions for future planning.

- **Targeted interventions:** The Mission Antyodaya Survey has been instrumental in channeling resources and schemes to the most deserving areas. By identifying villages and households in need, the government can allocate funds, infrastructure development projects, and social welfare programs to uplift these com munities. This targeted approach ensures that resources are utilized efficiently and effectively, leading to tangible improvements in the lives of rural residents.

- **Empowering local communities:** The survey process involves engaging with local communities, thereby empowering them to participate in decision-making and development planning. The survey teams collaborate with village-level institutions, community-based organizations, and local stakeholders to collect accurate data and ensure that the needs and aspirations of the rural population are adequately represented in policy formulation and implementation.

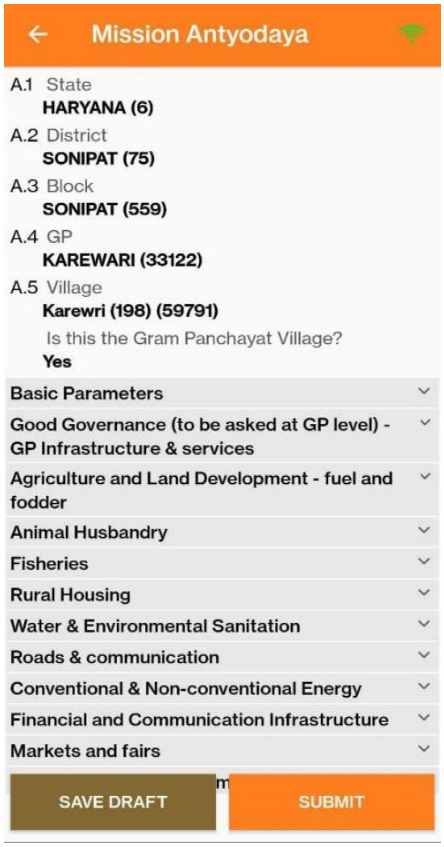
14. Future Roadmap

With the success of Mission Antyoday, a Survey, 2023, the Ministry of Rural Development, at the demand of line Ministries/ stakeholders, is planning to broaden the purview of Survey from current 216 questions pertaining to 21 sectors to many more indicators of new sectors. This will help in creation of a good repository of data pertaining to rural development.

Several options for strengthening of Mission Antyodaya, such as involvement of different agencies etc. for maintaining a dedicated pool of well training CRPs for quick data compilation, are being explored. The CRPs/surveyors need be trained multiple times so that their capabilities are honed to perfection. Ministry would have to lay special emphasis on this aspect.

Communication lines with the States will have to be strengthened for quick and effective transmission of the information to Block and GP level officials.

Snapshots of Mission Antyodaya Mobile App:



Legend:

1. PI – Panchayat Infrastructure (Infrastructure/assets at the Panchayat Level)

2. PS- Panchayat Services (Schemes/ Service/ HR facilitating development at the Panchayat Level)

3. VI – Village Infrastructure (Infrastructure/assets at the village Level)

4. VS- Village Services (Schemes/ Service/ HR facilitating development at the Village Level.

***

Maa Navjaat Tracking Application (MaNTrA) for Delivery Point Health Facilities

By: National Health Mission, Government of Uttar Pradesh

Abstract

Maa Navjat Tracking App (MaNTrA) is a comprehensive web and mobile-based application implemented in public health facilities across Uttar Pradesh, India. This digital innovation addresses critical issues related to monitoring maternal and newborn healthcare by capturing key service delivery parameters for pregnant women and newborns during their stay in the labor room, from admission to discharge or referral. The MaNTrA Labour Room Online Management Information System (MIS) utilizes real-time data from the Labour Room Delivery Register and Referral-Out Register to provide ongoing analysis for decision-making. This integrated platform involves key stakeholders, service providers, and beneficiaries to monitor and improve the quality of care in labor rooms. Since its launch in December 2021, MaNTrA has demonstrated significant success, capturing approximately 90% of deliveries, and is designed for sustainability through its cost effectiveness and user acceptance

1. Project Background

Uttar Pradesh is committed to providing high quality of care to pregnant women and new-borns. The stagnation in the decline of maternal mortality ratio as evident from SRS (2018-20) MMR estimate (167 maternal deaths, 1,00,000 live births) underlines the need for renewed efforts to accelerate the pace of decline in the maternal and new-born deaths in State. There is evidence that 46 % of maternal deaths, 40 % of neonatal death, and 40 % of stillbirths happen on the day of delivery and therefore, improving quality care at the time of birth is the most effective intervention to reduce maternal and neonatal deaths and stillbirths.

MaNTrA was conceptualized by National Health Mission, Uttar Pradesh, while looking for solutions to improve the quality of intrapartum care in public health facilities. There was an evident lack of critical real-time data related to care around birth and facility preparedness in existing data systems (HMIS). Therefore, there was a need to make this critical information readily available for real-time monitoring by services providers and policy-makers in healthcare system and to address this need, MaNTrA, which is an online MIS for Labour rooms, was

launched by Hon'ble Chief Minister – UP, on 5th Dec 2021, across 25,835 health facilities in Uttar Pradesh.

2. The Current (AS IS Process) and the Critical Stakeholders

- **Manual Entry in Delivery Registers:**
    - The current process heavily relies on manual entries in delivery registers, creating a labor-intensive and time-consuming system for recording critical healthcare information.
- **Limitations in Real-Time Analysis:**
    - The manual entry system hinders the ability to conduct real-time analysis, presenting a significant obstacle to promptly assessing and responding to crucial healthcare data.

3. Prompt Addressing of Crucial Information:

- The manual process poses limitations in promptly addressing and responding to crucial information, potentially leading to delays in critical interventions, especially in maternal and newborn care.

4. Diverse Stakeholders:

Key stakeholders impacted by the current process include:

- **Pregnant Women and Newborns:** The primary beneficiaries of maternal and newborn healthcare services, whose wellbeing relies on the efficiency of the healthcare system.
- **Health Service Providers**
- **Staff Nurses**: Involved in direct patient care and data entry, influencing the accuracy and completeness of healthcare records.
- **Obstetricians, Anesthetists, and Pediatricians:** Specialized healthcare professionals contributing to comprehensive maternal and newborn care.
- **Decision and Policy Makers:** Individuals responsible for shaping healthcare policies and strategies, relying on accurate and timely data for informed decision-making.
- **State Health Department:** A central entity overseeing and coordinating healthcare initiatives at the state level.

5. **Integral Participation of Decision and Policy Makers:**

Decision and policy makers, along with the State Health Department, play integral roles in the healthcare ecosystem, relying on accurate and timely data for formulating informed policies and strategies.

6. **Need for Enhancement:**

- Enhancing the current system is deemed vital for several reasons:
- **Timely and Effective Care:** Improving the system is crucial for ensuring timely and effective care for pregnant women and newborns, reducing the risk of complications and improving health outcomes.
- **Informed Decision-Making:** Healthcare professionals and policymakers require accurate and real-time data to make informed decisions, driving improvements in overall healthcare delivery.

In conclusion, the existing manual entry system in delivery registers poses challenges in real-time analysis and responding to crucial information. The diverse group of critical stakeholders, including pregnant women, healthcare providers, and decision makers, underscores the need for system enhancement. The ultimate goal is to ensure timely and effective care for pregnant women and newborns while facilitating informed decision-making among healthcare professionals and policymakers.

7. **Problem areas and need for intervention**

The challenges identified in the existing system were multifaceted, encompassing elevated maternal and neonatal mortality rates, absence of real-time data, and a cumbersome manual record-keeping process. These pain points collectively contributed to a significant constraint on the accessibility of vital information for decision makers within the healthcare system. Recognizing the urgency of the situation, an intervention became imperative to rectify these issues. The primary objectives of the intervention were to establish a mechanism for the timely availability of critical information, enable effective decision-making, implement performance tracking measures, and ultimately enhance the overall quality of care provided. Through these targeted improvements, the intervention aimed to alleviate the burden on healthcare professionals, enhance patient outcomes, and contribute to the broader improvement of maternal and neonatal healthcare.

8. Planning for the New Project/System and the Role of the Organization

National Health Mission, Uttar Pradesh, in collaboration with UNICEF, strategically planned and executed the MaNTrA initiative, aiming to modernize and streamline healthcare processes. MaNTrA was designed to digitize delivery registers, usher in real-time data entry capabilities, and establish mechanisms for performance tracking and beneficiary feedback. This comprehensive approach sought to revolutionize the healthcare information system, enabling more efficient decision making and improving overall service quality.

Notably, the project is undergoing a significant transition as it moves towards complete handover to the National Health Mission (NHM) Uttar Pradesh (UP). The inclusion of MaNTrA 's costs in the annual Program Implementation Plan (PIP) of NHM UP, starting from the fiscal year 2022-2023, signifies a crucial step toward sustainability and continued impact.

The State Health Department, in conjunction with NHM UP, played a pivotal role in ensuring the long-term success of the system. Efforts were directed not only towards its seamless integration with NHM UP but also with other existing Management Information Systems (MIS) such as the Civil Registration System for birth registration and UP Ke Swasthya Kendra. This collaborative and integrative approach underscores the commitment to a robust and interconnected healthcare ecosystem, fostering sustainable advancements in healthcare delivery and information management.

9. Objectives and Scope of the Project

The MaNTrA project, initiated by the State Health Department in collaboration with UNICEF, strategically aimed to revolutionize healthcare processes in Uttar Pradesh. Covering a vast scope of over 2.8 million deliveries across 5547 delivery points, the project sought to digitize delivery registers, introduce real-time data entry for monitoring and decision-making, track service provider performance, and collect beneficiary feedback.

MaNTrA stands out as an Ayushman Bharat Digital Mission (ABDM) compliant initiative, currently in the final stages of achieving M2 and M3 integrations. This system seamlessly integrates with various existing platforms, such as the Civil Registration System (CRS) of the Government of India for birth registration, ABHA, and Up Keswasthya Kendra, which serves as a health facility master of UP. Additionally, MaNTrA is interconnected with the Safe delivery app, developed by

Maternity Foundation, facilitating the capacity building of staff nurses on clinical aspects. Integration with AADHAAR adds an extra layer of authentication for beneficiaries, ensuring the secure disbursement of Direct Benefit Transfers (DBTs).

In its role, MaNTrA digitizes data related to care around birth in Labour Rooms and Maternity OT at delivery points, enabling closer monitoring of key maternal and newborn service delivery parameters critical for determining outcomes. The comprehensive reach of this intervention covers 6,297 functional delivery points in the public sector, catering to approximately 2.8 million deliveries in the state. This ambitious project not only addresses the immediate challenges of manual record-keeping and limited data accessibility but also contributes to a more interconnected and efficient healthcare ecosystem in Uttar Pradesh.

10.The redesigned Process and the Role of ICT

MaNTrA, the innovative digital application designed for labor room process automation, stands as a comprehensive solution driving process re-engineering and digital transformation within healthcare systems. This initiative began with meticulous process mapping and analysis, critically examining labor room registers and data capture processes to identify bottlenecks and areas for improvement. The result was a strategic framework that integrates real-time data capture, electronic health records, and digital registers, fostering streamlined and automated labor room processes. This not only enhances efficiency but also ensures greater accuracy in healthcare data management.

One key focus area of MaNTrA is the optimization of Staff-Nurse/ANM workflows. This involves enhancing the sequencing of tasks, implementing unique beneficiary identification methods, and overall workflow optimization. Real-time monitoring and alerts further contribute to the efficiency of healthcare delivery, allowing for prompt responses to emerging situations. The application fosters seamless communication and collaboration among healthcare providers through secure messaging, data sharing, and coordination tools.

Patient engagement and empowerment are integral components of MaNTrA's approach. The application goes beyond mere automation, prioritizing the dissemination of health messages and establishing a feedback mechanism. It actively facilitates timely birth registration and details related to the Janani Suraksha Yojana (JSY). Integration with the Ayushman Bharat Digital Mission

(ABDM) and civil registration systems ensures data interoperability, contributing significantly to the efficiency of the overall healthcare ecosystem.

A pivotal aspect of MaNTrA's impact lies in its introduction of a digital process, aiming to replace manual record-keeping with a user-friendly mobile and web based data entry application. Information and Communication Technology (ICT) play a key role in enabling real-time data capture, analysis, and feedback mechanisms, resulting in a notable enhancement of service quality within the healthcare sector. MaNTrA represents a transformative leap towards a more technologically advanced and efficient healthcare delivery system, offering benefits not only in terms of process optimization but also in contributing to improved overall service quality and patient outcomes.

11.What is the change/ Transformation?

The pivotal transformation from manual record-keeping to the digital system, known as MaNTrA, represents a significant leap forward in enhancing the landscape of maternal and newborn healthcare. The manual process, where Staff Nurses filled registers after the mother's discharge, led to a lack of real-time data availability, hindering effective monitoring and decision-making. Additionally, the manual birth registration process, relying on forms filled by data entry operators, often resulted in delayed and missed registrations.

The introduction of MaNTrA marked a paradigm shift in this scenario. All staff nurses now utilize the MaNTrA application to input details of delivered women, encompassing crucial information about delivery outcomes and newborns. Even in cases of mortality, pertinent details are promptly recorded in MaNTrA by staff nurses. The workload is distributed among multiple staff nurses, but the application ensures seamless sharing of information, providing them with real-time awareness of the current status.

A notable feature of MaNTrA is its integration with the Civil Registration System (CRS) portal for Birth Registration. This integration facilitates swift and efficient birth registration processes before the discharge of the mother from the labor room. The digital pre-filled Janani Suraksha Yojana (JSY) forms and discharge slips generated by the system further contribute to the overall efficiency of the healthcare process. This streamlined approach not only addresses the challenges of manual record-keeping but also accelerates vital administrative processes, fostering a more responsive and effective maternal and newborn healthcare

system. The transition to MaNTrA not only ensures real-time data availability but also significantly improves the overall efficiency and accuracy of healthcare practices, ultimately leading to enhanced decision-making and improved patient outcomes.

12.Implementation Processes

The implementation process was a multifaceted endeavor that encompassed several key components aimed at enhancing the efficiency and effectiveness of the healthcare system. One crucial aspect involved the digitization of information extracted from delivery registers. This transition from manual to digital recordkeeping was a fundamental step in modernizing the data management process within the healthcare framework. By doing so, the system gained the capability for real-time data capture, storage, and retrieval, enabling a more dynamic and responsive approach to maternal and newborn healthcare.

Capacity building emerged as another pivotal element of the implementation strategy. This comprehensive initiative aimed to empower all stakeholders, including staff nurses and administrators, with the necessary skills and knowledge to effectively navigate and utilize the new system. This not only facilitated a smoother transition to the digital platform but also ensured that all users were equipped to maximize the benefits of the MIS (Management Information System) across the 5547 delivery points.

The launch of the MIS across such an extensive network of delivery points signifies the scale and impact of the implementation. This widespread deployment aimed to bring the advantages of digitization and real-time data access to a broad spectrum of healthcare settings, ensuring that the benefits reached far and wide.

Ensuring seamless integration with other existing systems was a critical aspect of the implementation strategy. Coordination meetings were organized to facilitate the harmonious convergence of the newly implemented MIS with other systems such as the Civil Registration System, UPKSK, and the Safe Delivery App. This collaborative approach enabled comprehensive data sharing, fostering interoperability among different healthcare platforms. By integrating with these established systems, the MIS not only expanded its reach but also contributed to a more interconnected and streamlined healthcare ecosystem.

In summary, the implementation process was a well-thought-out and comprehensive initiative that involved the digitization of delivery registers, capacity building for stakeholders, and the extensive launch of the MIS across numerous delivery points. The emphasis on coordination meetings and integration with other healthcare systems showcased a strategic approach to ensuring the success and sustainability of the newly implemented digital framework.

13. Constraints and Challenges Faced and Overcome

The implementation process faced several challenges, each demanding careful consideration and strategic solutions. A primary challenge was the **need for capacity building**, emphasizing the necessity to equip stakeholders with the skills and knowledge required to effectively utilize the new system. To address this, a comprehensive training approach was adopted, combining both physical and online training sessions. These training initiatives aimed to empower users, including staff nurses and administrators, ensuring they were proficient in navigating and leveraging the capabilities of the new system.

Coordination with other departments emerged as another significant challenge in the implementation process. Successful integration required effective communication and collaboration among various departments within the healthcare system. To tackle this challenge, coordination meetings were organized, providing a platform for stakeholders to discuss and align their efforts. These meetings played a crucial role in fostering a unified approach and ensuring that all departments were on the same page regarding the implementation, minimizing potential conflicts and streamlining the integration process.

Integrating the new system with existing ones presented yet another layer of complexity. To overcome this challenge, a combination of approaches was employed. User manuals served as detailed guides, offering step-by-step instructions for users to navigate and integrate the new system seamlessly. Additionally, video tutorials provided visual aids, enhancing the learning experience and catering to different learning preferences. These resources collectively contributed to a smoother integration process, ensuring that the new system could effectively communicate and share data with existing systems.

In summary, the challenges in the implementation process, such as the need for capacity building, coordination with other departments, and integration with

existing systems, were systematically addressed through a variety of measures. Physical and online training, user manuals, video tutorials, and coordination meetings were strategically employed to ensure that stakeholders were well-prepared, communication channels were open, and the new system seamlessly integrated with the existing healthcare infrastructure. This comprehensive approach aimed to overcome hurdles and create a foundation for the successful adoption of the new system within the healthcare ecosystem.

14. Impact of the Project-Tangible/ Intangible (with data), Social Impact

Tangible Impacts:

a **Comprehensive Data Capture:** MaNTrA has successfully captured data from 90% of deliveries since its launch, indicating a significant improvement in the efficiency and coverage of data collection within the healthcare system.

b **Real-time Tracking:** The project enables real-time tracking of key service delivery parameters, ensuring that critical information is readily available for monitoring and decision-making processes.

c **Health Promotion Messages:** Over 17 lakh beneficiaries have received health promotion messages, indicating a tangible impact on community awareness and education about maternal and newborn health.

d **Automated Feedback Mechanism:** MaNTrA has implemented an automated feedback system, receiving valuable inputs from beneficiaries, thereby fostering a participatory approach and promoting user engagement.

Intangible Impacts:

(i) **Improved Service Quality:** The project has resulted in an intangible yet profound impact on service quality, fostering advancements in the overall healthcare delivery system.

(ii) **Increased Transparency:** MaNTrA has contributed to increased transparency within the healthcare system, ensuring that stakeholders have access to accurate and up-to-date information.

(iii) **Enhanced Responsiveness:** The project has enhanced responsiveness to beneficiaries' needs, indicating a positive shift in the healthcare system's ability to address and adapt to community requirements.

Clinical and Operational Impacts:

- **Monitoring delivery outcomes:** MaNTrA allows facility staff, program managers, and decision-makers to monitor delivery outcomes, maternal and newborn complications, and other clinical and staff performance related indicators. This supports clinical audits and informed decision making.
- **Perinatal, Maternal Mortality and Still birth Review:** The system facilitates the efficient review of perinatal mortality, maternal deaths and still birth review, contributing to a more informed and responsive healthcare approach.
- **Tracking Vaccination and Family Planning:** Service delivery parameters, including birth dose vaccinations and family planning methods, are tracked and improved with the help of MaNTrA, showcasing its versatility and impact on diverse healthcare aspects.
- **Community Tracking:** MaNTrA's line-list data of 3.2 lakh low-birth-weight newborns aids in community tracking, ensuring targeted interventions for vulnerable populations. We have integrated the application with e-kavach comprehensive primary healthcare application in a manner so that at the time of admission pregnant women data will be retrieved from e-kavach and at the time of discharging from Mantra application, all relevant information related to delivery, birth dose vaccination and new born birth registration will be sync back to community. By this mechanism we are able to maintain longitudinal health record for every pregnant woman.
- **Integrated Campaigns:** During campaigns like the Integrated Diarrhea Control Fortnight, MaNTrA-generated line-lists facilitated targeted visits to over 27,000 low birth weight babies, demonstrating the system's role in public health campaigns.
- **HMIS Reporting:** MaNTrA streamlines Health Management Information System (HMIS) reporting by providing readily available data elements within the application, 7 contributing to efficient reporting process.

Wider Stakeholder Engagement:

1. **Program Divisions and External Departments:** Different program divisions of the National Health Mission (NHM) and external departments like ICDS and the Department of Vital Statistics utilize MaNTrA data for monitoring various indicators, showcasing cross-departmental collaboration.

2. **Civil Registration System Integration:** The project has facilitated over 4 lakh birth registrations, and complete integration with the Civil Registration System is in its final stages, promising timely registration of all births and ensuring a robust vital statistics system.
3. **HR Mapping Portal:** The creation of an HR mapping portal within MaNTrA allows for the performance review of over 1,700 specialist service providers, contributing to workforce optimization and skill enhancement.
4. **Beneficiary Satisfaction Tracking:** The project actively tracks beneficiary satisfaction through SMS feedback links, sending health messages, and has sent over 4.4 lakh SMS to beneficiaries as of January 19, 2023.

In summary, the tangible and intangible impacts of MaNTrA extend beyond data capture and real-time tracking, encompassing enhanced service quality, transparency, and responsiveness. The project demonstrates its versatility by facilitating clinical and operational improvements, community tracking, and wider stakeholder engagement, contributing significantly to the advancement of maternal and newborn healthcare and the overall healthcare ecosystem.

15. Lessons Learnt

- **Importance of Capacity Building:**

  - Capacity building emerged as a cornerstone for successful implementation. Adequate training for stakeholders, including staff nurses and administrators, played a crucial role in ensuring the effective utilization of the new system.

  - Lessons highlight the necessity of investing in training programs to empower users with the skills and knowledge required for seamless adoption.

- **Stakeholder Coordination:**

  - Effective coordination among various stakeholders was identified as a critical success factor. The lessons underscore the need for seamless collaboration among different departments and entities within the healthcare system.

  - Coordination meetings were instrumental in aligning efforts, ensuring a unified approach, and minimizing potential conflicts during the implementation process.

- **User-Friendly Design:**

- The user-friendly design of the MaNTrA system significantly influenced its successful implementation. Lessons emphasize the importance of intuitive interfaces and functionalities that cater to the diverse needs and skills of users.
- A design that prioritizes ease of use fosters quicker adoption and acceptance among healthcare professionals, contributing to the overall success of the project.

- **Automated Feedback Mechanisms:**

- The implementation experience underscored the value of automated feedback mechanisms. Real-time feedback from users and beneficiaries not only enhances the user experience but also provides valuable insights for ongoing improvements.
- Lessons learned highlight the importance of integrating feedback loops to continuously refine and optimize the system based on user experiences and needs.

- **Real-Time Tracking:**

- Real-time tracking of key service delivery parameters emerged as a game-changer. The ability to monitor crucial indicators in real-time enhances decision-making and ensures a proactive response to emerging issues.
- Lessons stress the significance of incorporating real-time tracking features into healthcare systems for improved responsiveness and timely interventions.

- **Contributions to Sustained Success:**

- The lessons learned emphasize the long-term impact of automated feedback mechanisms and real-time tracking on sustained success. These features contribute not only to the initial success of the implementation but also to the ongoing efficiency of the system.
- Continuous monitoring and user feedback mechanisms are integral for adapting to evolving healthcare needs and maintaining a system's relevance over time.

In summary, the lessons learned from the implementation of MaNTrA highlight the pivotal role of capacity building, stakeholder coordination, and user-friendly design in successful project outcomes. Additionally, the incorporation of automated feedback mechanisms and real-time tracking emerged as key contributors to sustained success and the continuous improvement of the healthcare system. These insights provide valuable guidance for future projects aiming to enhance healthcare processes and outcomes.

16. Long Term Significance

- **Sustainable Design:**

- MaNTrA's sustainable design is a key aspect contributing to its long-term significance. The system is designed with scalability and adaptability in mind, allowing it to evolve alongside the changing needs of the healthcare landscape.

- Sustainability is ensured through regular updates, capacity building initiatives, and a commitment to staying current with technological advancements, ensuring the system's longevity and continued effectiveness.

- **Cost-Effectiveness:**

- The cost-effectiveness of MaNTrA is instrumental in its long-term significance. The digitalization of records eliminates the recurring costs associated with manual record-keeping, such as paper, printing, and storage.

- The initial investment in MANTRA translates into long-term cost savings, making it a financially viable solution for the public health sector.

- **Electronic Records for Data-Driven Decision-Making:**

- The adoption of electronic records marks a paradigm shift towards data-driven decision-making. MaNTrA 's ability to capture, store, and analyze data in real-time provides healthcare professionals and decision-makers with valuable insights into service delivery, patient outcomes, and operational efficiency.

- Data-driven decision-making enhances the effectiveness of public health interventions, enabling a proactive and informed approach to address emerging health challenges.

- **Integration with Existing Systems:**

- MaNTrA 's integration with existing systems is a strategic move that ensures continued relevance and efficiency in the public health sector. This integration avoids silos of information and fosters a cohesive healthcare ecosystem.

- Integration with systems such as the Civil Registration System (CRS) and other health-related databases enhances interoperability, allowing for a seamless exchange of information across different platforms.

- **Interoperability for Relevance:**

- The interoperability of MaNTrA with existing systems ensures its continued relevance in the dynamic healthcare environment. This feature enables the system to adapt to changing standards, protocols, and technologies.

- By staying interoperable, MaNTrA positions itself as a sustainable solution that can evolve with the ever-changing landscape of public health, maintaining its utility and effectiveness over the long term.

- **Enhanced Public Health Sector Efficiency:**

- MaNTrA's integration and data-driven approach contribute to enhanced efficiency in the public health sector. By streamlining processes, reducing manual efforts, and facilitating real-time data access, the system optimizes resource utilization and service delivery.

- The efficiency gains translate into improved healthcare outcomes, making MaNTrA a valuable asset for the long-term advancement of the public health sector.

In conclusion, MaNTrA's long-term significance is anchored in its sustainable and cost-effective design, the transformative shift towards electronic records, and strategic integration with existing systems. By fostering data-driven decision-making and ensuring continued relevance, MaNTrA emerges as a solution poised to contribute meaningfully to the enduring efficiency and effectiveness of the public health sector.

17. Future Roadmap

I. Expansion to Other States:

- A key component of MaNTrA's future roadmap involves expanding its implementation to other states. This expansion signifies the scalability and replicability of the system, indicating its potential to address healthcare challenges on a broader geographical scale.
- By extending MaNTrA to other states, the project aims to share its success and benefits with a larger population, contributing to the enhancement of maternal and newborn healthcare practices nationwide.

II. Enhanced Features for Sharing Digital Health Records:

- The future development of MaNTrA includes enhancing features for sharing digital health records directly with beneficiaries. This proactive approach aligns with the broader trend in healthcare towards patient centered care, empowering individuals with access to their own health information.
- Features for sharing digital health records contribute to increased transparency, patient engagement, and informed decision-making, fostering a more collaborative and participatory healthcare model.

III. Ongoing Coordination for Data Sharing Across Systems:

- Continuous coordination efforts for data sharing across systems represent a commitment to interoperability and a seamless exchange of information. Ongoing collaboration ensures that MaNTrA remains integrated with other relevant health systems, avoiding information silos.
- This aspect of the future roadmap emphasizes the importance of a connected and harmonized healthcare ecosystem, where data can flow seamlessly between different platforms for comprehensive decision-making.

IV. Replicability Across States:

- MaNTrA 's future success is linked to its replicability across states. The project's design and implementation model should be adaptable to diverse regional contexts and healthcare infrastructures.

- The replicability factor underscores the potential for other states to adopt and implement MaNTrA successfully, contributing to the standardization of efficient healthcare practices on a national scale.

V. Compliance with Ayushman Bharat Digital Mission (ABDM):

- MaNTrA's compliance with the Ayushman Bharat Digital Mission (ABDM) is a strategic alignment that ensures its relevance and success in the evolving digital healthcare landscape. ABDM sets standards for digital health initiatives in India, and MaNTrA's adherence positions it as a forward-looking and compliant solution.
- This compliance enhances MaNTrA's credibility and paves the way for continued support from national healthcare initiatives, reinforcing its role in the broader healthcare framework.

VI. Scalability for Future Success:

- MaNTrA 's scalability is a fundamental aspect of its future success. The ability to scale up operations and adapt to increasing demands ensures that the system can accommodate the evolving needs of a growing user base and healthcare landscape.
- Scalability is crucial for sustaining the impact of MaNTrA over time and maximizing its reach and effectiveness in diverse healthcare settings.

In summary, MaNTrA 's future roadmap envisions expansion to other states, enhanced features for sharing digital health records with beneficiaries, ongoing coordination for data sharing across systems, replicability across states, compliance with ABDM, and scalability for future success. These strategic initiatives position MaNTrA as a dynamic and adaptable solution, poised to make a lasting impact on maternal and newborn healthcare practices and digital health initiatives nationwide.

***

JJM-WQMIS (Jal Jeevan Mission - Water Quality Monitoring Information System)

By: Department of Drinking Water & Sanitation, Govt. of India

Abstract

The Jal Jeevan Mission Water Quality Monitoring Information System (JJM WQMIS) is a transformative initiative aimed at ensuring safe and sustainable drinking water supply to every rural household in India. JJM-WQMIS is an internet-based application designed for the analysis of water quality, which is consistently maintained and regularly checked to assess the standards of supplied drinking water. The data analytics integrated into JJM-WQMIS also play a crucial role in aiding proactive actions to prevent waterborne disease outbreaks. This concept note and case study provide an in-depth exploration of the project, with a particular focus on water quality and technology. It delves into the project's background, objectives, scope, implementation process, and the impact it has had on various stakeholders, emphasizing the pivotal role of Information and Communication Technology (ICT).

1. Project Background:

The Jal Jeevan Mission (JJM) is a flagship program of the Government of India, with the primary goal of providing potable water to all rural households. The vision of JJM is:

> *"Every rural household has drinking water supply in adequate quantity of prescribed quality (BIS: 10500) on regular and long-term basis at affordable service delivery charges leading to improvement in living standards of rural communities."*

Recognizing the significance of water quality in the context of public health, the mission aimed to ensure that the drinking water supplied to rural areas met the highest quality standards. The earlier water quality monitoring system faced significant challenges in terms of accuracy, efficiency, and coverage, necessitating a new approach that would leverage the potential of technology. Due to which Department of Drinking Water and Sanitation (DDWS) took the initiative and along with NIC developed an online tool for water testing, maintained, and regularly monitored for investigating and tracking the quality of drinking water supplied.

2. The Current (AS IS Process) and Critical Stakeholders:

The earlier water quality monitoring system relied on manual entry of collected water samples, laboratory testing, and data dissemination through conventional means. There was no record of remedial actions taken against the contaminated samples.

Critical stakeholders included rural communities, water supply personnel, laboratory technicians, and government authorities at various levels.

3. Problem areas and need for intervention:

- **Inaccurate Data:** The earlier system often yielded inaccurate data due to delays and human errors in sample collection and testing, leading to ineffective corrective actions.
- **Limited Coverage:** Many rural areas lacked access to water quality testing facilities, leaving communities vulnerable to waterborne diseases, and raising concerns about the lack of equitable access to clean drinking water.
- **Inaccessibility and shortage of water quality testing laboratories:** The challenge at hand revolved around the inaccessibility and scarcity of water quality testing laboratories, which posed a significant obstacle in ensuring the safety of drinking water in the affected areas. In numerous regions, especially rural and remote communities, access to proper water quality testing facilities was severely limited. This deficiency not only hindered the assessment of water quality but also compromised the ability to take timely and informed actions to safeguard public health.
- **Manual Delays:** Data dissemination and action on water quality issues were often delayed due to the manual nature of the process, leaving communities in the dark about the safety of their drinking water.
- **Lack of Community Awareness:** Rural communities had limited knowledge about the quality of the water they consumed, hindering their ability to make informed decisions regarding their health.

4. Objectives and Scope of Project:

The JJM WQMIS project aimed to:

- **Adherence to National and International Standards:** The project aimed to establish a robust water quality monitoring system that conformed to

both national and international standards. This not only bolstered data reliability but also facilitated global comparisons.

- **Equitable Access and Inclusivity:** Going beyond technological advancement, the project focused on ensuring equitable access to water quality monitoring for all rural areas in India. It was committed to leaving no community behind, regardless of its geographical location or economic status.
- **Community Empowerment:** The project sought to empower rural communities with in-time and easily accessible information about water quality. By imparting knowledge and skills, it enabled informed decisions and active community engagement in safeguarding their drinking water sources.
- **Timely and Proactive Responses:** A pivotal goal of the project was to establish a swift and efficient response mechanism. This early warning system aimed to detect water quality issues promptly, enabling rapid corrective actions and enhancing public confidence in the safety of their drinking water.
- **NABL Accreditation of Labs:** An integral part of the project involved obtaining National Accreditation Board for Testing and Calibration Laboratories (NABL) accreditation for water quality testing facilities. This accreditation ensured that the labs adhered to international quality standards, enhancing the reliability of water quality data.
- **Creation of New Labs and Infrastructure:** The project embarked on the establishment of new water quality testing laboratories in underserved areas. This included the creation of state-of-the-art infrastructure and procurement of cutting-edge equipment, further enhancing the capacity for water quality assessment.

5. The Redesigning Process and Role of ICT:

The redesigning process entailed a significant paradigm shift, where Information and Communication Technology (ICT) played a central role. A comprehensive suite of technological solutions was introduced, including mobile applications for water quality testing, cloud-based data storage, water quality testing facilities equipped with automated sensors, and a web-based platform for data dissemination and decision support.

ICT transformed the water quality monitoring landscape in rural India by automating processes, reducing human errors, and providing all the information

that was accessible to all stakeholders. The integration of technology not only increased the efficiency of data collection but also enhanced the accuracy of results, making the information more reliable for decision-makers.

6. What is Change/ Transformation:

The JJM WQMIS project brought about a transformative change by shifting from a manual, inefficient system to an automated, data-driven one. It transformed the water quality monitoring landscape in rural India, making it more accessible, transparent, and responsive. This transformation extended beyond just technology and encompassed a change in the mindset of stakeholders, a shift towards data-driven decision-making, and the empowerment of rural communities.

The key points summarizing the achievements and features of the JJM WQMIS:

- Trained women in water quality management are now available in the majority of villages, contributing to effective and localized monitoring.
- Water quality testing is being conducted in most villages, enhancing data accuracy and accessibility.
- Remedial actions in response to water quality issues have seen a significant increase, resulting in a proactive approach to maintaining safe drinking water.
- Household-level awareness has been heightened through the expansion of Field Test Kits (FTK) testing, enabling citizens to be more informed about their water sources.
- The project has successfully eliminated arsenic and fluoride contamination in previously affected habitation areas.
- Role-based access control ensures that information is managed securely and responsibly.
- The JJM WQMIS promotes public disclosure of water quality data, enhancing transparency and community engagement.
- Citizens can conveniently book water quality tests, ensuring easy access to monitoring services and contributing to the project's mission of providing clean and safe drinking water for all.

7. Implementation Process:

The implementation process was multifaceted and included several key components:

- Mobile Application Development: A user-friendly mobile application was developed for field personnel to collect water samples efficiently and accurately. This application ensured that samples were properly labelled, GPS-tagged, and sent to designated testing facilities in real-time.
- Water Quality Testing Facilities: State-of-the-art water quality testing facilities were established, equipped with automated sensors and cloud connectivity, enabling real- time data transmission.
- Capacity Building: Local personnel, including field technicians and community leaders, were provided with training to operate the new technology effectively and educate communities on its use.
- Web-Based Platform: A web-based platform was launched to disseminate water quality data in real-time. This platform allowed government authorities, community members, and concerned stakeholders to access and analyse data easily.
- Community Engagement: Extensive efforts were made to engage and educate rural communities about the importance of water quality and how to interpret the information provided by the JJM WQMIS.

8. Constraints and Challenges Faced and Overcome:

The implementation of ICT in rural areas posed unique challenges, including technological adoption, infrastructural limitations, and behaviour change among stakeholders. However, these challenges were addressed through innovative approaches:

- **Technology Adoption:** The project offered customized training programs tailored to the specific needs and capabilities of the local population. This helped bridge the digital divide and build the necessary skills for using the technology effectively.
- **Infrastructural Limitations:** Recognizing the need to extend the project's reach to every corner of the country, the challenge of bridging infrastructure gaps loomed large. The Department of Drinking Water and Sanitation (DDWS) in collaboration with the National Informatics Centre (NIC) conducted a comprehensive SWOT analysis to assess the situation. This strategic evaluation enabled them to identify the strengths, weaknesses, opportunities, and threats associated with the JJM-WQMIS project. Subsequently, they devised effective solutions to address the infrastructure

requirements, ensuring that the project could comprehensively cover all villages and deliver its benefits to rural communities.

- **Behaviour Change:** Overcoming resistance to change among stakeholders required continuous community engagement and awareness-building programs. These initiatives focused on the benefits of the new system, which included safer drinking water and improved public health.

9.Impact of the Project - Tangible/Intangible:

The JJM WQMIS project has yielded remarkable impacts:

Tangible Impact:

- Significant Improvement in Water Quality: The introduction of automated testing and in-time monitoring has led to a substantial improvement in water quality, reducing the incidence of waterborne diseases.
- Healthcare Savings: Fewer cases of waterborne diseases have resulted in reduced healthcare costs for rural communities and government agencies.
- Efficient Data Management: The project has streamlined data collection and management, making it easier for government authorities to take corrective actions swiftly.
- Empowerment of Rural Communities: Rural communities now have access to accurate information about the safety of their drinking water, empowering them to make informed decisions about their health.

Intangible Impact:

- Empowerment of Rural Communities: The project has empowered rural communities, instilling a sense of ownership and trust in government programs, as they witness tangible improvements in their daily lives.
- Data-Driven Decision-Making: The culture of data-driven decision-making has permeated government agencies, resulting in more efficient allocation of resources and improved service delivery.
- Community Awareness: The project has raised awareness about the importance of water quality, fostering a culture of vigilance and accountability among community members.
- Increased Trust in Technology: The successful integration of technology has increased trust in technology solutions for addressing critical issues in rural areas.

10. Lessons Learnt:

The JJM WQMIS project has provided several valuable lessons:

- Tailored Solutions: Technology adoption in rural areas requires solutions that are tailored to the local context and the capabilities of the population.
- Community Engagement: Engaging with and educating communities about the benefits of technology and data-driven decision-making are crucial components of successful implementation.
- Continuous Monitoring and Evaluation: Ongoing monitoring and evaluation are essential to ensure that the technology and processes remain effective and relevant.

11. Long-term Significance:

The JJM WQMIS project has profound long-term significance:

- Sustainable Water Supply: The project has laid the foundation for sustainable and safe drinking water supply in rural India, ensuring that communities have access to clean water for generations to come.
- ICT Integration in Public Service Delivery: It serves as a model for the integration of ICT in public service delivery, with potential applications in other sectors such as healthcare, education, and with other departments such as MoUHA and CGWB.
- Healthcare Savings: The reduction in waterborne diseases and associated healthcare costs will lead to significant long-term savings for both individuals and the government.
- Empowerment of Rural Communities: The project has empowered rural communities to take charge of their own health and well-being, fostering a sense of ownership and agency.

12. Future Roadmap:

The JJM WQMIS project's future roadmap is dynamic and multifaceted:

- Expansion of Coverage: The JJM WQMIS project is committed to an ongoing expansion, aiming to extend its coverage to the remotest corners

of India. Its goal is to ensure that no community is left without access to clean water. As part of this endeavor, the Central Ground Water Board (CGWB) laboratories have been onboarded onto the WQMIS platform, strengthening the project's capabilities to monitor and maintain water quality data.

- Urban Area Water Quality Monitoring: In a further step towards enhancing water quality monitoring, the system has been extended to the Ministry of Housing and Urban Affairs (MoHUA) for urban areas. This extension ensures that not only rural but also urban communities benefit from the advanced monitoring and data- driven decision making capabilities offered by the JJM-WQMIS. The project thus contributes to improving the overall water quality across diverse settings in India.
- Technological Refinement: Ongoing technological enhancements will ensure that the system remains up-to-date and effective.
- Predictive Analytics: The integration of predictive analytics will enable the anticipation of water quality issues, allowing for proactive interventions.
- Replication in Other Sectors: The success of the JJM WQMIS project can serve as a model for similar initiatives in other sectors to harness the power of ICT for social transformation.
- International Collaboration: The project's success has the potential to lead to international collaboration on water quality monitoring, benefiting not only India but also other countries facing similar challenges.

The JJM WQMIS project has not only improved the monitoring of quality of drinking water but has also transformed the way rural communities, governments, and stakeholders approach water quality monitoring and service delivery, making it a critical milestone in the journey towards a healthier, more empowered India, and a shining example of how technology can be harnessed to drive positive change on a national scale.

***

Apuni Sarkar-Information Technology Development Agency, Dehradun

By: Government of Uttarakhand

Unified portal for the delivery of citizen centric services in faceless, cashless & paperless manner

Abstract:
Apuni Sarkar is a unified portal developed by the Information Technology Development Agency (ITDA), Department of IT, and Government of Uttarakhand with the primary objective of revolutionizing service delivery for the citizens of Uttarakhand. This innovative platform is designed to offer citizen-centric services in a faceless, paperless, and cashless manner, ushering in a new era of efficiency, transparency, and convenience in public administration.
Apuni Sarkar represents a paradigm shift in the delivery of government services in Uttarakhand. By harnessing the power of technology and emphasizing faceless, paperless, and cashless transactions, it empowers citizens, enhances government efficiency, and strengthens the bond between the government and its people. This unified portal sets a benchmark for modern governance and serves as a model for other regions aspiring to provide efficient and citizen centric services.

1. Project Background:

Apuni Sarkar, launched in Uttarakhand as part of the 'Digital India' initiative, is a transformative effort led by the Hon'ble Chief Minister to modernize government processes. It aims to digitise traditional manual processes, making them more efficient, transparent, and user-friendly for Government-to-Citizen (G2C) and Government-to-Government (G2G) interactions. This digital transformation in Uttarakhand is designed to enhance citizen access to government services, reduce bureaucracy, and promote transparency, aligning with the broader vision of a digitally empowered India.

Integration and Collaboration:

Apuni Sarkar is deeply integrated with various government platforms and initiatives, including Digilocker, UMANG, CM Helpline 1905, WhatsApp, and

Single Sign on etc. This integration ensures seamless data exchange and collaboration across different sectors of governance.

2. The Current (AS IS Process) and the Critical Stakeholders

The current process involves several key elements:

Digitization and Automation: ITDA has been mandated to digitize and automate Uttarakhand Department's services. This has streamlined the application receiving and processing process, resulting in faster response times for both citizens and government officials. Manual paperwork has been replaced with digital solutions, reducing waiting periods and improving overall efficiency.

Officer Dashboards: Officer dashboards have been developed and provided to key authorities such as the Chief Secretary, Secretary, and Heads of Departments, along with the Uttarakhand Right to Service Commission. These dashboards enable real-time monitoring of service delivery to citizens. By tracking performance metrics effectively, departments can pinpoint areas for improvement and make data-driven decisions to enhance outcomes for citizens.

Complaint and Grievance Handling: An effective complaint and grievance handling mechanism has been implemented. Citizens can register their complaints related to service delivery through a dedicated helpline number. This system ensures that citizens' concerns are addressed promptly and transparently.

Service Delivery Channels: Services are made accessible to citizens through various modes, including a web portal, mobile applications (available on Android and iOS platforms), and individual logins. Additionally, citizens have the option to visit Common Service Centers (CSCs), EDC Centres, or contact the helpline number for assistance. Doorstep delivery services further enhance accessibility and convenience for citizens.

Critical Stakeholders

- Uttarakhand Citizens
- Uttarakhand Government Departments
- Information Technology Development Agency
- Uttarakhand Right to Service Commission

3. Problem areas and need for intervention

The Government of Uttarakhand recognized several critical challenges and gaps that served as the driving force behind the inception of the Apuni Sarkar initiative, aimed at creating a solution-oriented family registry to enhance governance efficiency. Some of the persistent issues that prompted this initiative included:

- **Inefficient Government Machinery**: The need for a more proactive approach by the government to reach out to intended beneficiaries efficiently was a key challenge. Apuni Sarkar sought to address this by streamlining service delivery.
- **Lack of Awareness:** Many citizens were unaware of the various government services available to them and the benefits they could avail. Apuni Sarkar aimed to bridge this awareness gap.
- **Real-Time Information**: In the face of sudden shocks and disaster management scenarios, the lack of real-time information was a significant hurdle in effectively administering benefits. Apuni Sarkar aimed to provide up-to-date data to facilitate quick responses during crisis.

4. Objectives and Scope of the Apuni Sarkar Project

The Apuni Sarkar project, spearheaded by the Information Technology Development Agency under the Department of Information technology, Government of Uttarakhand, has been conceptualized to revolutionize citizen services by creating a unified citizen centric portal. Apuni Sarkar, with the establishment of a unique citizen dashboard, aims to facilitate inclusive and proactive welfare service delivery by the government to its citizens. This integrated information system is designed to facilitate seamless information flow and management across various development sectors, including healthcare, education, and social security. The overarching goal is to eliminate

obstacles and conditions that hinder beneficiaries from accessing government benefits while enhancing the overall efficiency of the state and fostering better coordination among multiple departments responsible for administering these benefits.

5. The redesigned Process and the Role of ICT

Apuni Sarkar redesigned process leverages ICT at every stage, from citizen engagement and data management to eligibility determination, service delivery, monitoring, and anti-corruption measures. This comprehensive use of technology ensures that government services are efficient, transparent, and citizen-centric, aligning with the vision of Digital India.

6. What is the change/transformation?

The portal has significantly improved service aspects:

- **Processing Rate:** Increased from 43% to 98%
- **Timely Delivery**: Increased from 25% to 82%
- **Processing Time:** Decreased from 45 days to 9 days
- **Pendency Rate: Reduced** to 1%

7. Implementation Processes

The Apuni Sarkar portal is designed as an integrated solution with a decentralized architecture, following a structured approach in strict adherence to the Software Development Life Cycle (SDLC) framework. Throughout its development and management, the project heavily relies on the Agile Methodology, fostering constant collaboration with all key stakeholders and emphasizing continuous improvement at every stage, including Planning, Analysis, Design, Implementation, Testing, and Maintenance.

8. Constraints and Challenges Faced and Overcome

Challenges Faced	Before Initiative	After Initiative
Processing time	Processing time for an application was more than 30 days	Presently processing time for an application is 9 days

Service Delivery	Services were provided to the citizen in Offline Mode. 100 % Manual Services delivery.	End to end digitization of Service Delivery through web portal, mobile application Android & iOS. Presently,400 services are developed and integrated with 98 % Application processing rate
Transparency	Citizens were not able to track the status of their application	Application status can be tracked using the citizen dashboard.
Administrative burden	Managing Application Manually Keeping the details offline	Reduces manual intervention. Leverage automation and data management capabilities.
Service Delivery Channels	Citizens were visiti Government Offices to avail the services of Various departments. Due to hilly terrain, it was difficult for citizens in remote locations to reach the Government office and avail the services. Thus, taking time and cost.	Citizens can avail services through various channels like Web portal, mobile application (Android and iOS). Citizens can apply the services through individual mode, CSC and EDC centres.

9. Lessons Learnt

Bridging the Gap Post-Implementation: Even after services have been brought online through Apuni Sarkar, it's important to continuously assess and address any gaps in service delivery. Regular monitoring, feedback mechanisms, and a

commitment to improving the platform's functionality ensure that the benefits reach all citizens consistently

Capacity Building: To ensure that stakeholders and beneficiaries can make full use of Apuni Sarkar Portal, capacity building is crucial. This includes providing training and support to government officials, and service providers. Enhancing digital literacy empowers individuals to navigate the platform effectively and maximize its benefits.

Creating Awareness: It's essential to create awareness about the Apuni Sarkar initiative and its benefits among the target audience. Effective awareness campaigns can help citizens understand the services available to them and how to access them digitally. These campaigns should employ various communication channels to reach a wide audience.

10. Long Term Significance

Apuni Sarkar has demonstrated the government's capacity not only to enhance service delivery but also to embrace a data-driven approach in all its endeavors. This transformational initiative has the potential to revolutionize the government's interactions with all stakeholders, marking a shift from "Good Governance to Smart Governance.

11. Future Roadmap

- Emerging technologies like Artificial Intelligence, Block Chain etc.
- AI Integration
- Implement AI-driven chatbots that can provide personalized assistance to citizens navigating the portal. These chatbots can answer queries, guide users through processes, and offer real-time support, enhancing the user experience.
- Big Data Analytics
- Analyse user behaviour and interactions on the portal to gain insights into citizen preferences and service usage patterns. This data can help in optimizing the portal's design, content, and service offerings.

***

Water SCADA

By: Bhopal Smart City Development Corporation Limited

Abstract

Smart City Mission envisages creation of modern, IT based sustainable infrastructure that directly affects quality of life of the citizen. Water, Electricity, Sewerage, Traffic Management etc. are some of the key areas where use of technology can bring about perceptible change in quality of life, environmental conservation and savings to the local Municipal Corporation/Public Utility. With this in mind projects related to the above domains have been planned for implementation by the Bhopal smart City Development Corporation Ltd.

1. Project Background

Geographical & Demographic Spread

About Bhopal City:

Situated in Madhya Pradesh the State Capital Bhopal has an affluent and varied historical backdrop. The city is located north of the gorgeous Vindhya Mountain range and creates a periphery with its array of small hills. Bhopal today with its multifaceted profile is an interesting place to visit. Known as the City of Lakes, it is a pleasing blend of tranquility and harmony. Located on a gradient, the metropolitan has a coliseum like eminence, with a fair dash of serene gardens and lakes. As we come close to the city, titanic minarets and mosques can be seen posturing as an emblematic indication of Lake City. Bhopal has a widespread, well urbanized transportation network, which makes it reachable from diverse parts of the country. It is known to be one of the most developed cities in India. It is easier to travel to Bhopal in any transport, including railway, airways, and roadways. The flights to this city are regular and easy to take up. Besides, all of these transportation services are prominent and easily available across the country.

Bhopal is among the first 20 cities selected in the first round of smart cities challenge under Government of India's (GoI) smart cities mission (SCM) to implement the smart city proposal (SCP). In this context, Bhopal has

incorporated a special purpose vehicle (SPV) - Bhopal Smart City Development Corporation Limited (BSCDCL) (the “Authority”) to plan, design, implement, coordinate and monitor the smart city projects in Bhopal.

BSCDCL is a company incorporated under Indian Companies Act 2013 with equal shareholding from Madhya Pradesh Urban Development Company Limited (MPUDCL) on behalf of Government of Madhya Pradesh (GoMP) and Bhopal Municipal Corporation (BMC).

Bhopal Smart City Development Corporation Limited (BSCDCL) is planning 24x7 water supply for the project area of Bhopal city. The city has intermittent water supply and availability. However, it is setting targets and processes in place to try to improve its water supply. Bhopal Smart City Development Corporation Limited (BSCDCL) has planned to implement the existing Bhopal City Water Utility Management System (BWUMS) with GIS integrated Supervisory Control, Real Time Water Loss Detection System and Data Acquisition along with the centralized Control Centre.

2. The Current (AS IS Process) and the Critical Stakeholders

The Survey and analysis revealed that Water Supply to the city of Bhopal is primarily through 161 ESRs located all over the city. Water is pumped / distributed under gravity from one arterial line each from Narmada and Kolar treatment plants respectively and 12 small treatment plants drawing water from Bada Talab. Distribution in the city of and Water management of the City of Bhopal was done manually on the basis of thumb rules. The zone wise distribution engineers would be dependent on the concerned valve men for data (level / pressure etc.) on the basis of which decisions with respect to opening / closing of inlet and outlet were based. The critical stakeholders in this activity were 20 nos. AEs (each responsible for their respective zone / zones), 03 nos. Executive Engineers, 01 No. Superintending Engineer and 01 no Additional Municipal Commissioner (Water Supply) and of course the citizens of the city. There was no way for the senior management to intervene unless data was made available to them from the concerned AEs, which often led to gaps / delays in the system and crisis management was a normal occurrence.

3. Problem areas and need for intervention

Stakeholders in the Current Process

- Complete Reliance on Local manpower to Supply Water to Citizens
- No/Limited Maintenance of Records of Level, Operation Timings etc.
- Only Reactive Actions Possible as No Online Monitoring was Available
- No Level / Flow / Pressure Data available, Water Audit Not possible
- Distribution of water was ad hoc leading to Dissatisfaction
- Lack of agility in case of Overflow or Leakages
- Lack of Historic Data – Very Limited Planning for the future months.
- Problems (Faced by Stakeholders - Citizen)
- Kolar Line is one of the primary Arterial Line supplying to a number of ESRs
- The geographical terrain is such that ensuring water to ESRs at tail end / high head areas was perennial problem
- For Water to reach the topmost area / tail end a min Pressure of 5-6 Kg is Required
- To maintain this pressure valve have to be opened in a pattern such that Pressure does not go below threshold
- Valve men would often operate on their whims and there wasn't any effective monitoring system
- This leads to shortage of certain ESRs (especially at the tail end leading to grievances of the citizen receiving water from ESRs at the tail end of the network.

Problems (Faced by Stakeholders - BMC Engineers)

The city spread over 463 sq. kms has over 161 operational ESRs.
The ESRs are distributed over 22 zones each containing 6 to 10 ESRs.

On the basis of consumption pattern / availability etc. ESRs have specific timing for filing and distribution. Valve men would act according to their whims and hence problems would be realized only on escalation of crisis.
This would mean that there was no way for the BMC Engineers to get any advance warning of an impending crisis / water shortage in a particular area

4. Planning for the New Project / System and the Role of the Organization

The engineers of Bhopal Smart city along with the project consultant and the end user viz, Bhopal Municipal Corporation carried out a detailed survey of the Water distribution network and its management along with in depth analysis to identify gaps. Study of various technological advancements, to plug the gaps and provide cost effective and efficient solutions, was conducted and use of SCADA and IT along with relevant field instrumentation was finalized. On the basis of the above, tender was drafted and floated.

The basic concept was to provide a Real Time Monitoring & Control of Water Supply System for Optimum utilization of Water for the entire city of Bhopal spread over 463 sq.km. with an avg. daily water consumption of 450 MLD. The scope was restricted to monitoring and control up to primary distribution only (up to ESR level only).

5. Objectives and Scope of the Project

Equitable Distribution of Water – Maintaining LPCD (liters/capita/day) as per commitment. Water should be supplied to ESR depending upon the on the number of citizens it caters to. Water Availability as per consumption pattern / timing Schedule.

Water should be supplied to ESR depending upon the primary area it caters to.

Minimize Losses in Distribution Due to Overflow of Tanks

Overflow from tanks is a criminal wastage of expensive and precious resource

Ensure Effective Operation of Valves to avoid passing or partial Opening to maintain Optimum Head of Water in ESR

Critical to ensure water availability to the tail end of network / height head areas

- Study Consumption Pattern on yearly / seasonal basis
- Ensuring equitable rationing in case of anticipate shortages
- Anticipate Demand Availability Gap by study of data over a finite period of time

- Planning, both short term and long term with a view to temporary / permanent solution.
- Identify zone wise leakages / pilferage in the distribution network
- If water is supplied to a zone as per designated benchmark, but the citizens complain of shortage, corrective measures can be immediately initiated
- The redesigned Process and the Role of ICT
- Creation of Control and Command Centre with SCADA for Monitoring and Control of Water Supply
- Installation of PLC Based Control Panels with inbuilt GPRS modems for central monitoring and control
- Of Level, Pressure, Flow, Energy (Pumps)
- Automatic / remote Operation of critical valves
- Ultrasonic Level Sensor for level monitoring of ESRs, Pump Houses and Clear Water WTPs
- Pressure Sensors for Pressure Monitoring of inlet and outlet of Tanks, Pump delivery and WTP outlets;
- Flowmeters for flow rate and total flow Monitoring of inlet and outlet of Tanks, Pump delivery & WTP outlets.
- Mobile Apps for “ON THE GO” monitoring by Field Personnel – Cutting edge of SCADA System

6. What is the change / transformation?

Implementation has brought about certain distinct changes and transformation Flow from WTP indicates WTP efficiency i.e. Pure water discharge vis-a-vis WTP capacity.

Flow from PH i.e. Actual flow vis a vis rated flow of Pumps gives healthiness of pumps / availability of water in the sump etc.
Advance warning helps city engineers both with timely maintenance and making alternate arrangements to tide over the crisis OR reduce its impact by planning distribution on the basis of area wise LPCD requirement i.e. water cuts if any are not on ad-hoc basis.

Non-standard, need based operation of valves carried out remotely from SCADA control center. A handy feature for emergency operations if needed.

Water is now supplied to ESR depending upon the LPCD requirement of the area it caters to.

Ensures water availability to the tail end of network / high head areas.

7. Implementation Processes

The implementation involved two clear activities (as listed below), both of which needed the contractor to have domain knowledge related to water supply along with the use of IT in Water Supply. The implementation also required active support of the end user i.e. engineers of the water supply department of the Municipal Corporation to plan shut downs etc.

Field Work

- Installation of Electromagnetic flowmeters in existing lines, preferably such that the work is executed during no distribution hours.
- Installation on Pressure transmitters
- Installation of Ultrasonic level transmitters with proper calibration according to the tank height.
- Retrofitting of Electrical Actuators on existing Sluice Valves.

SCADA and IT work

- Creation of SCADA screens as per actual site and visualization requirement of the client.
- Creation of suitable soft keys for remote operation of electrically actuated valves
- Mapping water supply infra on GIS maps.
- User defined Reporting formats, alarms, alerts etc.
- Creation of a robust mobile app as per instruction of the end user.

8. Constraints and Challenges Faced and Overcome

The primary challenge in executing a Water SCADA system in a brownfield project i.e. existing functional water supply system in a bustling, capital city like Bhopal is to ensure work is executed without causing disruption in the standard water distribution pattern since the activity involves asking for shutdowns for installation of filed instruments.

The other major constraint was interacting with the electricity department to ensure availability of single phase / three phases supply from the electricity board.
Both the constraints were overcome by active involvement of engineers of BSCDCL and BMC. Care was also taken to carry out work during not distribution hours to minimize disruption if any.

9. Impact of the Project-Tangible / Intangible (with data), Social Impact

- The technical impact of the project has already been brought out in points F, G and H above. The project has had a massive impact in terms of savings achieved by the Bhopal Municipal Corporation as listed below.
- Annual saving of filtered water = 14000 ML amounting to financial saving of INR 2,30,00,000=00
- Annual financial saving on account of lower electricity consumption = INR 8,24,00,000=00
- Annual Savings of cost of Manpower = INR 1,30,00,000=00
- Approximate Annual Financial Saving = INR 11,84,00,000=00

Social Impact

- Successful implementation of the project has resulted in a definite reduction in complaints on account of manpower as brought out in the below example.
- Annual Grievance count prior to Implementation of SCADA(01.01.2022 to
  16.07.2022) = 1848 nos.
- Annual Grievance count prior to Implementation of SCADA (01.01.2023 to

16.07.2023) = 1366 nos.

- Reduction in number of complaints over a period of 6.5 months = 482 nos. i.e. 26%

10.Lessons Learnt

Application of technology by taking into account the points of view of all stakeholders can dramatically alter the landscape of any city. Judicious use of state-of-the-art instrumentation, Information technology, suitable communication methodology and creation of robust and powerful (but simple to use and understand) mobile apps and reporting has resulted in not only.

Two apparently insurmountable problems (Refer point D, problems faced by citizen and stakeholders) were overcome with a fair amount and ease a great success

11.SOLUTION ACHIEVED to problem faced by citizen (Shortage of water to ESRs at tail end)

One PLC/RTU Panel was installed at the main line to monitor pressure of water. The Pressure level and ESR filling data is available on Mobile App & Control room in Real Time. This allowed the concerned field person to pass on clear cut instructions of valve Opening/Closing. If pressure went below threshold some valves were closed and if went above some were opened. Any non-compliance was immediately noted and acted upon. Active cooperation between the user (BMC) and SCADA vendor successfully resolved a major Pain Point.

SOLUTION ACHIEVED – problem faced by BMC engineers -(no warning of impending crisis)

ESR filling data is available on Mobile App & Control room in Real Time. This allowed the concerned field person to clamp down on non-compliance Active cooperation between the user (BMC) and SCADA vendor successfully resolved a major pain point.

12. Long Term Significance

In an era of water shortages, use of technology to ensure large savings in potable water, consistently – year on year is worth its weight in GOLD. Add to this the associated savings in energy makes this system a long- term investment of immeasurable value.

13. Future Roadmap

As mentioned earlier in Point E – the scope of work under this project was restricted up to the primary distribution system only – i.e. up to ESRs. However, the PLC Panels and SCADA has been selected such all future integration can be achieved seamlessly. They way forward would be to add on to this system so as to get an end to end i.e. Raw Water to user level monitoring, control and automatic billing system. The primary additions that can be considered to achieve fully advanced and remotely monitored water supply system are

Water Quality Monitoring at key points

- Automated filtration process
- Key point Flow monitoring all over the city (for bulk water audit)
- Metering at end points (can be planned for commercial complexes, institutes, factories and other bulk users to begin with and extend it to each residence in the city phase).

***

Jan Sahayata Koshang: A Public Grievance Management System

By: District Administration, West Singhbhum

Abstract

Jan Sahayata Koshang is a public grievance management portal aimed at making district administration more approachable to the people by ensuring time bound resolution of issues which is achieved through continuous monitoring. The grievances are registered through phone call, WhatsApp, social media, e-mail, letters etc. which are then allocated to the concerned departments for resolution by a dedicated team of grievance managers. The portal allows transparent tracking of the complaint status during the complete cycle of the complaint resolution. The concerned department resolves the complaint and uploads the documents supporting the resolution. Hereafter, the complainant is asked about his/her satisfaction before the closure of the complaint. In the event of the complainant being unsatisfied with the resolution, the complaint is re-allocated to the concerned department. The portal also offers a variety of features to make grievance management easier such as multiple allocations of the same complaint to different departments are possible so that the different issues highlighted in it can be addressed appropriately by each department. A feedback rating system has been implemented for the complainant to rate his/her satisfaction with the resolution process.

Online tracking of Grievance Cycle is possible with transparent updates of complaint registration, allocation, resolution and closure which are communicated to the complainant by the grievance managers.

Technical Closure to handle complaints not within the domain of the district administration. User Friendly Mobile Application for government officials for easier accessibility.

Overall, Jan Sahayata Koshang employs technology to ensure transparency and accountability in administration while upholding the Citizen First approach of governance.

1. Project Background

Jan Sahayata Koshang was conceptualized as a solution to address the demands of a geographically and demographically unique district. The large

area of the district (5291 sq km), its difficult terrain and its scattered population settlements make it difficult for people to access the district headquarters for grievance resolution. Hence a dedicated online grievance management system with the option of registering complaints through multiple sources like mobile phones, social media was set up to make grievance management easier.

2. Problem Areas and Need for Intervention

Jan Sahayata Koshang aims to address the following problem areas in the governance of the district.

Peculiarity of West Singhbhum

- **Largest District of the State** – West Singhbhum is the largest district of Jharkhand which spans around 5291 sq km which made the district headquarters nearly inaccessible for people belonging to far off areas of the district. For instance, Manoharpur block of the district is around 130 sq km from the district headquarters.
- **Difficult Terrain** – Around 46.6% of the district is covered with forests which again made it difficult for people to access the district headquarters for the resolution of their complaints.
- **Left Wing Extremism** – The presence of LWE in the district again accentuates the same problem. Jan Sahayata Koshang has helped erode these distances, using technology as an effective and long-lasting solution to register these grievances.

Tribal Population – West Singhbhum is a tribal dominant district. Around 67.2% of the total population of the district comprises tribals. Usually, this segment of the population is hesitant in putting up their demands or grievances for resolution. Jan Sahayata Koshang was seen as an effective way to make this process smoother to cater to the special needs of the tribal population.

- **Loss of Time and Money** – The high travelling costs and significant loss of time in travelling and waiting made it difficult for people to access the highest officials in the district for complaint resolution. This meant that

people were left at the mercy of the subordinate and local level functionaries who were apathetic to their demands.

- **Uncertainty in Availability of Officials** – The multifarious work profile and various engagements of the officials sometimes made it difficult for the people to access them and place their grievances before them for resolution.
- **Lack of a Monitoring System** – The lack of a centralized monitoring system to track the real-time pendency of complaints made the departments lethargic towards timely grievance resolution.
- **No Emphasis on Beneficiary Satisfaction** – There was no mechanism in place to record the satisfaction of the complainants. Hence, departments stressed more on complaint closure than its effective resolution to the complete satisfaction of the beneficiaries.

  The special needs of the district and the deficiencies in the traditional governance processes prompted the need for this intervention.

3. Planning for the New Project

The District E-Governance Society (DeGS) was approached to conduct the Requirement Analysis of the different stakeholders of the project. Extensive meetings were conducted with different departments and Project Monitoring Unit (PMU) fellows of the district to comprehend the needs of the public, district administration and the monitoring team. A specialized agency was consequently empaneled for the development of the portal based on these requirements.

4. Objectives and Scope

Jan Sahayata Koshang was developed to fulfil the following key objectives

- **Ease of Accessibility** – The portal would save the precious time and high travelling costs for public, increasing public access to governance.

- **Transparency in Administration** – The portal would allow effective tracking of the resolution status of grievances facilitating transparency in governance.

- **Accountability in Governance** – Weekly follow-ups and regular tracking of grievances through the portal would bring accountability in the government systems and processes.
- **Combating Digital Illiteracy and Language Barrier**– Multiple mediums for registration of complaints – phone, letters etc. would be more suitable for a population who lacks the technical know-how of operating a portal. Also, the majority population of the district speaks local languages like Ho, Mundari etc. The availability of these mediums of complaint registration facilitates their access to administration as well.
- **Citizen Centric Governance** – The feedback mechanism of the portal would uphold the "citizen first" approach to governance.

The portal is maintained at the district level. The portal covers all the sectional offices at the district level and the key posts at the block level. In its present form, the portal caters to grievances related to 146 offices.

5. The redesigned process and the Role of ICT

The offline method of grievance redressal was modified with the introduction of the Jan Sahayata Koshang and certain changes were introduced in the following processes.

Complaint Registration

The complaints can now be registered through multiple mediums – phone, letters, mail, and social media etc. which are then drafted as a digital application in the portal for efficient tracking.

Complaint Allocation

The portal allows the allocation of grievances to multiple departments at the same time facilitating inter-departmental convergence which is very difficult to establish in a conventional government set-up.

Complaint Monitoring

The complaint status is visible transparently on the portal. Also, the number of pending complaints and the resolution time can be tracked at the portal allowing for an effective follow-up.

Complaint Closure

There was no system of incorporating the satisfaction of beneficiaries in the earlier system of grievance redressal. This system involves a feedback mechanism to ensure that complaints are closed based on a user's satisfaction with the resolution process. The incorporation of e-technology is the foundation of this project. The use of a web application for registration and monitoring of grievances has smoothened the resolution process. The software allows the transparent tracking of the resolution cycle which helps in effective monitoring.

The Data Analytics Dashboard of the portal facilitates in analyzing the

Complaint Source – This helps monitor the frequency of complaints from various sources to understand the medium of complaint which is most frequently being utilized.

Resolution Time – The Master Sheet categories the complaints into 4 categories as per pendency -

< 7 Days
7 – 14 Days
14 – 21 Days
> 21 Days

This helps in effective follow-up of complaints which are pending for more than 7 days which effectively ensures accountability of officials.

6. Implementation Processes

The empaneled agency created the beta version of the portal. Consequently, feedback from different departments was taken and their suggested changes were incorporated into the portal. It was felt that a dedicated and independent team would be more effective as an intermediary between the District Administration and the public for the process of registration, transparent tracking and regular follow-up of grievances. Hence, an MoU was concluded with the Piramal Foundation to set up a team of dedicated grievance managers who were then provided comprehensive training to make them familiar with

the government set-up and the portal. A public help desk was created to facilitate the daily operations of these grievance managers. After this process, the dashboard was launched, and an extensive awareness generation drive was organized in the district to familiarize people with this intervention. A weekly follow-up system was set up by the Deputy Commissioner to review the status of the pendency and resolution.

7. Constraints and Challenges Faced and Overcome

- **Ensuring Familiarity with Digital Processes among the Officials** – The officials at the district and block level had to be trained with the usage of the portal. A detailed training was conducted with the help of the DeGS and the empaneled agency to train the various offices to effectively use the portal for complaint resolution.

- **Ensuring Understanding of the Government set-up in the Grievance Managers** – The team of fellows trained by the Piramal Foundation were unfamiliar with the government set-up and the processes which could lead to issues in the complaint allocation and closure process. Dedicated training was provided to them to close this knowledge gap. Also, handholding support by the district administration officials was provided to them, in the initial phase of the project.

- **Awareness Generation in Public** - The awareness about the portal was low in the initial phase of the project. Dedicated awareness drives were conducted to spread awareness with the help of the district PRD Team, Piramal Foundation and the local Civil Society Organizations.

- **Ensuring Strict Monitoring** – A strict follow-up system was necessary to impose accountability of officers. Hence, a system of weekly meetings under the chairmanship of the Deputy Commissioner was set up.

- **Handling of Complaints not in the Domain of the District Administration** – Some complaints registered on the portal due to their nature could not be resolved at the district level. A system of Technical Closure was provided to handle these complaints.

8. Impact of the Project -Tangible/Intangible/Social Impact

- **Increased Usage** - More than 5000 complaints have been registered and resolved from the time the portal went live i.e. a year back.
- **Faster Resolution -** Around 60-70% of the complaints are being resolved within a week.
- **Increased Accountability of Officials** – The complaint resolution is being taken up on priority due to a weekly system of meetings and follow-ups.
- **Increased Beneficiary Satisfaction** – The compulsion of incorporating beneficiary's feedback before complaint closure has increased their say in the resolution process increasing their satisfaction.
- **Saving Time and Cost of Travel to District Headquarters** – An easier system of complaint registration and monitoring has reduced the need to travel to District Headquarters for grievance registration.
- **Better Complaint Management –** An online, centralized database of complaints ensures better management and access to complaints. This database also serves as a useful repository for the new officers of the district to understand the government processes.
- **Removal of Language Barrier** – The Grievance Managers are trained in local languages hence they help applicants not well versed with English/Hindi in drafting their application on the portal as well as efficiently communicate to them the outcome of the complaint resolution.

9. Lessons Learnt

An online system of grievance management with dedicated follow-up would serve as an effective way to resolve complaints timely and increase accessibility of administration to the public, which this project has implemented. Also, a grievance portal open to the public may not be suited for a digitally unaware population who will find the online system of complaint registration to be tedious. Rather, registration of complaints through letters, mobile phone, WhatsApp or social media would be easier for any complainant as these mediums are easy to use and are being utilised by people daily. This portal has also helped create a dedicated system of grievance management which has also made administration a lot easier than before.

10. Long Term Significance:

The portal holds a long-term significance as the complete system of grievance management could be made online in the future which would reduce the need for physical meetings and Janta Durbars which are tedious and costly for people.

11. Future Roadmap

Many updates have been planned. In the future, the system of complaint registration may be made public for direct registration of the complaints on the portal. Also, dedicated independent public help desks may also be set up at the block level so that all complaints received at block offices are routed through the portal. This will also help in building a comprehensive database of complaints which may be utilised to understand the dominant nature of the complaints to identify the focus areas of the district. There are plans to include all the offices of the district and all the complaints reaching these offices within the ambit of the portal to utilize this portal as a dedicated system for grievance handling.

***

LUCKY BILL APP

By: Kerala University of Digital Sciences, Innovation and Technology (Digital University Kerala)

Abstract

The "Lucky Bill App" is an AI-based Android Mobile Application that allows consumers to upload images of invoices/bills from shops to this mobile app. Through this, they can participate in lucky draws and win exclusive prizes. The App also provides a "Bill Locker" facility, like "Digi Locker," through which consumers can upload and keep their bills secured for future use, like claiming warranty, service complaints, etc. The App substitutes the legal process of 'Test Purchase' conducted by Tax officers to check Invoice details by visiting the shops and allows consumers to play this role through the Lucky Bill App. This also creates an awareness among consumers to 'Ask for Bills.' The data collected using OCR technology (Optical character reading technology using machine learning) is used as external data for analysis (using machine learning) to identify tax evasions or anomalies and ensure the tax compliance of taxpayers.

1. Project Background

Retail Sales or B2C (Business to Consumer) trade is the major value addition point in the GST tax structure. Due to practical difficulties in covering the varied nature of transactions, B2C continues to be the grey area in tax compliance, like many taxpayers are not issuing invoices or not issuing properly in correct tax rates or not remitting collected tax to the GST department, etc. By collecting sample data of B2C transactions, the tax administration will be able to monitor compliances more efficiently. Many consumers are also not asking for bills for taxes paid by them because they are not incentivized to collect bills in B2C transactions.

2. The current (As Is Process) and the critical stakeholders

The administrative option with the department is to collect bills/invoices through the test purchase process or through market intelligence. This will

require manpower deployment, logistics arrangement, money for test purchases, etc. In many cases, the process may lead to traders' protests. More than that, the invoices or bills collected are to be entered into the system for cross-verification.

From a Consumer angle, most traders are issuing invoices in papers with thermal print ink, which will disappear in a week. This creates many troubles for them in getting a warranty, filing service complaints, etc. They are also concerned about whether the tax money they have paid to the trader will reach the government correctly or not.

The critical stakeholders are the following:

- Consumers.
- State Government.
- Central Government.
- Tax officials.
- Taxpayers i.e. Shops/Traders/Sellers.

3. Problem areas and need for Intervention

B2C continues to be the grey area in tax compliance like many taxpayers are not issuing invoices or not issuing bills properly with correct tax rates or not remitting collected tax; some taxpayers are collecting taxes illegally even if they don’t have the right to collect taxes since they have registered as “Composite Taxpayers,” etc.

Many consumers are also not asking for bills for taxes paid by them because they are not incentivized to collect bills in B2C transactions.
The test purchase process or market intelligence requires manpower deployment, logistics arrangement, money for test purchase, etc.
In many cases, the test purchase process leads to trade protests.
The invoices or bills collected through test purchases or market intelligence will be keyed into the system for cross-verification.

The scope of the data analysis with currently available GSTR Returns/E-way data is very limited since all these data are provided by Taxpayers, so GST department cannot completely trust the Taxpayer's filed data. It would be required to collect actual invoices directly from the consumers/sellers for accurate verifications.

4. Planning for the new Project/System and role of the organization:

The Lucky Bill Mobile Application is designed and developed by the Digital University Kerala; this research project encompasses a wide range of aspects, including technology, user experience, data analysis, and compliance. To address these diverse areas, a combination of research methodologies was employed, ensuring a comprehensive and insightful study.

The Project is a part of the Big Data Analytics Project for the Kerala GST Department, developed based on a Memorandum of Understanding (MoU) where the Business Problems and System Processes were documented. The Application is Security Audited/Certified and placed in Google Play Store.

5. Objectives and scope of the project:

Traditionally, the GST department is deploying tax officials to the field to conduct test purchase activity in shops and to collect information about invoices/bills issued by taxpayers. This activity is even though very critical for collecting market intelligence, it has several limitations due to manpower availability, time, cost of logistics arrangements, protest from traders, subjectivity of officials, etc.

Through the Lucky Bill App, consumers are empowered to collect and upload invoices/bills, thus re-engineering an officer-centric process to a completely citizen-driven process using technology like Optical Character Recognition and Machine Learning.

The mobile app will read/scan by the app using Optical Character Recognition (OCR), and the details of GSTN, Invoice Number, Invoice Date, and Invoice Amount will be captured by the system automatically. The Mobile App has a machine learning algorithm to identify valid GST invoices and to capture the data.

By leveraging machine learning technologies to automate the process of capturing sales details from bill images, real-time monitoring of business transactions becomes possible for GST Officials. This fosters a sense of accountability among businesses and serves as a deterrent against fraudulent practices. As a result, citizens can place their trust in the GST System, knowing that their transactions and taxes paid to the seller are accurately recorded and accounted for. Consumers are also incentivized to upload bills through lucky draws conducted using an algorithm, and consumers are informed through SMS and App notifications.

Through the Lucky Bill app, citizens are encouraged to request bills for their purchases. This practice promotes transparency in business transactions and reduces the likelihood of tax evasion. Citizens can now participate actively in maintaining a formal economy. This also creates an awareness among consumers to 'Ask for Bills', which makes them responsible citizens for supporting the growth of the country by participating in efforts of the government to collect revenue.

The App also provides a "Bill Locker" facility, like "Digi Locker," through which consumers can upload and keep their bills secured for future use, like claiming warranty, service complaints, etc. This will help reduce consumer complaints filed before the Consumer Redressal Forums in the country. The data collected using OCR is used as external data for ensuring tax compliance of taxpayers by the department. This will help in identifying collection of tax without authority to do so or collecting more than permitted, non-remittance of collected tax, etc.

As the research and development of the App evolves, the Lucky Bill app has the potential to integrate advanced features that will further enhance the benefits for consumers. With the implementation of AI technology, users will gain the ability to identify potentially illegal tax collections. For instance, when scanning a bill, the app will notify users if a restaurant owner attempts to collect taxes through the bills if the restaurant is registered as a "Composite taxpayer" type in the GST system, which means they are not authorized to collect any taxes from consumers. This level of transparency ensures that citizens are protected from unknowingly paying illegal taxes and promotes fair and ethical business practices.

6. The redefined process and the role of ICT:

Information and Communication Technology (ICT) plays a crucial role in various aspects of the "Lucky Bill" research project. ICT is leveraged to create an innovative and efficient system that addresses tax compliance and revenue generation challenges. The following are the details of how ICT is used in the research proposal:

Digital Bill Locker Facility: ICT is employed to develop the Bill Locker feature in the Lucky Bill App. This facility allows users to store and manage their bills digitally, eliminating the need for physical documentation. The ICT infrastructure ensures secure and reliable storage of bill data, making it easily accessible to users whenever required.

Automation of Bill Data Capture: ICT, particularly machine learning and image processing technologies, is utilized to automate the process of capturing sales details from bill images. This automation significantly reduces manual effort and speeds up the bill upload process. Machine learning algorithms enable accurate data extraction from the bill images, enhancing the overall efficiency and user experience of the app/the system.

AI-based Tax Analytics: ICT is integral in developing the AI-based analytical platform for tax data analysis. Advanced data analytics techniques, powered by AI algorithms, are employed to identify tax evasion cases and trade anomalies. The platform leverages large datasets collected through the app to generate insights for tax authorities, enabling better decision-making and revenue enhancement.

User Engagement and Feedback: ICT tools, such as 360° User Feedback mechanisms within the app, are utilized to gather insights from users, tax authorities, and other stakeholders. The collected data is then processed and analyzed using ICT tools to understand user expectations, pain points, and preferences. This feedback loop aids in continuous improvement and refining the app's features.

Lucky Bill Control-Panel: ICT enables real-time monitoring of business transactions through the control panel interface system. The system can identify discrepancies and fraudulent activities promptly, help on further

investigation by tax authorities. This real-time monitoring ensures timely action and enhances compliance.

Automated Lucky Draw System: The Automated Lucky Draw System is a technological solution that utilizes ICT to automate the process of selecting bills/winners in a randomized manner without any manual intervention for a lucky draw.

Cloud Infrastructure: ICT plays a significant role in providing the necessary cloud infrastructure for data storage, processing, and scalability. Cloud technologies facilitate seamless access to data from different devices and locations, making the app user-friendly and accessible. The Lucky Bill System is highly scalable. It can handle a large number of participants, Bill uploads, Parallel Analysis of Bills and conduct multiple lucky draws simultaneously, making it suitable for events with a vast audience.

Mobile App Development: The entire research proposal revolves around the development of the "Lucky Bill" mobile application using the advanced AI technologies. ICT is at the core of creating a machine learning based user friendly interface, seamless data exchange, and secure transactions within the app.

In summary, ICT forms the backbone of the "Lucky Bill" research project, enabling the development of an efficient, data-driven, and user-centric system for tax compliance and revenue generation. The integration of ICT tools and technologies empowers citizens, tax authorities, and governments with valuable resources to create a formal and transparent tax ecosystem.

Through the Lucky Bill App, consumers are empowered to collect bills/invoices and upload them in the App. Since they are incentivized in the form of rewards of Cash prizes, and Gift Packets, they will be motivated to collect and upload the bills. An amount of 5 Crore was the Prize Money for 2022-23 for distribution to winners.

The Lucky Bill App provides the department with lakhs of invoice data with GSTIN, Invoice Number, Invoice Date, and Amount, which is impossible to collect through official channels. This will be very useful for cross-verification of self-declared figures reported by the taxpayers in their returns. The

department found many cases of illegal tax collection and non-remittance of tax using this database.

The entire administrative process of 'Test Purchase' by tax officials is replaced with bill uploading by Consumers. Thus, this process saves 100% of the time and effort of tax officials in performing test purchases and market intelligence for collecting bill details. The number of bills collected through the Lucky Bill App in 6 months is 10 lakhs, whereas the same in manual mode for the previous period was nearly 5000. Thus, the savings in terms of cost and time were 100%, and the app has a snowball effect in terms of output.

Since the bills uploaded are validated by an independent user with a registered mobile number, it will give evidence for proceeding against a taxpayer in cases where tax evasion is noticed. Whereas in the officer-centric process, the independent witness was lacking, and subjectivity was high, resulting in the protest of traders. The consumers are also taken into confidence that the tax amount they are paying is reaching the government through returns filed by the taxpayers, and they are supporting the government as a responsible citizen.

7. What is the change/transformation?

Traditionally, the GST department is deploying tax officials to the field to conduct test purchase activity in shops and to collect information about invoices/bills issued by taxpayers. This activity, even though very critical for collecting market intelligence, has several limitations due to manpower availability, time, cost of logistics arrangements, protests from traders, the subjectivity of officials, etc.

Through the Lucky Bill App, consumers are empowered to collect and upload invoices/bills, thus re-engineering an officer-centric process to a completely citizen-driven process using technology like Optical Character Recognition and Machine Learning. The mobile app will read/scan by the app using Optical Character Recognition (OCR and ML technologies), and the details of GSTN, Invoice Number, Invoice Date, and Invoice Amount will be captured by the system automatically. The Mobile App has a machine learning algorithm to identify valid GST invoices and to capture the data.

Consumers are also incentivized to upload bills through lucky draws conducted using an algorithm, and consumers are informed through SMS and App notifications.

Implementation Processes:

The project was declared in February 2022 by the Hon'ble Finance Minister of Kerala, Sri. K.N. Balagopal in his Budget Speech. The Digital University Kerala designed and developed the App along with the analytical systems and deployed it on the cloud environment on 16th August 2022 by the Hon'ble Chief Minister of Kerala, Sri. Pinarayi Vijayan.

8. Constraints and challenges faced and overcome:

The major challenge faced is creating an App with the facility to read data available in invoices/bills, having different formats. The Machine learning algorithms were used to learn the system to handle most of the scenarios. The next challenge was in reaching out to the general public and prompting them to upload invoices. For this, the GST department initiated a public relations campaign using various media like Print, FM Radio, T.V., Social media, etc.

9. Impact of the Project - tangible/intangible (with data), social impact:

To Citizens:

They can act as a responsible citizen for supporting the revenue efforts of State and Central Governments. Using the Bill locker facility, they were able to keep track of bills received and used for future use like warranty, service calls, etc., saving a lot of time and cost.

To Officials:

Since 100% of bill collection work is taken care of by the App, the officers can concentrate on utilizing the data collected in the App for revenue generation purposes.

To State/Central government:

100% savings in officer deployments for test purchases and market intelligence. The data collected through the App is nearly 10 lakhs in the first six months, which would not be possible through official machinery; if tried, it would have cost crores of rupees. Since the data is collected from invoice images using OCR, it provides an instant ground for cross-verification for tax evasion. The GST department was able to detect several cases of tax evasion using this external data.

To Taxpayers/Shops:

The taxpayers issuing proper invoices/bills are rewarded since they are customer base will increase as the consumers are incentivized to upload bills.

The following processes were eliminated:

- Approval process for conducting Test Purchase by Senior Official.
- Test Purchase process at Shops.
- Keying in information collected from Test Purchases or Market Intelligence into the system.

Impact on Women Empowerment/Tribal Communities:

As a result of the R&D of the “Lucky Bill” system, the app is implemented and deployed for the Kerala State GST department. Through the Lucky Bill App, consumers are incentivized in the form of rewards of Gift Packets/Cash rewards. To empower the women and tribal communities, the government is decided to deliver the household products from Kudumbasree (Kudumbashree is the poverty eradication and women empowerment program implemented by the State Poverty Eradication Mission (SPEM) of the Government of Kerala) and Vanasree (Vanasree’ is a novel initiative by the Forest and Wildlife department of Kerala to improve the livelihoods of tribal communities by facilitating the collection, processing, value addition and market access to the forest produce which has been traditionally collected from interiors of pristine evergreen forests) as a reward to the Lucky Bill winners, around 10000+ gift

packets (with more than 50000 forest/household items) are already processed; that could make so many direct or indirect jobs related to this.

10. Lessons learnt:

The Lucky Bill App has contributed to the growth of the economy:

From the Taxpayer's angle, the application promotes local sales within Kerala as the lucky bill prize scheme is designed to reward bills received for purchases from traders in Kerala.

Taxpayers registered with GST will get more business as Lucky Bill App indirectly promotes purchases from GST-registered taxpayers than unregistered dealers.

From the Consumer's angle, the consumers can win prizes worth Rs.5 Crore by uploading bills in the lucky bill app. This will positively impact the purchase pattern of consumers since they are incentivized to ask bills and collect bills. This increases taxpayers' compliance levels as they are informed about bill data reaching the GST department.

Awareness is created among the general public to 'Ask for Bills' through Lucky Bill App. Since the campaign is backed by prizes, it will have more attention from taxpayers.

B2C is the major point of value addition in GST tax structure. Even though compliance strategies like e-invoice were introduced for monitoring B2B transactions, due to practical difficulties in covering the varied nature of transactions, B2C continues to be the grey area in tax compliance. By collecting sample data of B2C transactions through the Lucky Bill App, the tax administration will be able to monitor compliances more efficiently. This data is used extensively for Investigation and Audit purposes, the only external data available with the tax administration for cross-verifying the self-assessed figures declared by a taxpayer. Several cases involving lakhs of rupees of tax evasion were detected using the Lucky Bill app data.

The department interventions, including major ones like Lucky Bill App, have achieved total GST revenue for 2022-23 of Rs. 29195.30 Cr with revenue

growth of 20.51% compared with the previous year. The GST revenue for 2023-24 up to August is Rs. 13073 Cr, which is 13.17% compared to the previous year.

11. Long-term significance:

Consumers replace the entire administrative process of 'Test Purchase' using tax officials with bill uploading. Thus, this process saves 100% of the time and effort of tax officials in performing test purchases and market intelligence for collecting bill details. The number of bills collected through the Lucky Bill App in 6 months is ten lakhs were as the same in manual mode for the previous period was nearly 5000. Thus, the savings in terms of cost and time were 100%, and the app has a snowball effect in terms of output.

12. Future Roadmap:

The department had showcased the App to other states and central for adoption. Based on the best practice learned from this project, many states like Uttarakhand, Tamil Nadu have adopted this model for implementation. The Centre has adopted the Lucky Bill App Model of Kerala and introduced a Mobile App named "Mera Bill Mera Adhikar" to promote asking for bills and uploading bills with a reward scheme w.e.f. 01.09.2023 in 7 states as a pilot run. The new version of the 'Lucky Bill App' will be launching soon with new features such as Referral Programs, point-based rewards for uploading quality bills (eg: verified GSTIN and Tax data), milestone-based rewards, enrolment of Volunteers with special rewards (Eg: School Students/College NSS, etc.), renewed app user interface and user experience, Report an incident feature (Eg: App will notify the user if there is any anomaly/unauthorized Tax collection on Bills while uploading the bill image to the Lucky Bill app), etc.

***

Percept Extended Detection & Response (XDR)

By: Sequretek IT Solutions Pvt. Ltd.

Abstract:

India is currently the fifth largest economy in the world. As per an article by Times of India, India will be amongst the Top 4 nations to spend heavily on Digital Transformation and Digital Initiatives, by end of 2023. Digital Transformation has been adopted by most of the organizations, either by choice or force (COVID-19 led Digital Transformation and Acceleration) and India is no exception to that!

Digital Penetration:
Increased Telecom, Internet, Smart phone & Data users

Technology Ability:
'Young India' stands ready and willing to take advantage of the technology

Adroitness with Global Economy:
Make in India and Startup India are big steps towards India's global aspirations

Breakout of COVID-19 Virus:
It forced most of the organizations to adapt to Digitization

With the advent of above, there has been a phenomenal growth in the number of cyberattacks on India. First, the increase post COVID-19 was of over 400%, and reports show that the situation is even more aggravated. According to an article by Mint, Maharashtra is one of the most targeted states constituting over 40% of cyber-attacks and needs to get themselves ready to combat against them.

Though Digital Technologies allow organizations to scale at a faster speed, they bring along vulnerabilities which could be easily exploited. A cyber-attack can directly impact the brand (pride) of State / Central Governments, result in data breach (sensitive information about the individuals, organizations and technology), and could hamper the operations of the organization (due to denial of services). This data can further be utilized to dig down personal information of the individuals, risk the life of individuals, and expose monetary records. In addition to the above risks, organizations also need to comply with the incident reporting guidelines by CERT-In, Reserve Bank of India (RBI), and the recent Digital Personal Data Protection Act 2023 (DPDPA).

Taking an example of Sequretek's project in the banking industry:

Banking industry experienced a huge surge in the number of cyber-attacks during 2018-19.

Some large attacks include 'Attack on India's 2nd largest co-operative bank – where 94 Crores were siphoned-off, an urban co-operative bank where 68 lakhs were stolen, a scheduled co-operative bank lost 29 Crores due to insider leak, and a very recent attack on Hyderabad based cooperative bank which lost 12 Crores & had an additional penalty exercised by the regulatory body.

As the banks directly had an impact (monetary), they became cautious and started procuring and implementing cyber-security products in their enterprise. This was limited to only the large organizations due to the hefty cybersecurity costs. The small-sized banks had no option but to struggle, resulting in a cyberattack and non-compliance by RBI.

Our project **'SauraQshan' with The Maharashtra State Co-operative Banks' Association, Mumbai (MSCBA),** focused on preventing cyber-attacks and noncompliance in the co-operative banking sector of Maharashtra. This sector was previously underserved due to its rural presence and lack of relevant skill set. 'SauraQshan' was an initiative to skillup this sector, protect them against increasing cyber-attacks and giving them out-of-the box compliance reports.

1. Project Background:

Cooperative banks in Maharashtra have a rich history of serving rural and urban communities, providing financial services to millions and keeping their investments protected. However, the increased digitization of banking operations has exposed them to cybersecurity threats, including data breaches, fraud, and cyberattacks. To address these challenges, a project was initiated to establish a state-of-the-art Percept XDR to monitor, detect, and respond to cyber threats effectively.

Project 'SauraQshan' consisted of various cyber awareness campaigns (by physically visiting regions like Aurangabad, Nashik, Karad, Kolhapur, Amravati, Pune and Mumbai), sharing posters, wallpapers, events for cyber awareness, offering 24/7 Cyber-security Monitoring and Management Service (SOC / Percept XDR) with compliance, at an affordable cost.

Sequretek today, supports over 30+ small and big co-operative banks in different parts of Maharashtra. Through this project, we protected these co-operative banks from over 378 probable cyber-attack attempts, out of which 140 were for the last 3 months.

This case study explores the transformation of cybersecurity operations center (SOC) / Extended Detection and Services (XDR) services for cooperative banks in the state of Maharashtra, India.

Cooperative banks play a vital role in the region's financial landscape, making them attractive targets for cyber threats. The study sheds light on how a comprehensive SOC upgrade initiative helped mitigate cybersecurity risks, enhance operational efficiency, and safeguard the sensitive financial data of these banks while making them compliant with RBI regulations.

2. Current Process & Stakeholders:

The existing cybersecurity framework in cooperative banks faced several challenges. The typical cooperative bank in Maharashtra had a rudimentary approach to cybersecurity, often relying on outdated security measures and basic AV / firewall / intrusion detection systems.

3. Pain Points:

- **Inadequate Security Posture:** Cooperative banks had limited visibility into their network and digital assets, making it challenging to identify and respond to threats in real-time.
- **Resource Constraints:** Many banks lacked the necessary resources, both in terms of skilled personnel and advanced security tools, to effectively combat cyber threats.
- **Regulatory Compliance:** Compliance with cybersecurity regulations, such as the Reserve Bank of India (RBI) guidelines, was becoming increasingly complex for these banks.
- **Limited Incident Response:** A lack of formalized incident response plans and a low detection or response mechanism / delay in detecting and responding to incidents put customer data and financial stability at risk.

4. Planning for SOC / Percept XDR services:

The first phase of the project involved detailed planning for the establishment of a Security Operations Center / Percept XDR. The planning included:

- **Understanding of the Set-up and the Processes:** We tied up with The Maharashtra State Co-operative Banks Association (MSCBA) to understand the current set-up and the processes followed by the organizations. We also tried understanding their specific cybersecurity needs and their current capabilities.

- **Technical and Financial Feasibility:** We went through various forms of engagements with the association as well as the organizations to understand the technical & financial feasibility so as to ensure that maximum organizations can benefit from the project.

- **Compliance Alignment:** Ensuring that the SOC's operations align with RBI's guidelines and other relevant regulations. The project plan also included multiple training & awareness sessions which explained the regulatory guidelines through use cases / relevant examples.

5. Objectives:

The objectives of the SOC project included:

- **Enhanced Threat Detection:** Detect and respond to cybersecurity threats proactively to minimize damage and protect customer data.
- **Regulatory Compliance:** Ensure compliance with RBI guidelines and other relevant cybersecurity regulations.
- **Operational Efficiency:** Improve the efficiency and effectiveness of cybersecurity operations within cooperative banks.

A cyber-attack directly impacts the brand, financial assets and business continuity. Most of us are aware about how, a certain number of banks got impacted after facing cyberattacks or penalties from regulatory noncompliance. Percept XDR enables organizations to stay protected from evolving cyber threats.

Redesigned Process: The redesigned process included cutting-edge technologies enabling following capabilities, at an affordable cost and with a local language support:

- **Deep Learning AI based Detection:** Deep learning is used for correlation and attack identification, powering Percept XDR to detect APTs, Zero-day and other targeted attacks. The deep learning detection engine self learns to identify new use cases and anomalies which enhances detection capabilities.

- **24/7 Monitoring:** Percept XDR enables continuous monitoring of enterprise wide network traffic, log data, and endpoints to detect suspicious activities.

- **User & Entity Behavior Anomaly (UEBA):** AI trained with hundreds of use cases including insider threats, user login failures, compromised user accounts, unauthorized configuration changes in critical devices to name a few.

- **Big Data Security Analytics:** Percept XDR leverages Big Data to process data features and detect various associations including Attack Kill Chain

Association, Insider Threat Enrichment as well as Time Series Analysis for Threat Hunting and APT.

- **Threat Intelligence Integration:** Percept XDR incorporates threat intelligence feeds from over 85+ sources to identify emerging threats and vulnerabilities.

- **SOAR ML Based Automated Response:** Percept XDR features SOAR-based automated response in line with the MITRE ATT&CK framework. The reduced number of incidents that require manual intervention allows enterprise IT teams to focus on the core objectives.

- **Incident Response Plan:** Sequretek helps in developing and implementing a comprehensive AI-based incident response plan for swift action during security incidents.

- **User Training:** Subscribing to Percept XDR, the organizations also receive cybersecurity training for their employees to enhance overall security awareness in their local language.

Implementation Process:

Sequretek has an easy implementation process for organizations who wish to enable security monitoring and incident response processes (through Percept XDR).

a. **List of devices that need to be monitored:** Organization / bank to share the list of devices that need to be monitored.

b. **Sizing of the basic hardware required (1 Server):** Sequretek to provide basic sizing of the hardware for installing a server at the organization's premises and IPSEC-based connectivity.

c. **Server Set-up and Device Onboarding:** Sequretek works along with the organization/ bank's IT team to complete the server set-up and onboard the devices to Percept XDR.

d. **Testing and Validation:** Comprehensive testing to ensure that the Percept XDR was functioning as intended.

e. **Training:** Trainings & Awareness session in local language for the organization employees.

f. **Incident Response Drills:** Conducting incident response drills to prepare for potential security incidents.

6. Challenges Faced:

- **Resistance to Change:** Resistance from some bank employees who were accustomed to the traditional ways of doing things.
- **Lack of Skillsets:** The employees in the sector had very limited skillsets, from the IT point of view. Making them understand the cybersecurity concepts and create awareness of security technologies was a challenge.
- **Resource Constraints:** Managing the costs (TCO) and resources, keeping in mind the quality of the output delivered is world-class.
- **Regulatory Complexity:** Navigating the complex landscape of cybersecurity regulations and ensuring compliance.
- **Politically Driven Decision Making:** Apart from the traditional evaluation process, the sector also had a lot of political influence behind approving procurement decisions.

7. Impact of the Project:

The SOC / Percept XDR project implementation resulted in significant improvements:

- **Improved Cybersecurity:** Enhanced threat detection and response capabilities reduced the risk of data breaches and financial losses.
- **Regulatory Compliance:** Cooperative banks were better aligned with RBI's guidelines and other regulations like CERT-In’s Incident Reporting guidelines.

- **Efficiency:** Cybersecurity operations became more efficient, cost-effective and improved security posture significantly.

Sequretek protects over 30 co-operative banks in Maharashtra whilst ensuring their regulatory compliance. It is pleasure to share that one of our customers – Hasti Cooperative Bank was awarded as the WINNER of the Best SOC Initiative (two years in a row, 2022 & 2023) at the National Cooperative Banking Summit 2023 & Frontier Cooperative Banking Awards 2023.

8. Long Term Significance:

The Percept XDR services have enduring significance for cooperative banks in Maharashtra:

- **Safeguarding Reputation:** Continuously protecting the banks' reputation and customer trust by minimizing data breaches.

- **Competitive Advantage:** Demonstrating a commitment to cybersecurity can be a competitive advantage in the financial industry.

9. Future Roadmap:

The future roadmap includes:

- **Continuous Improvement:** Regularly updating technology and processes to adapt to evolving threats. Organizations get the latest functionalities & threat intelligence through the SaaS subscriptions. Furthermore, the XDR SaaS helps reduce the number of FTE’s per shift, the cyber insurance costs and the blind spots in the system.

- **Enhanced Training:** Expanding cybersecurity awareness and training programs in regional language.

- **Collaboration:** Collaborating with industry peers and regulatory bodies to share threat intelligence and best practices.

In conclusion, the transformation of SOC services in cooperative banks in Maharashtra has significantly enhanced their cybersecurity posture, compliance with regulations, and operational efficiency, ensuring their

continued success in an increasingly digitized financial landscape. This case study serves as an example of how proactive cybersecurity measures can secure sensitive data and strengthen the respective sector.

Like the above project (SauraQshan), we wish to work with the Central as well as State Governments to protect their Departments, Municipal Bodies (split between large and small), State Public Sector units, and State Departments. We look to create awareness, protect them against new-age cyber-attacks, and ensure that there is a timely response to a cyber-attack attempt.

We (through Percept XDR) could help in monitoring the security logs on a 24x7 basis, detect lateral movement of the virus/bad file in the environment, remediation to stop the ongoing cyber-attack, and lastly threat advisories to create awareness-readiness for organizations against latest cyber-attacks.

Through this project, we wish to secure India against the ever-evolving cyber threats, while accelerating digitization.

10. Awards & Recognition:

Sequretek is recognized by leading global analyst and research firms and is a proud winner of prestigious awards including:

- National Award for e-Governance 2023 by DARPG, Government of India
- National Startup Award 2021, Startup India, Government of India
- One of the winners of the NASSCOM Emerge 50 2021
- Winners of the State as well as National Conclave by ESC India & STPI India for MISSION TO USA program
- DSCI's Security Product Company of the Year 2019
- Winner of RAISE 2020 – AI Challenge by Ministry of Electronics and IT and many more awards and recognition.

***

DEPARTMENT OF ADMINISTRATIVE REFORMS AND PUBLIC GRIEVANCES
GOVERNMENT OF INDIA