AWARDS SCHEME FOR EXEMPLARY IMPLEMENTATION OF e-GOVERNANCE INITIATIVES

Proforma for Category

II. NAME OF CATEGORY-'OUTSTANDING PERFORMANCE IN CITIZEN CENTRIC SERVICE DELIVERY'

1.   Coverage – Geographical and Demographic :

(i) Comprehensiveness of reach of delivery centres :   State of Maharashtra

(ii) Number of delivery centres   2

(iii) Geographical

(a)National level – Number of State covered   1

(b) State/UT level-Number of District covered   2 (Latur & Solapur)

(c) District level-Number of Blocks covered   21

Please give specific details: 1) Latur 2) Solapur

(iv) Demographic spread (percentage of population covered)   100% (Approx 6 Million)

2.   Situation Before the Initiative:

The medical colleges and hospitals are under the state government's purview. Being a public sector, the monitoring and the operations are on the less efficient quadrant because of delays in taking decisions and implementing policies. This is backed by the scarcity of manpower to carry out the hospital operations. Having said this, find below the common problems faced by the hospitals in a traditional public sector hospital:

1.1.   Patient Waiting Time:

The time taken by the patient to get a case paper / get his registration done is very high. This is majorly because of:

- Less number of staff allocated for the registration process
- Manual process of registration

This has got a cascading effect on the number of patients being consulted by a hospital. This is less due to large patient waiting time affecting the revenue of the hospital.

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Patient Waiting Time details		
Phase	Dr. Vaishampayam Memorial Medical College, Solapur	Government Medical College & Hospital, Latur
Pre Go-live	00:55:00	01:05:00
Post Go-Live	00:04:56	00:04:16

1.1. Misplace of case papers/Reports:

Clinicians depend heavily on the patient's medical record for arriving at the correct diagnosis and treatment plan. Due to the manual process, the patients have to safeguard all the case papers, reports; CT scans etc for future consultation. Most of the time, it is found that the patient has misplaced his previous reports, consulting case papers increasing the time taken for treatment. Also the patient might have to incur cost for repetitive investigations.

1.2. Decision on treatment plan dependent on the arrival of reports:

In an emergency case, the clinicians have to wait for the CT/MRI scans, investigation report to decide on the treatment/surgery. The dependency of these investigations reports to be prepared and sent takes time and the surgery/treatment is delayed which may cause death.

1.3. Medication error because of manual process:

In the manual process, the case paper is written by hand by the clinicians. The drug and investigation prescriptions are to be interpreted by the technicians and pharmacist. Due to misinterpretation of the hand writing, the patient might be issued wrong medications causing further complications and even death.

1.4. Mismatch of Patient Samples:

Many-a-times, in the manual process, all the lab samples are labelled manually which can cause the sample to get misplaced or mis-matched. This becomes very critical when it comes to decide upon the plan of treatment.

1.5. Administration and Record Keeping:

All the records are maintained manually, right from the number of patients visiting the OPD, details of the IPD patients, decease wise categorization of patients, trend reports of the decease to procure medicines, etc. Maintaining and formulating data via the manual process consumes a lot of time and also requires enhanced manpower. Moreover this data cannot be made available instantly. This affects the delay in

taking some crucial administrative decisions.

1.6. Huge Pilferage in Revenue:

As all the data is being maintained and managed by individuals, there is a big possibility of pilferage when it comes to procurement and cash collection. There is less accountability among the staff due to the loop holes in the manual process.

Healthcare falls under the service domain which requires quality services at a fast & immediate pace. So to provide rapidity & maintain the quality services the need for digitalisation & technology to intervene; was identified to reduce time & paper.

Being a public sector domain, we had many challenges ranging from the patient volume to the user's inclination to use computers for consultation. Below are some of the challenges during implementation:

1. **Huge Patient Volume:**

Over 5, 00,000 Patients visit OPD and over 45,000 admissions in Large hospitals (Large hospitals - having bed capacity over 1000 Beds) in a year, due to the patient rush in Outpatient department the key challenge was to develop the system in such a manner that it's a single operation screen for all patient care activities that consultant will work upon

2. **Non Standard Maintenance of Data:**

There are no universal standards to record or to keep medical Data. The availability of accurate and exhaustive master data as the data was available in bits and pieces.

3. **Management of Change:**

This was the most challenging piece in the hospital as the users were more comfortable using paper and pen for doing patient care related activities and they were to be migrated from Paper based system to On line system which due to lack of time was difficult. Also setting up right expectations from the management and users in the hospital on the effort required for internalizing this Programme was a difficult task.

4. **Inconsistency of Capturing data:**

Designing user friendly interfaces in HMIS as each user has his own way of looking at patients and then capturing data for creating EMR

5. **Outdated Equipments**

Interfacing OLD Equipments - like X-Ray, Biochemistry Machines not compatible to current day HMIS

6. **Lack of IT Knowledge:**

Lack of any IT related module in Medical course(MBBS/BAMS/BHMS)

7. **Infrastructure Rollout:**

Right infrastructure in terms of right sizing, the servers and PCs, LAN design, equipment security etc, this typically was a key point at most of the government hospitals are hosted out of old stone buildings / structures in which setting infrastructure is difficult due to its build and where most of the route diagrams / floor layout blue prints are not available.

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3. Scope of Service/ Activities Covered

3.1 Extent of e-enablement in terms of number of services:-

Application

1. **HMIS Modules are fully Integrated:** Radiology Information System, Laboratory Information System, Electronic Medical Record, Inventory control and finance modules are accessed as one application from Anywhere in he Hospital / Department
2. **HMIS Modules are Patient centric :** All Modules are configured, accessed based on patient work flow
3. **Integrated and standardized Workflow :** The HMIS system workflow is customized to meet requirements of Government Hospitals
4. **Decision Support system :** Unified online reports on Patient information for supporting the Dean / HoD's to make decisions faster and provide better medical care to patients
5. **Uniform access to HMIS modules:** Simple Internet Browser based user-interface for all modules of application
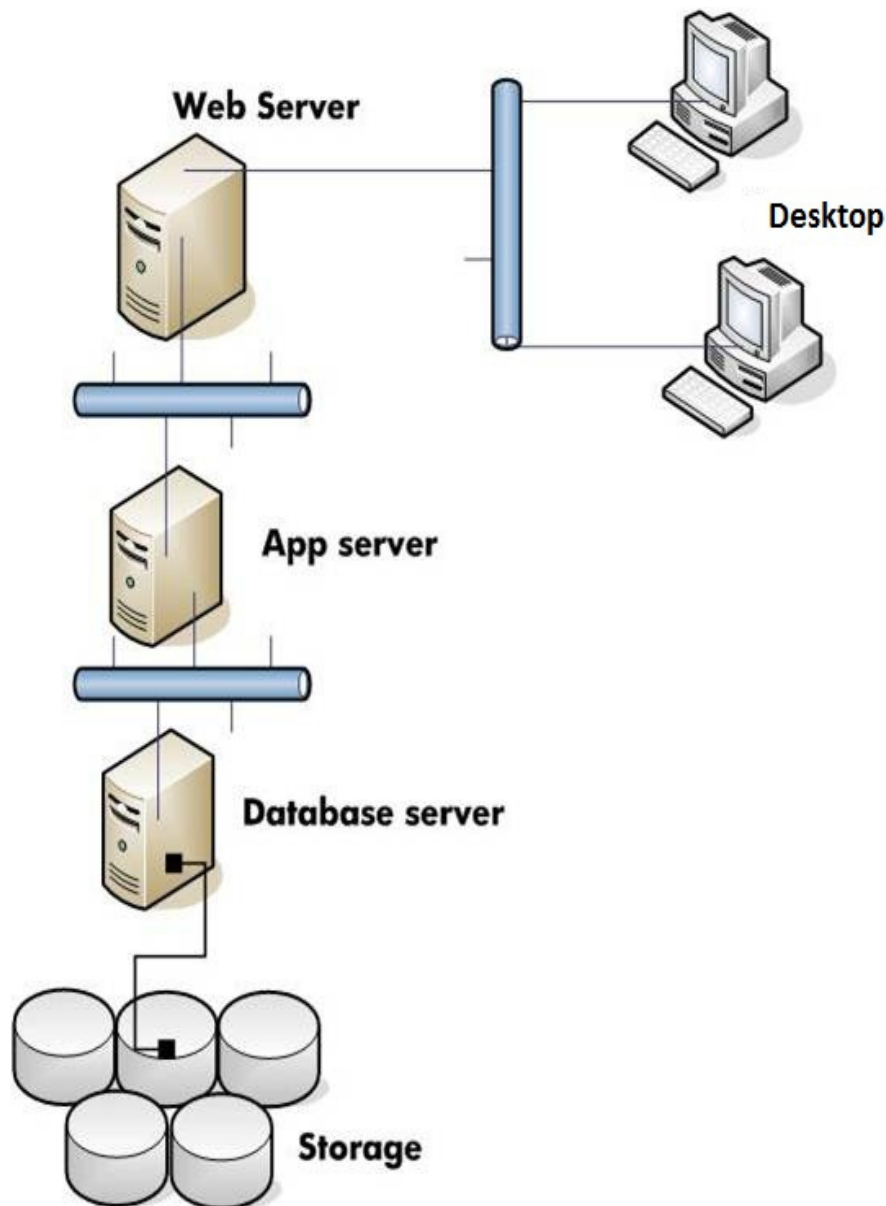
Details of Services:
1. Hospital Information System (HIS)
2. Laboratory Information System (LIS)
3. Radiology Information System (RIS)
4. Picture Archival And Communication System (PACS)
5. Business Intelligence
6. University management System

IT Infrastructure: The IT infrastructure is created to bring the following benefits:

1. **Simplicity** – Reduce Complexity, Open Standards, lower cost and minimum resource requirement
2. **Modularity** – ability to change one component of the environment without affecting other components
3. **Integration** – IT infrastructure components must be integrated through a uniform set of relationship that is defined by the Business, easy to understand, manage and modify Standardization – identifies how things work (processes), how they work together and makes the knowledge available for maximum benefits
4. **Redundancy** - The application is installed in two application servers which give a redundancy feature enabling to give 100% availability of the HMIS application to all users.
5. **The Central Site** - All the 19 sites under the scope of this project will be connected to the central site through WAN. This gives an option to the patient to visit any hospital without bothering to carry all his files with him/her.

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Details of Scope:

1. The Service Provider (hereinafter referred to as 'SP' which is Hewlett Packard India Sales Pvt. Ltd.) shall be solely responsible for providing Electrical Power Supply (with requisite cabling as applicable), for their systems used by them in providing Services to GoM for the HMIS Project, for a 24x7 operation

2. Wide Area Network (hereinafter referred to as 'WAN') termination hardware (i.e. WAN Routers).

3. Local Area Network (hereinafter referred to as 'LAN').

4. Server Room and related facilities, including air conditioners, with in-built redundancy, for housing Servers, Uninterruptible Power Supply (hereinafter referred to as 'UPS') sets, Diesel Generator (hereinafter referred to as 'DG') sets, etc.

5. Workstations, comprising of Personal Computers (hereinafter referred to as 'PC') and thin clients, along with related Operating Systems (hereinafter referred to as 'OS'), database, tools and other

related software.
6. Peripherals like printers, scanners, web cameras and kiosks.
7. Backup and Recovery software.
8. Establishing a Centralized Services Repository Center for
   a. Central storage of data from all Locations under the HMIS Project.
   b. Remote management services of the IT infrastructure of the entire HMIS Project.
9. Office infrastructure Equipment, including chairs and tables for computers, printers and scanners used by the SP for the HMIS Project
10. Other related System Software, as follows: -
    a. E-mail.
    b. Internet browsing.
11. System Security including firewall, Intrusion Detection Services (hereinafter referred to as 'IDS'), anti-virus solution, development, documentation and implementation of end-to-end Information Security (hereinafter referred to as 'IS') management systems and procedures as per international guidelines and standards like BS7799 / Equivalent
12. User training on HMIS, PACS, E-mail, System Security
13. Acceptance Test Plan for deliverables
14. Providing services for Roll-out phase, for entire duration of the HMIS Project, as follows
    a. Manpower for HMIS operation - for Out-patient Registration, In-patient Registration and Registration of Student Records.
    b. Maintenance services, Support services, Facilities Management services and Network Support services, for a 24x7 operation at the Locations.
    c. BS 7799 compliance & regular audits.
    d. Technology Refresh for meeting the Service Levels
    e. Management of Change
    f. Program Management Services
15. Provision of Registration Services
    a. Though a hospital functions 24x7, the SP shall provide registration services as per the prevailing timings of individual departments

3.2 Extent to which steps in each service have been ICT-enabled :-

In a Nutshell, the activities covered are as follows:
☐ 24x7 uninterrupted support of IT-Infrastructure
   a. Application Availability
   b. Network Availability
   c. Server Availability
   d. PACS Application Availability
   e. Lab & Radiology investigation Availability.
   f. Manpower For Registration Process
   g. Availability of system equipment support
   h. Security Infrastructure
   i. Office Infrastructure Equipment
   j. Extended Helpdesk to provide User Support
   k. User Training on Application
   l. System Security Training

m. HMIS Application Security
n. Data Security
o. Network Security
p. Facility Management
q. Asset management
r. Centralized server Management
s. Centralized Network Management
t. Database Management
u. Management Information System (MIS) Reporting

On the user level, the implementation of the project has been able to cover the following areas of hospital operations:

1. **Reduction of patient waiting Time for Registration –**

   During the manual registration being done by hospital clerks only 3 to 4 registration counters were available but after introducing HMIS system number of counter increased to 14 – 16 depending on the volume of the patients.

   The average waiting time at counters has been reduced to about 7 minutes from about 55 minutes prior to implementation of HMIS project.

   Thus the waiting time at registration counters has been reduced by nearly 90%.

2. **System generated Queue numbers and schedules for Patients –**

   Every patient is allocated with the queue number which is available for the clinicians at their work stations. This helps in a big way in managing the patient queue in a particular department in an orderly fashion.

3. **Transparency at all billing stations like Registration, Investigation, Patient billing –**

   This has resulted in increased revenue collection. Implementation of HMIS has been able to clog the pilferage in a big way, which normally is evident in a government organization

   • Registration Cash collection has increased by 40%
   • Investigation Cash collection has increased by 74%

4. **Accurate Patient data and clinical audit trial facility (less chances of data fudging)**

   All the OPD registration and the IPD admissions are done through the system. The users (clinicians, nurses, technicians etc) have to carry out their hospital operations on the system itself. So all reports related to patient registration, admissions are available in the system. Also, once the patient data is saved, it is practically impossible to edit the data plugging all options

of data fudging. All the users have their own user name and passwords which creates a trail of every activity done by a particular user.

5. **On line e-Prescription – speedy delivery and elimination of medical errors**

   The drugs prescribed by the clinicians to the patient are available online for the pharmacist in the medical store. This helps the pharmacist to understand and dispense the medicines faster without any error.

6. **System accounting of pharmacy and other inventory for less pilferage**

   Prescriptions and medicine dispensing from within HMIS is about 85%. At pharmacy, the printout given by the doctor facilitates the process because it contains the MRD number.

   Since it's a print out and not handwritten, legibility increases, thus increasing accuracy in medicines dispensed.

   Based on the medicines outflow, the inventory is automatically updated. This also helps in stock replenishment.

   The possibility of pilferage is reduced because each medicine is now accounted for in the HMIS system.

7. **Saving on X-ray and other imaging films and its processing is envisaged in the coming time –**

   CT / MR scans are available online for a patient to access care from any terminal on the HMIS network.

   These scans are stored for minimum of 7 years hence no loss of images and are as part of EMR in Picture Archiving and Communication System (PACS) Servers.

   With the procurement of latest CR/DR machines, X ray films will be made available through HMIS system and soft copy of the X-Ray film is available on the computer screens of all doctors. In the future, a potential cost saving of 90 % on Film procurement, Developing / processing of films and Storage of films is envisaged.

   The Old films / images are stored as soft copy in the HMIS servers for recall at any future date. Therefore patient need not go around collecting Films to get doctor consultation thus saving time for both Patient and consulting doctor.

8. **Referrals of patients**

   Through the HMIS system, the clinicians can refer the patients online to any other clinician for opinion and treatment. The referred clinician has access to all the patient data for deciding

upon the further course of treatment making it convenient for the patient and in providing speedy treatment.

9. Online bed transfer

This feature enables a particular ward to shift the patient data to the other ward instantly on a click. While the patient is being physically transferred from one ward to other, the system transfers the entire patient data and reports for continuing the further course of treatment.

10. Patient location finding

As all the patient data, right from the registration to the reports are available on-line, the patient can be located instantly from the system.

11. Make patient data available in Electronic format and Access to patient data by clinicians from anywhere in the hospitals

The patient and his relatives are spared the burden of having to maintain accurately filed medical history and having to carry such files around the hospital.

The Laboratory reports, X-ray images, prescribed drugs and previous doctor's consultation is readily available from HMIS system.

The patient's EMR is instantly available to the doctor hence reducing non-clinical process time.

Since the EMR contains historic data and other information, it helps the doctor in avoiding medication errors.

The EMR is a digital record, and is impervious to damage by time and weather as with paper records.

4. Stakeholder Consultation

- Stakeholders of MEDD HMIS Project
  - Government of Maharashtra – Health Ministry
  - Government of Maharashtra's Medical Colleges and Teaching Hospitals
  - Users – Dean, Clinicians , Nurses , Technicians , Dieticians, Pharmacist
  - Client or Patient's of Hospital

- Stakeholders and their Functions:
  - ☐ Government
  - Frame health policies and regulation
  - Manage the public delivery system and financing
  - ☐ Academic
  - Medical education and training

- Research on Innovations and best practices
- ☐ Service User
- Diagnose , Investigate, Treat and Monitor health
- ☐ Service Provider
    - Deployment of Application for Hospital Use
    - Make it User Friendly

4.1 Type of stakeholders consulted :-

The government Project Co-ordinator, The State Level Project Implementation Committee and the Local Project Implementation Committee were at all times given a complete status of the implementation and are more or less responsible for the smooth execution of the project

4.2 Number of stakeholders consulted :-

12 to 15 key stake holders and around 25-30 others with regards to the ground level execution

4.3 Stages at which stakeholder input was sought: -

Regular interactions with the stakeholders are being done to counter the challenges during implementation.

4.4 Details of user satisfaction study done: -

After the infrastructure rollout was completed the Application Demo was carried out with the Local Project Implementation Committee. The User Acceptance Test (UAT) report was signed and submitted to GPC for records.
The user satisfaction survey is carried out by Hewlett Packard on a monthly basis and feedback is noted to improve the service.

5. Strategy Adopted

(i) The details of base line study done, -

Application:
- The application base line study was completed in 2007-08.
- The application work flows were customized based on the customization document.
- The PILOT site went live on 18th Oct 2008 and then the other locations were taken up for implementation.
- The application customization was freezed at this stage.

After receiving the formal order from the Government of Maharashtra, Hewlett Packard mobilized the team to the respective locations – Latur & Solapur

(ii) Problems identified –

- The GAPS identified during the AS-IS study were taken up for customization and the
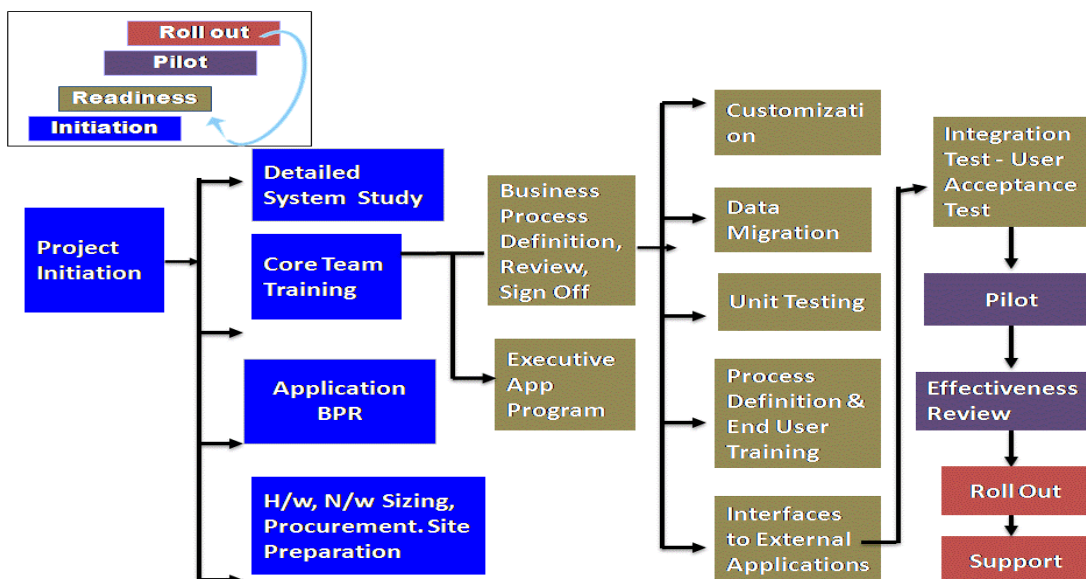
application was built to suit the current available work flow.
- However the application is configurable as per the respective institutions details like the number of departments, User Base, drug list, investigations carried out etc through the master data template.

(iii) Roll out/implementation model, -

- An official order from GOM to initiate the HMIS implementation of the institution
- Kick off meeting was held to form and orient the local governance team so that the implementation is smooth
- Hewlett Packard mobilized the team to carry out the infrastructure rollout
- Simultaneously the training of the users were carried out
- On the completion of the infrastructure rollout and the user training, the location went through a technical audit. Simultaneously the User Acceptance Test (UAT) was carried out.
- On the successful completion of the audit, the Go-Live order was given to Hewlett Packard to carry out the routine operations on the HMIS system.

Implementation Model

o The implementation was carried out in a phase wise manner with the high OPD patient volume departments like General Medicine, General Surgery, Orthopaedic and OBGY will be taken in the first phase of 2-4 weeks
o Laboratory, Pharmacy, Discounting and Billing started simultaneously.
o The stabilization of these high patient volumes OPD initiated the implementation of other remaining departments again in a phase wise manner with 3-4 OPD's being implemented in one phase. Depending on the number of OPD's and the time taken for stabilization, the implementation time differed.

➢ **The transition of the various departments happened as per the following:**
   o **Registration Counter** –

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- The HP Team sat along with the hospital staff to understand the registration dynamics at the institution for a period of 4 days i.e. 26th July 2013 before the scheduled Go-Live date of 1st August 2013
- From the Go-Live date, HP took over the registration counter to carry out the OPD and Casualty registrations, IPD admissions and student registration. The institution withdraw the existing staff from these locations from midnight 31st July 2013
- The HP team collects cash and submits it to the cashier on a daily basis. The AO issues a receipt of the cash submitted to the HP team and endorses the cash collection report
- The document mentioning the free categories of patients and the documents supporting the same is as per the GR of GoM
- In case the patient is not carrying the documents supporting his request for patient category, HP team directs the patient to the RMO for approval and the patient category will change ONLY after receiving the written approval from RMO.
- HP team issue a strip of paper to the patients mentioning the unique MRD number
- All IP admission from OPD will be done online and no offline request is entertained and existing MRD # given by MRD department pre-printed on Admission file were discontinued by removing the previous MRD # by white ink

o **OPD Consultations by Clinicians –**
- Open the cover sheet using the MRD # on the strip of paper
- Prescribe medicine to patients from HMIS application using Notes Tab
- Order Investigation to patients from HMIS application using Notes Tab
- Refer a patient from one specialty to another from HMIS application using Referral Tab
- Enter data like History, Findings, Advise and Diagnosis to a patient from HMIS application Notes Tab
- Clinicians to STOP writing lab forms and radiology orders manually and order the same from HMIS application

o **IPD Consultations by Clinicians –**
- Open the cover sheet using the MRD # on the strip of paper
- Enter vital information like Temperature, Pulse of a patient from HMIS application using Vital Tab on cover sheet
- Enter Allergies from HMIS application using Allergy Tab on Cover Sheet
- Order online investigation from HMIS application using Notes Tab and STOP writing lab forms and radiology orders manually
- Prescribe medicine to patients from HMIS application using Notes Tab
- Enter Clinical Notes, Progress Notes, OT Notes for a patient from HMIS application using Notes on the Left Pane
- Refer a patient from one specialty to another from HMIS application using Referral Tab
- Create Discharge Summary from HMIS application from MRD viewer
- Enter ICD codes after final diagnosis

o **Medical Store –**
- To enter the current pharmacy stock in the HMIS application and keep updating

the global stock on arrival of new stock
- Issue indent to OPD pharmacy, floor pharmacy, wards based ONLY on the online indents received from the HMIS application

- **OPD Pharmacist** –
  - To issue online drugs to patients whose online prescriptions have been ordered by the doctor in the OPD from HMIS application using Issue from Prescription option in Billing Menu
  - To tally the physical stock of pharmacy with the stock in application by consuming the drugs from HMIS application using Stock Consumption Menu
  - To raise and accept indent from the HMIS application to get stock in the pharmacy
  - To generate various pharmacy reports from HMIS application from Report Menu

- **Lab Technicians** –
  - Lab technicians to check the service orders on the HMIS application and verify the bill payment. The lab technician will send the patient back to the billing counter in case the bill is not paid.
  - Generate Sample ID of quantitative Lab tests ordered to a patient from HMIS application using LIS menu and Order Processing option
  - Enter the values of the Lab test ordered to a patient from HMIS application using LIS menu from Result Processing option
  - Provisionally certify the Lab test order from HMIS application using LIS menu from Result Processing option
  - Enter the results of qualitative Lab test ordered to a patient and save the report from HMIS application using SCM menu and SCM browser

- **Lab Doctors** –
  - Enter the values of the Lab test ordered to a patient from HMIS application using LIS menu from Result Processing option
  - Certify the results of Lab test ordered to patient from HMIS application using LIS menu from Result Processing option
  - Enter the results of qualitative Lab test ordered to a patient and Save and Final Approve the report from HMIS application using SCM menu and SCM browser

- **Radiology Technicians–**
  - The technicians will check the investigation order online and take for processing the investigations only after verifying the bill payment.
  - Upload the images from compatible CT/MRI/X-Ray machines to the PACS server.

- **Radiology Doctors–**
  - Enter the reports of radiology investigation of a patient ordered by the doctor in the OPD & IPD from HMIS application by using SCM browser
  - Save the report from HMIS application
  - Senior Doctors to Final Approve and Publish the report of the patient from HMIS application

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- **Billing Clerks–**
  - Enter the MRD number and in the Billing Module and verify the list of services availed by the patients from HMIS application from the Billing Menu and Make OP/IP Bill option
  - Prepare the Bill and Accept Cash from the patient from HMIS application Billing Menu and Make OP/IP Bill option
  - Generate receipt from the HMIS application and give it to the patient
  - If the services are not found in the HMIS application, the billing clerk has to send the patient back to the clinician for entering the orders
  - In case the patient wants to avail the discounts or waiver, the billing clerks will send the patient to the RMO for the same and accept cash as per the discounts
  - Use the cash collection report from HMIS application for book keeping and accounting purposes

- **Nursing Staff–**
  - Order Diet for a patient from HMIS application using Diet Menu
  - Transfer patient to one ward to another HMIS application using Transfer icon in IP Patient browser
  - Creation of pharmacy Indent and accept stock from store HMIS application using Stock Menu
  - Administration of drugs to patients HMIS application using Drug Admin icon in IP patient browser
  - Shift hand over and takeover activity through HMIS application using Nursing Menu
  - Carry out discharge process for a patient HMIS application using Mark for Discharge, Sent for Billing and Discharge icons in IP patient browser

- **Introduction of MRD numbers in the following documents**–
  - In-patient wards: to mention HMIS generated MRD number on the patient's sample and investigation note prescribed by the doctor, which is sent to labs for investigation
  - In-patient wards: to mention HMIS generated MRD number on the radiology investigation note prescribed by the doctor
  - In-patient wards: to mention HMIS generated MRD number on the IP discharge slip provided to the patient at the time of discharge
  - In-patient wards: to mention HMIS generated MRD number in the Admission/Discharge register maintained for every patient
  - Radiology: to mention HMIS generated MRD number of the patient on the CT Scan/MRI coupon, which is sent to billing counter along the patient
  - Radiology: to mention HMIS generated MRD number of patient on the register at X-Ray, USG, CT Scan, MRI reception by the staff nurse
  - Pathology/Biochemistry/Microbiology Lab: to mention HMIS generated MRD number of patient in the lab register
  - Out Patient Department: to mention HMIS generated MRD number, on the pharmacy coupon, meant to dispense medicines to the patient from the pharmacy
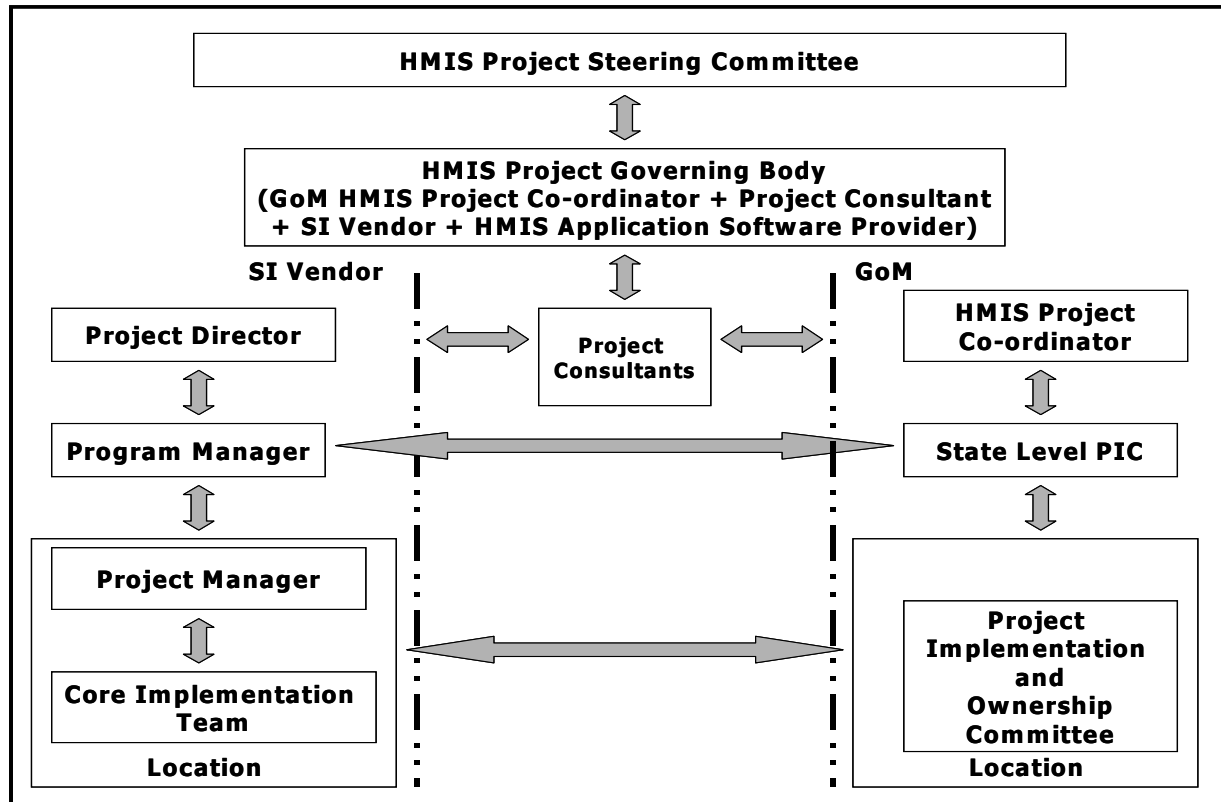
(iii) Communication and dissemination strategy and approach used:

For the smooth implementation of the project a governance plan was devised with various bodies as below:

- ☐ Steering Committee
  - Principal Secretary (Finance)
  - Principal Secretary (Planning)
  - Secretary (IT)
  - Secretary (Medical Education)
  - Director (DMER)
  - L&T Infotech (Project Consultants)

- ☐ State Level Project Implementation Committee (SLPIC) comprising of Dean, JJ Hospital and Grant Medical College and senior doctors are State implementation committee members

- ☐ Local Project Implementation Committee - LPIC (per site)
  - Dean
  - 5 to 7 Members

- Hewlett Packard has its own team at both the locations and their first point of contact is the Local Project Implementation Committee (LPIC).
- The review meetings occur regularly wherein the issues in implementation are discussed and probable solutions are designed.
- The issue which cannot be resolved at the local level is escalated to the State Level Project Implementation Committee (SLPIC).
- The next level of escalation is the Government Project Co-ordinator (GPC) which takes up issues put forth by the SLPIC.
- The steering committee is called in to handle high level issues and to take major decisions/roadblocks.

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Pictorial Depiction of the Governance Plan for MEDD - HMIS project

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│              ┌──────────────────────────────────────────┐                  │
│              │      HMIS Project Steering Committee      │                  │
│              └──────────────────────────────────────────┘                  │
│                               ↕                                            │
│          ┌──────────────────────────────────────────────────┐             │
│          │          HMIS Project Governing Body             │             │
│          │  (GoM HMIS Project Co-ordinator + Project         │             │
│          │   Consultant + SI Vendor + HMIS Application       │             │
│          │              Software Provider)                   │             │
│          └──────────────────────────────────────────────────┘             │
│     SI Vendor                      ↕                    GoM                │
│  ┌────────────────┐       ┌──────────────┐      ┌───────────────────┐     │
│  │ Project Director│ ←→   │   Project    │ ←→   │  HMIS Project     │     │
│  └────────────────┘       │  Consultants │      │  Co-ordinator     │     │
│         ↕                 └──────────────┘      └───────────────────┘     │
│  ┌────────────────┐                                      ↕                │
│  │ Program Manager │ ←────────────────────────→  │ State Level PIC │     │
│  └────────────────┘                              └───────────────────┘    │
│         ↕                                                ↕                │
│  ┌────────────────┐                              ┌───────────────────┐    │
│  │ Project Manager│                              │    Project         │    │
│  └────────────────┘ ←────────────────────────→  │ Implementation     │    │
│         ↕                                        │      and           │    │
│  ┌────────────────┐                              │  Ownership         │    │
│  │ Core           │                              │  Committee         │    │
│  │ Implementation │                              └───────────────────┘    │
│  │ Team           │                                   Location            │
│  └────────────────┘                                                        │
│       Location                                                             │
└──────────────────────────────────────────────────────────────────────────┘
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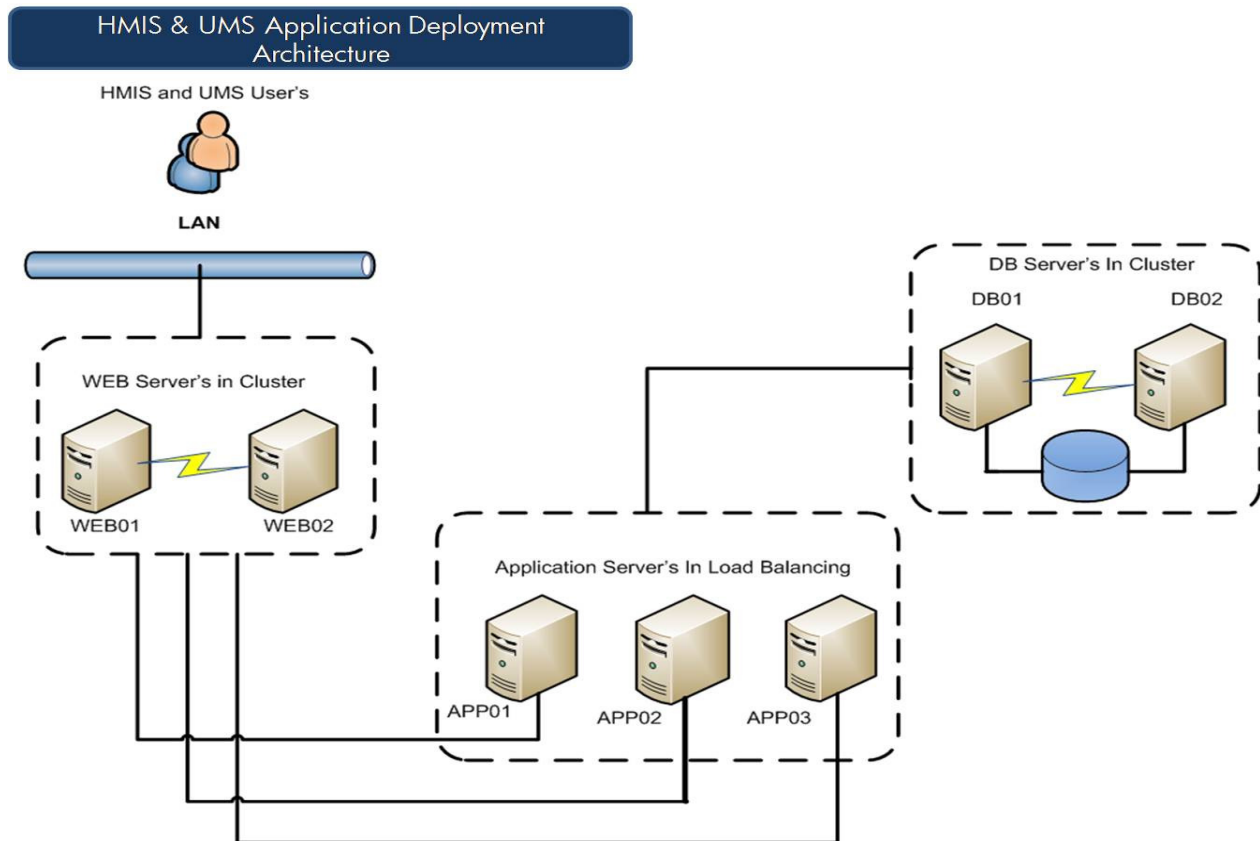
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6. Technology Platform used-

(i) Description:

    a. Operating System : RHEL Linux,
    b. Database : MySQL, JBOSS

HMIS and UMS Technical Architecture

(ii) Interoperability: the application runs on a browser and in a Intra Net (LAN). The scope of having it accessible to other locations is in the pipeline.

(iii) Security concerns: - The architecture has sufficient arrangements to secure the data in the network.

(iv) Any issue with the technology used :- No

AWARDS SCHEME FOR EXEMPLARY IMPLEMENTATION OF e-GOVERNANCE INITIATIVES

(v) Service level Agreements(SLAs)

Service	• **Availability of HMIS and PACS**
Service Coverage	• Continuous, 24x7 availability • Cumulative one percent (1%) non-availability of HMIS and PACS applications permissible, on a monthly basis.
Service Window	• 24 X 7
Service Availability	• 99%
Measurement Methodology	• Tool-based,
Measurement Frequency	• Monthly basis
Penalty	• If the cumulative non-availability of HMIS Application at a Location, in a month, exceeds 1%, calculated with provisions as mentioned in the Service Coverage above, shall attract a Service Penalty in terms of deduction of payment from monthly invoice for that Location, as below: More than 1% & up to 5% - deduction of 3% More than 5% & up to 7% - deduction of 5% More than 7% & up to 10% - deduction of 10% More than 10% - deduction of 20%

Service	• **HMIS Transaction Response Time**
Service Coverage	• Response time of HMIS Application, measured periodically • For all normal transactions (excluding reports and queries), the end-to-end response time - from release of transaction by the user till receipt of output on the screen - shall be less than 3 seconds • For all transactions involving image transfer, the end-to-end response time - from release of transaction by the user till receipt of output on the screen - shall be less than 10 seconds, for an image size of 1.5MB • If the transaction response time is observed higher than the permitted limit for continuous three (3) readings, or, for every twenty (20) readings in a day, it shall be considered as an outage
Service Window	• 24 X 7
Measurement Tool	• A tool, provided by the SP, to continuously monitor the HMIS Application transaction response time at pre-defined periodic intervals, or, any other automatic measurement tool identified by GoM
Measurement Methodology	• Tool-based, automatic capturing log of response time • For every outage, a ticket should be generated
Measurement Frequency	• Ten (10) minute interval

Penalty	• Any outage more than the stipulated time, accumulated during a month at a Location, shall attract penalty in terms of deduction of payment from monthly invoice, at 0.25% of monthly invoice value of that Location, per day of outage, subject to maximum 10% of the monthly invoice for that Location

Service	• **Availability of End-user Workstations, Peripherals & Network devices**
Service Coverage	• All user workstation systems, peripherals and network devices (LAN), that form part of the HMIS Project related to this PPSA, should not exceed a maximum outage time of one hour during the period from 0800 hours to 2200 hours and four hours beyond this period • 98% of the calls in this category shall be resolved within this permitted outage time by repaired or replacement with a proper working unit, as a stop gap arrangement, till the original unit is rectified / replaced
Service Window	• 24 x 7
Measurement Tool	• Tool Based.
Measurement Methodology	• Affected end-user to inform Local helpdesk, who in turn will log call with the Service Desk deployed at the CSRC Location, either through computer or over the phone (at the expense of the SP), and give ticket number to the end-user for follow up, if required • If Percentage of Call Resolution is less than 98% then it will be considered as violation by an amount = (98 - Percentage Call Resolution)
Measurement Frequency	• Measured on a monthly basis
Penalty	• Any violation of SLA, accumulated during one month, shall attract penalty in terms of deduction of payment from monthly invoice @ 0.20% of monthly invoice value per percentage of the violation. • Penalty in terms of deduction of payment for a Location shall not be more than 5% of the monthly invoice for that Location

7. Citizen centricity and relevance

7.1 Details about impact on effort and time invested by user

Effort Analysis:
☐ Most of the users weren't used to the IT way of treating patients or carrying out daily work & used to do the patient consultation and other work with a pen and paper. Consistent training and practise on the system has helped them to adopt the new system. Hewlett Packard has developed an IT Training centre for the users and is available 24 x 7 where they have trainers to coach the users on the application and also on the basic operations of a computer.
☐ In the initial phase, the users found it time consuming to consult the patients on the HMIS

application as it involved typing the findings, symptoms and chief complaints on the digital case paper. HP adopted an implementation plan that allowed the users to get used the new way of consulting patients. Each user invested 1-2 hours daily on the HMIS application initially and eventually they were able to consult all patients on the HMIS system.

☐ Currently User's are investing not more than 7 minutes to 10 minutes (average – depending on the diagnosis and the criticality of the patient) with a patient to complete one consultation, which got possible after continuous efforts by the User's & the Trainer's from the HMIS service Provider. The other transactions like indent ordering and processing, Lab orders processing and reporting, billing have seen considerable reduction of time as compared to the manual process.

☐ Implementation of HMIS in Hospitals has shown enormous results in reduction of Patient Waiting Time which is under 7 minute.

Patient Waiting Time details for all Sites		
Phase	Dr. Vaishampayam Memorial Medical College, Solapur	Government Medical College & Hospital, Latur
Pre Go-live	00:55:00	01:05:00
Post Go-Live	00:04:56	00:04:16

Results of the implementation to the patients:
☐ No Loss Of Patient Data
☐ A Unique Patient ID
☐ Speedy Access To Investigation Reports Online
☐ Immediate Access To Patient Old Records
☐ Below Poverty Line / Senior Citizen "Exempt" Process At One Counter
☐ Pharmacy Counter – Quick Disposal
☐ No Need for Prescriptions As Its Available Online.
☐ Accuracy Of Patient's Investigation Report.
☐ Saves Time For Bed Allocation.
☐ Simplified Patient Transfer System.
☐ Patient Data Integrity And Accuracy Maintained & Cannot Modified.

7.2 Feedback Mechanism :-

- The operations Team from Hewlett Packard, is constantly on the floor to provide technical help and Training to the users & taking the User's Feedback on day to day basis.
- Performance reports are shared with the Local Project Implementation team for feedback and issue resolution.

AWARDS SCHEME FOR EXEMPLARY IMPLEMENTATION OF e-GOVERNANCE INITIATIVES

7.3 Audit trails

- Audit Trails had been activated for all critical transactions carried out in the Hospital.

7.4 Interactive Platform for service delivery :-

- Hewlett Packard has deployed its team comprising of registration clerks and IT support Engineers who operate 24 X 7 and are responsible for handling the patient registration and resolving the technical issues arising while using the HMIS application. The Application support staff is available on the ground so that the users issue are resolved immediately without impacting patient care management.
- The institution has a 24 x 7 Helpdesk number through which the user can report their issues which is resolved by the onsite team.

7.5 Need gap fulfilment:

- The Hewlett Packard Onsite Team captures the relevant suggestions made by the users.
- As per the communication plan, the requirements are addressed by the LPIC and then are sent to SLPIC for evaluation.
- SLPIC reviews the requirement and recommends based on the merit to the Government Project Co-ordinator for approval.

8 User convenience

(i) Service delivery channels (Web, email, SMS etc.) :-

- It is currently LAN and Browser Based on an Intra-Net
- The email services will be available to the users once the WAN is provided by the Government to the institution.

(ii) Completeness of information provided to the users:-

- Total Application Training along with Module information had been given to User.
- Also, the HP team has deployed skilled trainers to Hand Hold the users in their day to day operations.

(iii)Accessibility (Time Window) : - 24 x 7

(iv)Distance required to travel to Access Points :-

- In the OPD, the systems are deployed on a 1:1 basis, i.e. every user has his / her own personal computer to access the HMIS application.
- In wards there are a minimum of 2 (Two) computers installed for the users.
- In service departments, each processing equipment is interfaced with the HMIS server and each reporting doctor has one computer.
- It has been taken care that the user does not waste his time in travelling distance to access the

HMIS application.
- It is available across the institution and can be accessed from anywhere with a secured user name and password.

(v) Facility for online/offline download and online submission of forms:-
- The application is browsed on an Intra net through a local data centre. The users are not required to access information from the internet.

(vi)status tracking –
- The status tracking is available for the clinicians in terms of the numbers of patients in queue to be consulted.
- The labs have the status of the number of samples received and to be processed.
- The OT list is also available with the clinicians.

9. Efficiency Enhancement (Give specific details about the following #)

(i) Volume of transactions processed :-   8.5 Lakh patients

(ii) Coping with transaction volume growth :-

- Customized Template designed for case notes for the clinicians
- Readymade templates of signs and symptoms for common diseases are available to the clinicians thus managing 70% to 80% of patient work load

(iii) Time taken to process transactions :-

- For a new patient, the registration time is around 1.5 to 2 min and
- For Old patient is around 30 sec.

(iv) Accuracy of output :-

- The accuracy is dependent on the patient providing the information during registration and teh clinician entering the data into the system.
- The lab equipment and drug processing results are 100 % accurate as there is no manual intervention.

(V) Number of delays in service delivery:-

- There has been no breach of SLA till date at both these locations.
- The entire service request has been resolved in the defined SLA.

10. Cost to User: -

The cost to the patient does not change and is as per the GR of the GoM which is prevalent all across

the state of Maharashtra irrespective of the existence of the HMIS project or not.

The cost is state funded and is as below:
- Rs. 14.8 cr – For 7 years of Service Contract – Cabinet Approved
  - Rs. 6,31,81,944 (Latur) - Fixed Charges - From Plan Budget
  - Rs. 8,48,73,516 (Solapur) - Fixed Charges - From Plan Budget
-
- Transaction Charges for registration from Hospital PLA - @ Rs. 6.60/Transaction

11. Citizen Charter

Benefits to the Patients:

- A unique patient ID for Life long as MRD number

- No loss of patient data including X-ray, CT, MRI images and accessible from any locations

- Reduction in the patient waiting time at registration and consultation since all demographic details of the patient are captured for life long

- Speedy access to investigation reports since they are available online leading to early diagnosis

- Patients do not have to go MRD section / Record room to draw their old records prior to consulting the doctor

- Below poverty line / senior citizen "exempt" process simplified through central data – no moving from one counter to another

- Prescriptions are available online to the pharmacist even before the patients reach pharmacy counter – quick disposal

- Online prescriptions reduce medication error

- Reduced chances of specimen mismatch through unique MRD number link improving the accuracy of patient's investigation report.

- On admission bed allocation is dynamic saving lot of time

- Simplified Patient transfer system through online bed transfer

- Patient data integrity and accuracy maintained - saved cannot be modified or erased

AWARDS SCHEME FOR EXEMPLARY IMPLEMENTATION OF e-GOVERNANCE INITIATIVES

Adherence for Service Delivery :-

- The services are delivered as per the agreed contract between Government & Service Provider is the adherence for service delivery which includes
  - Master Service Agreement
  - Revised Addendum
  - MSA- DOS – Details of Services.

12. Problem Resolution and Query Handling

(i) Availability of help desk **:-**
- The helpdesk is available 24x7 inside the hospital premises.
- The users can call the helpdesk and report their problems.
- The entire service request is resolved in the defined SLA.

(II)   Query resolution mechanism :-

How can a User Log a Ticket??

A User can log a Ticket with the service desk in the following ways.
1. Call the Helpdesk Extension
2. Send an Email Notification to the Helpdesk Email ID
3. Walk-in to the Helpdesk
4. Letter from Department

Service Call Category – IT Support

- User May get issues on Hardware & software related which is directly affecting the Core HMIS Services.

  These call categories can be divided into -
  1. Server
  2. Storage
  3. Network
  4. Database
  5. Infra
  6. Desktop
  7. Thin Client
  8. Keyboard
  9. Mouse
  10. Table & Chairs

Service Call Category – Application

- **Pre- Implementation –**
  - User Training at the time of Implementation for 3- months on respective HMIS Module.
  - E.G – Nurses will be trained or get training on Nurse Module from HMIS.

- **Post Implementation -**
  • Trained Handholding Staff in the department to ensure that user gets acquainted with the application without hampering Patient Care management.
  • 24x7 Helpdesk & Support Team to resolve the service request log by the Users

- All tickets submitted under different Severity have a stipulated time frame to resolve which is called as Resolution Time..

13. Privacy & Security Policy

☐ **System Security**
1. HMIS Application Security –
   Every User has been given a unique User Id and Password to access the HMIS application. When a new user joins or leaves the institute, the Hewlett Packard team is informed so that they can add or delete the userid from the database.
   The PC's are custom built for this project such that no other 3rd party application can be installed in the computers.
   There are no PC ROM drives and the USB drives are disabled.

2. Data Security –
   The Data centre has required security features which will prevent the loss of data. The data is consistently backed up on tape media.

3. Network Security –
   Firewalls with IDS are installed in the network.

4. Asset Security –
   The assets are deployed along with furniture which has got locking mechanism to avoid any thefts.

14. Innovation

HMIS Modules are fully Integrated
   Radiology Information System, Laboratory Information System, Electronic Medical Record, Inventory control and finance modules are accessed as one application
- **HMIS Modules are Patient centric**
   All Modules are configured, accessed based on patient flow
- **Integrated and standardized Workflow**
   Hospital workflow are customized to meet the tailor made requirements of Government Hospitals
- **Decision Support system**

Unified online reports on Patient information
- **Uniform access to HMIS modules**
    Internet Browser based user-interface
- **Asset management**
    Custom Made furniture with locking mechanism to safeguard the IT assets
- **A modified PPP model with Refresh option**
    - B-O-O-R model
    - Capital investments by HP (No upfront payment from GoM)

- Payments to HP on a monthly basis like EMI for 84 months from date of Go-Live.

15. e-Inclusion

- The trips are made by the governance team during the infrastructure rollout and after implementation on a regular basis.
- The application is developed in "English". It currently does not require to be be available in the local language.

- Currently no facility s available for the users who are Blind.

- Online services will be available once the government provides the internet line to the server room.

16. Sustainability

Technology :
1. Technology use – The Technology is an Open Source.
2. User privacy – Highly Protected by User ID and password.
3. Security of information shared –The information is available to the users based on their roles in the institution. So the information is accessible if they have their userID and password and is governed by Audit Trails.

Organization:
    The hiring and training of the support staff is carried out by Hewlett Packard.

Financial
    Scope for revenue generation :-

Transparency in Hospital Revenue by Online Process.
1. Increased By 30% in Hospital Registration
2. Significant Increase in transparency in billing

17. Number of users and services (Give details about frequency of services used in last 6 months, number of visitors, number of unique visitors, number of users etc. #)

Frequency of services used in last 6 months	:- 24x7 Availability.
Number of visitors	:- More than 8.5 Lakh
Number of unique visitors	:- More than 4.5 Lakh
Number of users	:- 1724
HMIS usage in Patient Registration	: - 100%
HMIS usage in Service Departments	: - 86%
HMIS usage in Patient Consultation	: - 98%
HMIS usage in Pharmacy	: - 85%

18. Result Achieved/Value Delivered to the beneficiary of the project-

(i) **To organization :-**
- Reduction of patient waiting Time for Registration
- System generated Queue numbers and schedules for Patients
- Transparency at all billing stations
- Accurate Patient data and clinical audit trial facility
- Online E-Prescription – speedy delivery and elimination of medical errors
- System accounting of pharmacy and other inventory for less pilferage
- Saving on X-ray and other imaging films and its processing
- Referrals of patients
- Online bed transfer
- Patient location finding
- Make patient data available in E- format and Access to patient data
- Availability of patient data across all State Run Government Teaching Hospitals

(ii) To citizen

- A Unique Patient ID
- No Loss Of Patient Data
- Speedy Access To Investigation Reports Online
- Immediate Access To Patient Old Records
- Below Poverty Line / Senior Citizen "Exempt" Process At One Counter
- Pharmacy Counter – Quick Disposal
- No Need For Prescriptions As Its Available Online.
- Accuracy Of Patient's Investigation Report.
- Saves Time For Bed Allocation.
- Simplified Patient Transfer System.
- Patient Data Integrity And Accuracy Maintained & Cannot Modified.

(iii) Other stakeholders

a. **Benefits To Doctors / Nurses & Administrative Staff**

- Availability of Electronic Medical Record (EMR) at any time, From anywhere.
- Availability of patients present & past history
- Proper medical audit through audit trail
- simplified process of Patient referral/second opinions.
- Dr. consultation from anywhere, anytime
- Simplified and transparent Cash collection process
- Automatic generation of All reports
- Computerized supervision system.
- seamless availability of patient data
- Availability of diagnostic images online in various dimensions during surgery.
- No paper documents as it is an automated process.
- Computerized Nursing documentation – Time saving activity.

b. **Benefit to Pharmacist –**
- Avoids error due to misinterpretation of Drugs
- Receives alerts on near Expiry stock & Low stock level
- On line Indent Request/Issue   for speedy delivery &
- Hassle free inventory management

c. **Benefits to Hospital Management and Health Ministry –**
- All MIS on a single click
- All Statistics on a single click
- Helps in taking quick decisions and action in case of emergency /shoot up of any communicable disease.

d. **Benefits to Service Departments – Interfacing of Lab Equipments (LIS) -**
- On line viewing of LAB & Radiology investigations
- Direct Result entry in Reports.
- PACs - No need to process films and for preservation of it.
- Any image can be view at any time for diagnostic/comparison purpose
- Images which are clinically critical can be used for academic purpose or for R&D purpose.

19. Extent to which the Objective of the Project is fulfilled:

- Covered in the above section

20. Adaptability Analysis

(i) Measures to ensure adaptability and scalability :-

The application is developed to support various features as below:

AWARDS SCHEME FOR EXEMPLARY IMPLEMENTATION OF e-GOVERNANCE INITIATIVES

1. Hospital Mobility Solution

The Computer On Wheel (CoW) is a computer system mounted on a medical trolley and connected to the server through wireless networks. In hospital wards, where the patient is stationary and the doctor is mobile, the CoW will enable HMIS to be used by doctors and other staff on their rounds of the wards.

2. Smart Cards and kiosks

This will decentralize patient registration and enable self-service. This will further bring down the patient's waiting time and non-clinical process time, in addition to providing ease of use and an improved user experience.

3 Biometric data integration with HMIS and payment gateway integration are some of the other plans on the anvil for further improving the system.

(ii) Measures to ensure replicability

- The development of the application and the technical architecture are bound by contractual agreements ensuring that the similar service can be replicated in other hospitals also

(iii) Restrictions, if any, in replication and or scalability

- Approval process has to be followed for the hospital beyond the scope of this project.

21. Comparative Analysis of earlier Vs new system with respect to the BPR, Change Management, Outcome/benefit, change in legal system, rules and regulations

- After the implementation of the HMIS project, significant improvement is seen in teh following areas of patient care management:
  - Patient Waiting Time has reduced
  - Misplace of case papers/Reports has reduced:
  - Decision on treatment plan dependent on the arrival of reports has fastened:
  - Medication error because of manual process has been eliminated
  - Mismatch of Patient Samples is eliminated
  - Administration and Record Keeping has improved
  - Huge Pilferage in Revenue is blocked

- Every institution as any other organization, is required to maintain certain number of mandatory

records like the number of patients visiting the hospital, details of IPD patients and certain dashboards/reports like number of investigation done etc to monitor the performance of the institution.
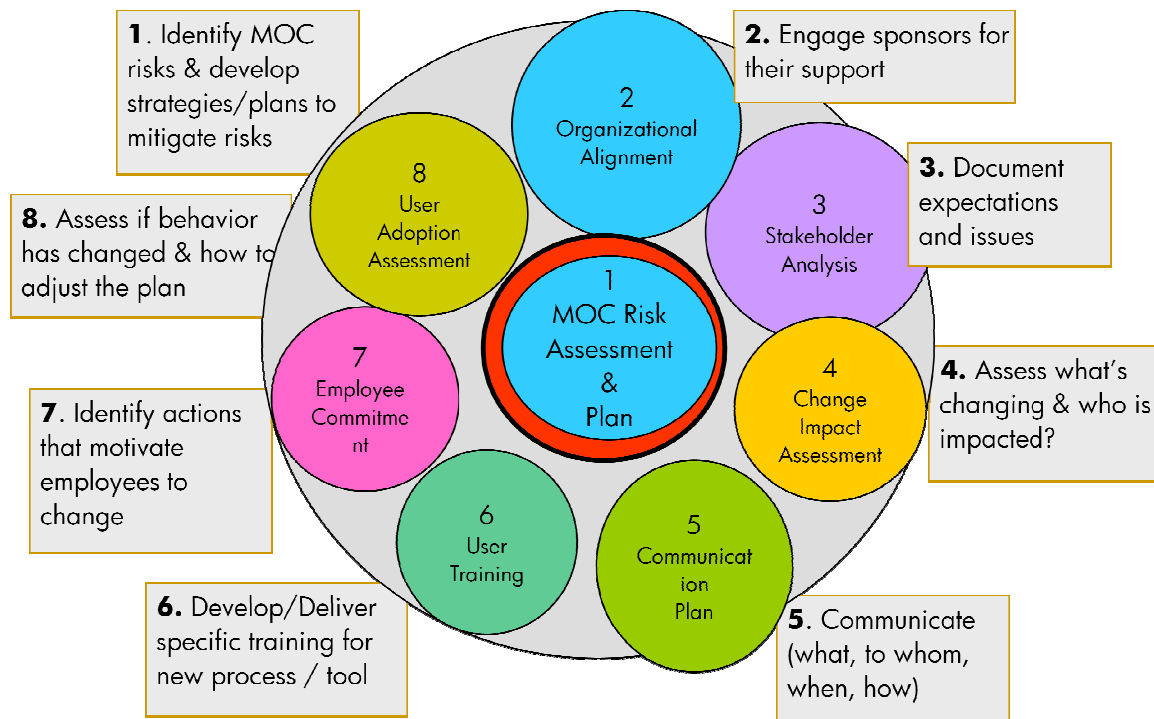
- Apart from these there are many Ad-hoc reports that are demanded by the ministry from these hospitals. All these data are being managed by a particular department named MRD (Medical Record Department) with one or two resources handling and managing the data.

- With the patient volume increasing over the years, managing these data and making reports is getting more and more tedious. Moreover these data are manually collated and is always subjected to errors.

This has caused major impact on:

- The way the Administration takes a decision
- Inventory management
- Revenue generation for the institution
- Accountability towards one's responsibility

- Implementation of ICT in the institution was to increase the transparency and inculcate more accountability into the staff for improving the patient care management.

AWARDS SCHEME FOR EXEMPLARY IMPLEMENTATION OF e-GOVERNANCE INITIATIVES

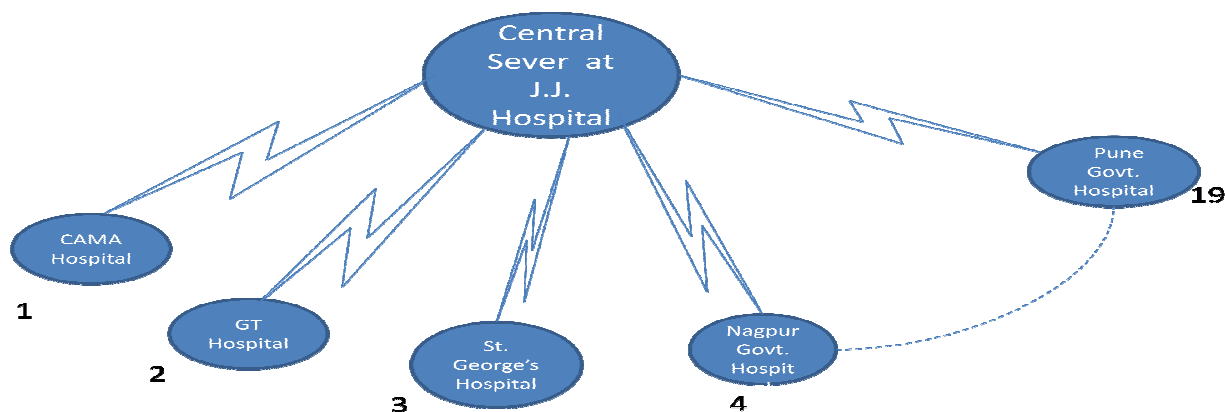## Management of Change:

1. Identify MOC risks & develop strategies/plans to mitigate risks

2. Engage sponsors for their support

3. Document expectations and issues

8. Assess if behavior has changed & how to adjust the plan

4. Assess what's changing & who is impacted?

7. Identify actions that motivate employees to change

5. Communicate (what, to whom, when, how)

6. Develop/Deliver specific training for new process / tool

8 User Adoption Assessment

2 Organizational Alignment

3 Stakeholder Analysis

1 MOC Risk Assessment & Plan

7 Employee Commitment

4 Change Impact Assessment

6 User Training

5 Communication Plan

22. Other distinctive features/ accomplishments of the project:

- Govt. of Maharashtra initiated a move to Computerized & Interconnect 19 Govt. Hospitals and 14 Govt. Medical Colleges.
- This project Called Hospital Management and Information System (HMIS), was flagged off by the state government's Medical Education and Drugs Department (MEDD) in 2007 to facilitate the Patient.
- There will be a Local Server in each of the Hospital which will be connected to the central Server at JJ Hospital

- HMIS application will be installed on the local server which will be accessed by the end user (clinicians/nurses, technicians etc) from the Linux based computer (desktop)
- Thus every clinician in the OPD has a system allocated to him on which he carries out the consultation of the patient. The medical store accesses the online drug orders and issues the same to the patient. The lab technicians take the sample of the patients by referring to the online investigation orders placed by the clinician and the bill payment made by the patient for these services. The reports are uploaded by the labs through interfaced system. The patient reports are viewed by the clinician and decides the course of treatment.
- Similar to the OPD, the HMIS application has flows designed for the treatment of IPD patients.

Achievements of the HMIS Project :-
- Unique Health ID issued to more than 4.5 lakh patients
  - Demographic details and photograph of every patient
  - Reduced time to commence treatment
- Waiting time at registration counter reduced by 88%
  - Reduced from 55 minutes to under 7 minutes
- More than 8.5 Lakhs patients registered from HMIS across hospitals since Aug 2013
- Increase in revenue at registration and billing counters
  - Registrations Revenue increased by about 82%
- Patient prescriptions and dispensing of medicines through HMIS is about 98 % (2 % of Patients go out of the queue)
  - Better transparency in inventory audits and accounting procedures
- Increase in number of patients registered is about 75%

AWARDS SCHEME FOR EXEMPLARY IMPLEMENTATION OF e-GOVERNANCE INITIATIVES

- • Computerized registration has helped curb number of unregistered patients
- HMIS handles over 90% of transactions
  - • Proves successful user acceptance of computerization in MEDD Hospitals
- Film-less Radiology Information System
  - • Potential savings on film, in addition to ease of use for the users