

# AWARDS SCHEME FOR EXEMPLARY IMPLEMENTATION OF e-GOVERNANCE INITIATIVES

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## NAME OF CATEGORY- 'INNOVATIVE USE OF MOBILE TECHNOLOGY IN e-GOVERNANCE'

### 1. Coverage – Geographical and Demographic

#### i. Comprehensiveness of reach of delivery centres

Mobile Application Based Quality Monitoring System designed, developed and implemented by C-DAC being used by National Quality Monitor at National level and State Quality Monitors of all the states at the State level for inspection of rural roads under the PMGSY scheme across the country.

#### ii. Number of delivery centres

The application is accessed through a web server hosted at a central location. The monitors download the schedule from the web server before proceeding to the site for inspection and would upload photographs through the mobile application (MABQMS) after the completion of the inspection.

The State Quality Monitors (SQMs) from all over the States are currently 932 empanelled for inspections in the respective States. The National Quality Monitors are empanelled from different parts of the Nation and currently 72 NQMs are empanelled for inspections.

#### iii. Geographical

a.	National level – Number of State covered	29
b.	State/UT level – Number of District covered	601
c.	District level – Number of Blocks covered	6422

Please give specific details:-

#### iv. Demographic spread (percentage of population covered)

1, 70,000 Habitations with Population of 1000+ each benefitted / covered by the connectivity provided through the PMGSY scheme

### 2. Situation Before the Initiative

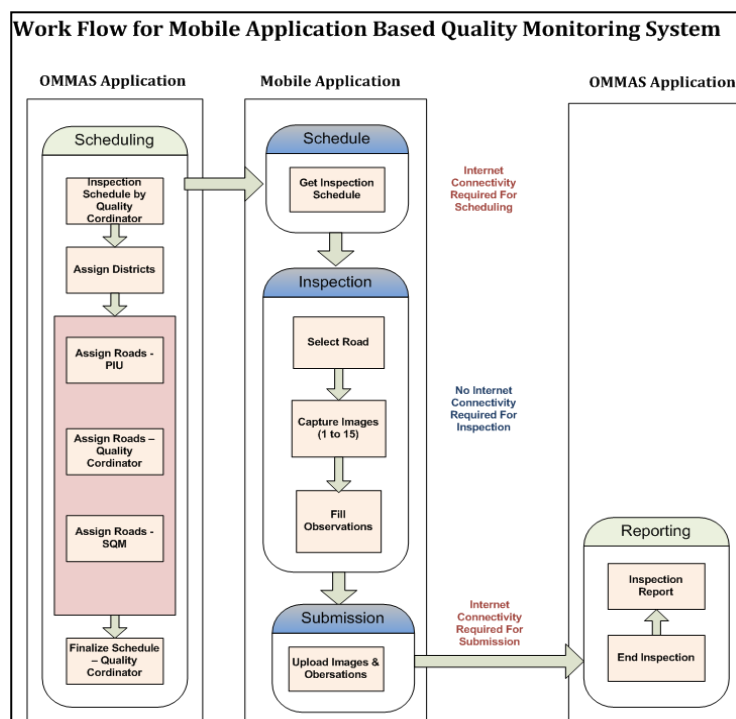
Independent Quality Monitors (IQMs) are required to carry out inspection of road works under PMGSY as per the guidelines and the observations are required to be abstracted in a format prescribed for this purpose. The IQMs are also required to take Photographs of the various components of the roads construction. The abstract of observations and Photographs are required to be uploaded to the appropriate module of OMMAS. It has been observed that there is a delay in uploading of abstract of observations and uploading of Photographs after the completion of inspection leading to delay in corrective action. Also it has been difficult to identify the accurate location of the road inspected as well the genuineness of the photos on web without physically visiting the location.

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### 3. Scope of Services

As per the PMGSY guidelines, every independent monitor (NQMs at National Level) and (SQMs at State Level) is required to grade the quality of every item and sub-item of road work and based on grading of various items and sub-items of work, overall quality Grading would be generated as per guidelines. The work generally conforming to specifications would be graded “Satisfactory” (S) and work which generally doesn’t conform to specifications would be graded “Unsatisfactory”, however, if a work needs some improvement to conform to specifications it would be graded as Satisfactory Requiring Improvement” (SRI). As per the PMGSY guidelines, it allows to take minimum 10 and maximum 20 photographs corresponding to specified description along with latitude, longitude and time stamp, so that it indicates the geographical position of roads inspected and time of inspection carried out.

The mobile application enables the monitors in providing the grading details along with geo-tagged photographs right from the site of inspection to the OMMAS portal; a customized mobile application has been developed. The inspection to be done through the mobile as per the existing multiple question formats and generation of reports through the OMMAS portal.



The solution is based on Smart phones on Android platform and is interfaced with OMMAS through web service to access the inspection schedule details and to upload the observation as well as photos from the mobile.

The IMEI number of the device is mapped with the User Id and the access is restricted at system level, both at OMMAS Application and Mobile Application and is made available only to registered devices. The quality monitor downloads the schedule comprising the details of the works to be inspected to his mobile after login. After visit to the

inspection site, monitor selects the roads to be inspected and capture photographs of the site against different parameters. Once the required number of photos is captured, grading observations are updated in the mobile application by providing the length of road inspected. After reaching to the site, the Quality Monitor should enable GPS in the mobile and will take pictures and upload the observations through his mobile handset.

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### 4. Strategy Adopted

#### i. The details of base line study done

Review of the data related to quality inspections by the National Quality Monitor and State Quality Monitors was carried out through the OMMAS portal and feedback received during the empowered committee meetings conducted by the Ministry or Rural Development and also from the regional review meetings, funding agencies.

#### ii. Problems identified

- a) Time required to complete the inspection and data updation on the OMMAS portal
- b) Multiple Interface points for the Quality Inspectors to upload information on the OMMAS portal leading to longer learning times
- c) Scheduling of inspections not as per the quality guidelines for PMGSY works
- d) Quality monitors not effectively utilized
- e) Place of inspection and photographs taken during the inspection are not verifiable

#### iii. Roll out/implementation model

To ensure smooth transition, in the first phase, 25 National Quality Monitors were provided training in the month of December, 2012 and the training to the rest of NQMs in February 2013. Region wise training was provided to the State Quality Monitors for all the SQMs.

#### iv. Communication and dissemination strategy and approach used

The application is provided to all the stakeholders through regional meetings and workshops arranged at regular intervals. The State Quality Coordinators and State IT Nodal Officers of the States are trained and involved and engaged for providing trainings to the Quality Monitors in the State. Trainings are arranged region wise and state wise where the monitors are trained in batches with in-house training and site visit.

### 5. Technology Platform used

#### i. Description

Mobile based Quality Monitoring System works on Android based mobile devices having storage enabled with GPRS, GPS and Camera.

#### ii. Interoperability

Mobile Application Based Quality Monitoring system supports Syntactic interoperability. MABQMS is capable of communicating and exchanging data, syntactic interoperability in specified data formats, communication protocols. XML standard are among the tools of syntactic interoperability and MABQMS communication is based on XML.

As per the e-Governance perspective, interoperability refers to the collaboration ability of cross-border services for citizens, businesses and public administrations, and MABQMS addresses all these requirements.

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### iii. **Security Concerns**

Mobile Application Based Quality Monitoring system works on android-based platforms which are exposed to various threats and are handled by the application. There are three prime threats-

- a. Data- MABQMS concerns about data management and data security of sensitive data via cryptographic encryption technology (AES128 – RIJNDAEL algorithm). As well as data transmission is also secure with secure socket layer implementation between server and client.
- b. Identity- Smart phones are highly customizable, so the device or its contents are associated with a specific person and MABQMS is based on Smartphone so it provides identity security. And MABQMS application binds the user with devices, so user cannot work on different device.
- c. Availability- MABQMS application access is restricted to concern person only.

### iv. **Any issue with the technology used**

Today appropriate technology is often developed using open source principles, which has led to open-source appropriate technology (OSAT). OSAT has been enabling innovation for sustainable development and MABQMS is based on Open source Android based mobile operating system. Android Operating system covers around 90% of market. As this vary with manufacturing of the device and android operating system is open source, so every device manufacturer customizes operating system according to their requirement. So testing and updation is required in MABQMS application in timely manner.

- v. Service level Agreement (SLAs) (Give details about presence of SLA, whether documented, whether referred etc. #)  
N.A.

## 6. **Citizen Centricity**

### i. **Impact on effort, time and cost incurred by user,**

The MABQMS application has automated the Quality Monitoring process. Once the schedule is finalized, the effort required by the monitor to download the inspection schedule and to submit the inspection gradings with photographs is minimum when compared to the earlier process. The monitor can download the schedule to his mobile at his convenience which requires network connectivity. Photographs of the inspection can be captured by the monitor using the application in offline mode where network connectivity is not required; only GPS is required. On submitting the inspection gradings, the application is enabled with a silent upload feature where the monitor is not required to interact with the application for uploading; application takes care of the image uploading when there is network connectivity. Application is also enabled with auto synchronization with the server for the application configuration details.

### ii. **Feedback / Grievance redressal mechanism**

Application is designed with a feature to submit the error log with comments via email. Emails are reviewed and addressed by the team regularly. Also help line is

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provided with the voice call feature which is attended by the team and required support is provided. Message broadcast feature is enabled to notify the enhancements / updates / instructions to the monitor when ever applicable.

### iii. **Audit Trails**

Logs are maintained on the server for every login by the monitor which includes the login id, mobile device IMEI number, application version with time stamp.

### iv. **Interactive platform for service delivery**

MABQMS works on Service Oriented Architecture; a hosted environment in which OMMAS expose the services using common Web technologies such as XML and SOAP. OMMAS environment provides a number of service delivery components covering aspects such as authentication, identity management and analytics, content adaptation and data format conversion.

### v. **Stakeholder consultation**

During the entire phases, all the Stake holders are involved. Based on the discussions and feedback received, the changes are incorporated.

## 7. **Demonstrate Innovation in use of Mobile Technology for e-governance**

Mobile based Quality Monitoring System working on Android based mobile devices enabled with GPS and Camera. The application enhances the efficiency of PMGSY Road quality monitoring process which includes Real time Geo-tagged capturing and uploading of images to central server.

The process is initiated by Quality Coordinator by creating a schedule for the quality monitors and assignment of road works to be initiated. After the finalization of schedule the PIU would be required to select at least 10 roads in each district for inspection by the Quality Monitor, within a week of schedule finalization. The State Quality Coordinator would be required to approve this list of roads including deletion or addition of roads if any. When the NQM would log in, this list of approved road by SQC would appear in his mobile. The NQM would be free to add roads of his choice to the schedule of inspection also.

The screenshot displays the 'Report -> State' interface of the MABQMS application. It includes a form for 'Observation Detail - NQM Inspection' with fields for Monitor (Gupta C.L.), State (Maharashtra), Package (MH235TH), Road Name (DDR-173 - Kaldari - Randhar), Start Chaiage (0 km), Inspection Date (08-08-2012), District (Pune), Sanction Year (2010-2011), Length (1.000 km), and End Chaiage (1 km). Below the form is a map showing the road location with a red pin. A pop-up window provides details: Description (A general view of the road), Insp. Date (8/8/2012 12:17:24 PM), Latitude (18.285299215803), and Longitude (74.022912215443). To the right of the map is a grid of 12 thumbnail images showing various views of the road, including 'View of Road With K.M. stone', 'Starting point of road', 'View of Road - 02', 'Cross Drainage - 1', 'Sign Board', 'Subvert', 'A general view of the road', 'Camber', 'Super Elevation', and 'View of completed Road'.

The Inspection Report submitted by the quality monitors using the mobile application is available to citizens and all the monitoring authorities. The national and state level authorities can verify the physical location of road and quality parameters of the road inspected by the quality monitor from the report which is embedded with Google map view. Report submitted by the monitors using the mobile application enables the authorities to identify the accurate location of the

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road inspected as well the genuineness of the photos on web without physically visiting the location.

The mobile application uses pull and push web service to receive and place the data on server, which works with SOAP (Simple Object Access Protocol) standards.

### 8. Adaptability and Scalability

The application is easily adaptable, with minor modification, based on the processes in place in the organization. The application can be used for different state and national level projects to monitor the progress with real time images and data. If organization has a basic requirement of data capturing with image and video, this application can be extended for accomplishing the required task.

In terms of hardware, the application works on any device which is develop by "Open Handset Alliance" member and follows the open standards for mobile devices, with minimum 256 MB RAM, Camera with minimum 2 Mega pixel, GPS (Global Positioning System) sensor and GPRS supported with 2G Internet connection to upload the data to the server.

The application works on open source operating system android, minimum version of 2.3.3. with software standard as per Open Handset Alliance (OHA).

### 9. Adaptability Analysis

#### i. Measures to ensure adaptability and scalability

The inspection items are as per the guidelines defined for the scheme which is easy to operate enabling the application to adapt. The application works on open source operating system android and is scalable.

#### ii. Measures to ensure replicability

The application architecture allows for customization of the grading procedure based on the requirement of various agencies and the work flow can be extended to any other scheme or programme where it is required to capture real time photographs to monitor the progress or execution of the scheme. This solution is already replicated for the inspection of works being executed by Rural Development Department, Government of Odisha.

#### iii. Restrictions, if any, in replication and or scalability

Application can be replicated in different departments and can be scalable across multiple domains. The application needs to be customized as per their guidelines and requirements.

#### iv. Risk Analysis

Mobile Application directly interacts with the OMMAS application and hence the users of this app need to be verified and controlled through appropriate access mechanisms.

### 10. New Models of Service Delivery

The existing web-based application (OMMAS) for road inspections binds the user to requirement of computer system and internet connectivity. But in this new mobile based

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application, the task can be accomplished with help of mobile. Inspection reports can be viewed on web interface which is available to general public as well as stakeholders for decision making.

### 11. Efficiency Enhancement

**i. Volume of transactions processed**

From the launch of the MABQMS application on 25<sup>th</sup> December 2012, approximately 60 thousand images uploaded through 4685 inspections

**ii. Coping with transaction volume growth**

The images uploaded are being archived at a centralized repository which will be segregated year wise to cater the volume as this data would be used only for reporting purpose.

**iii. Time taken to process transactions**

The time required to upload the inspection grading and min 15 images is ranging from 1 to 3 minutes depending on the network connectivity and the connection speed.

**iv. Accuracy of output**

As there is no manual intervention and no provision for human interaction while uploading the records, the records uploaded are 100% accurate. The geographical information captured with the photographs may vary by 10mtrs. The accuracy of the geographical information depends upon the GPS satellite signals. The accuracy of the data can be verified on Google map which is integrated with OMMAS.

**v. Number of delays in service delivery**

N.A.

### 12. User convenience

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

For the Mobile Application Based Quality Monitoring System, the service delivery channel is Web Server. The application connects to the Web Server to download the inspection schedule and to upload the inspection grading as well as photographs.

**ii. Completeness of information provided to the users**

Mobile based quality monitoring system is more user friendly as compare to web based system. Mobile notifies user each and every needful activity with proper text and audio messages.

**iii. Accessibility (Time Window),**

Mobile based application has very simple and easy to use interface which is operated by aged / retired quality monitors.

**iv. Distance required to travel to Access Points**

The operations to be performed by the monitors is available on the mobile application and can access the application right from his work place and no need to travel except to the site where the inspection is required to be performed.

**v. Facility for online/offline download and online submission of forms,**

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Application is Independent of mobile network and Internet connectivity. Quality Inspector is able to use the application in online and offline mode as per user convenience.

**vi. Status Tracking**

The schedule of inspection once finalized is informed to the monitor via system generated email containing the Schedule Intimation letter. The status of the inspection is tracking using the web application which intimates as "Initiated" once the schedule is created, "In-Progress" once the schedule is downloaded by the monitor on his mobile and "Completed" once the monitor submits his observations and uploads the photographs.

### 13. Sustainability

Mobile application works on open source mobile operating system 'android' and it binds particular user to device. Single user cannot use more than one device at a time, to ensure the user privacy and security of data. Application stores the mobile related logs on server, to track the user activity. APK file is digitally signed for installation.

No special trained staff required to use the application anybody with android device can operate the mobile based quality monitoring application.

### 14. Result Achieved/ Value Delivered to the beneficiary of the project

Quality monitoring system provides the efficiency in inspections of road works constructed under the PMGSY scheme in the following terms.

**i. To Organization**

- a) Data is uploaded onto central server in real-time.
- b) Geo-location information validates the time and place of the quality inspection.
- c) No manual errors for co-relating the pictures to inspection site.
- d) Enforcing guidelines and procedures related to quality inspections of PMGSY roads.
- e) Effective utilization of resources

**ii. To citizen**

- a) The overall progress of the inspection is available in public domain for social audit.
- b) The information related to quality of the roads is available to the citizen.
- c) The quality of the road has improved based on the quality processes adopted by the scheme

**iii. Other stakeholders**

- a) Automated process of data capture and inspection.
- b) Data is captured from the field.
- c) No end of the day work.
- d) No errors in copying paper based data to computer.



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### 15. Extent to which the Objective of the Project is fulfilled

The benefits achieved are

- a) Automated process of data capture and inspection
- b) Data is captured on the field
- c) Data is uploaded onto central server in real-time
- d) No end of the day work
- e) No errors in copying paper based data to computer
- f) Geo-location information further validates the time and place of the quality inspection
- g) No manual errors for co-relating the pictures to inspection site

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

SI No	Description	Earlier System	New System
1	Schedule information to the monitor	Through web portal	<ul style="list-style-type: none"> <li>- Schedule downloaded to mobile</li> <li>- Schedule intimation letter mailed automatically to monitor mail id</li> </ul>
2	Inspection and data updation	Through web portal. Time consuming leading to delay.	Through mobile right from the inspection site
3	Validation of Time and Place of Quality Inspection	Not possible	Geo-location and timestamp information of the photo
4	Co-relating the pictures to inspection site	Not possible	Inspection photos linked to Google map enabling viewing of location of inspection site
5	Inspection status	Once schedule finalized and till the inspections of all roads completed and uploaded, unable to track	As inspection grading uploaded right from site, inspection status of each road known

### 17. Other distinctive features / accomplishments of the project

- i. Access restricted at system level both at OMMAS Application and Mobile Application and is made available only to registered devices.
- ii. Mobile Application Version Updates through a seamless auto notification to the users
- iii. Messaging infrastructure which can target all / selected users of the application.
- iv. Photo compression on the mobile device independent of the resolution of the mobile camera without affecting the photo quality.

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- v. Provision to operate in training mode and live mode
- vi. Silent upload feature
- vii. Auto detection of network for synchronization with web portal.
- viii. Integrated with help line for easy access to avail support
- ix. Photo Backup facility
- x. Unplanned mode for on the spot inspections irrespective of the scheduled inspections