Chapter 8

NCAOR Project for Ministry of Earth Sciences *‡

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I) OVERVIEW

The sea which covers 70% of the planet earth has always been centre of action for various disciplines. The information on various facets, layers, depths of sea has been crucial for variety of agencies like shipping, oil and gas, telecommunication, fishing, defense. Tectonic movements in sea are monitored for natural calamities like Tsunami; upper and middle layers are studied to monitor life cycle and movement of marine life and safeguarding them against extinction.

- Mapping is required for different requirements by creation of marine geo-physical database for oceans in which different types of spatial data along with non-spatial parameters are visualized and overlaid on geo-referenced maps.
- Each stakeholder needs to access the information and it's representations based on their needs. The information can then be replicated in users' environment and can be further analyzed.
- Visual Representation is required for a range of data properties for multi-channel seismic reflection (MCS), seismic refraction, magnetic, gravity and bathymetric data with internationally accepted colour codes. This will help the scientific community in seismic analysis and exploration of natural resources.

Hence a system was desired which could facilitate the followings tasks:

- Migration of data from its various formats to the database;
- Customized GIS-based interface for easy retrieval of data based on various scientific inputs;
- Easy data input interface to insert new data from time to time;
- Queries based on different scientific inputs;
- Input of historical data for the purpose of comparing and analysis; and
- Web based input/output interface to facilitate the application to run on internet/ intranet with login authentication.

‡‡ * *Winner of CSI e-Gov Awards, 2009-2010*

NCAOR developed the National Marine Geo-scientific datacenter using state-of-the-art IT and geospatial technologies with the help of Information Technology industry major Tata Consultancy Services (TCS). This first-of-its-kind of implementation in the Indian Ocean region provides scientists and other stake holder's easy access of data in a secure environment.

II) RESULT INDICATORS

1. Key Performance

a. Stakeholder services and benefits achieved through ICT interventions

Key Stake Holder is the Ministry Of Earth Sciences. The National Marine Geo-scientific datacenter (NMGDC) set up at NCAOR hosts the solution. This solution built indigenously has helped the research, education and scientific community. This data is also crucial for various agencies like shipping, oil and gas exploration, telecommunication, fishing and defense. The dataset also provides invaluable background information for monitoring various geological and tectonic processes in the marine realm which have a bearing on the natural calamities like Tsunami and storm surges.

Performance Indicators Achieved by the System

- Access time for data has got reduced drastically. Previously to access a data it used to take hours which now can be done in few seconds thus saving precious time. Due to the inclusion of metadata in the application researchers now have a better idea about the data that they request.
- Visual Representation of range of data properties for MCS (Multi-Channel Seismic), OBS, Magnetic, Bathymetry and Gravity on Indian Ocean map with internationally accepted colour codes. This will help the scientific community in seismic analysis and exploration of natural resources.
- User can enter the spatial values as search parameters (Latitude, Longitude and select an area on map) to view the search result in the form of text or on a map. The search result data can be requested for further research.
- A customized GIS-based interface for easy retrieval of data based on various scientific inputs
- Acceptance/ Building of queries based on different scientific inputs.

- Interface has been provided to exchange of Spatial and non spatial data to different scientific communities for further research.

The implementation has been successful and has been appreciated by many senior scientists from various research institutes.

2. Efficiency improvement

Prior to the establishment of this center, scientist here had to go through lot of hardships for obtaining these data. Some of the common problems faced were:

The magnetic tapes on which the data were stored had started developing some major flaws, affecting their readability. The tapes were also facing moisture problems. Reading and downloading data from magnetic tapes was proving to be a time consuming process. With the inclusion of GIS interface the data can be directly accessed and plotted on these maps.

Project Delivery has showcased indigenous strengths in the scientific domain

The project has been successfully executed within the time and budget, exceeding client expectations. With this, NCAOR has an ultra modern state-of-the-art National Marine Geo-scientific datacenter thus showcasing exemplary skills in delivering systems within the time frames.

III) ENABLER INDICATORS

NCAOR is an autonomous body under Ministry of Earth Sciences, Government of India with a mission "To plan, promote, co-ordinate and execute the entire gamut of polar science and logistic activities of the country in order to ensure a perceptible and influential presence of India in Antarctica and to uphold our strategic interests in the global framework of nations in the southern continent and the surrounding oceans". The National Marine Geo-scientific datacenter set up at NCAOR was built indigenously to help Research, Education and Scientific community.

1. Processes

a. Major front end process changes and implemented

The Indian Continental Shelf Program being implemented by the National Centre for Antarctic and Ocean Research (NCAOR), Goa, on behalf of the Department of Ocean development (DOD) is a multi-institutional national endeavor that seeks to gather the requisite scientific and technical data to

define and substantiate the country's extended shelf claims. Underpinning the Center's efforts is a comprehensive work program comprising multi channel seismic reflection, refraction, gravity and magnetic data acquisition within and beyond the Indian EEZ.

NCAOR has spent over Rs.50 million in collecting the data. Considering the inherent difficulties in collecting marine geo scientific data, its intrinsic value and the costs involved, it was imperative that the data gathered was archived in a suitably structured database, facilitating its ease of retrieval and dissemination to the scientific community. Under the database created, users can search for the data availability online, and request for the relevant data.

The Home page and the searched metadata are shown in the below screenshots:

- The first screenshot is of the home page which gives the brief information regarding the whole application. It also explains in brief about the various types of data which is included in application. Step by step demo on using the application along with the registration process is also included in it. Feedback option is also included to get constructive ideas from users.
- The second screenshot displays the area and the lines whose data is available in the application. The GIS interface and tools help the users in searching requesting for the desired data.
- The third screenshot displays the metadata of one of the lines thus giving a brief idea about what the data contains.
- The forth screenshot is Raster visualization of magnetic data.

Comprehensive Swath Bathymetric Survey of entire Indian EEZ

The area of our Exclusive Economic Zone is over 2 million sq. km. abound with various living and non-living resources. This new program entails scientific mapping of this area to have an inventory of potential resources and to identify the causes of hazards. The study would help to develop innovative concepts on:

- Submarine fans and their role on accumulation of hydrocarbons
- Submarine canyons and their role in transport and distribution on pollutants.
- Islands- understanding of submarine landslides and stability of coastlines.

- Sedimentary processes- effect on fisheries and biogeochemical cycling.
- Sediment failure along slopes and their effects on communication cable links across the seafloor.
- Tectonics of margins.

The main output of the program will be the comprehensive bathymetric map of the exclusive economic zone of India. The entire data may not be commercial made available as it will be sensitive from the defense angle. However, possibility of making the data in parts, available commercially does exist. Specifically-

- For pipe line laying routes to petroleum and natural gas industry.
- For selecting suitable areas for waste disposal and dumping- for coastal industries, atomic energy stations etc.
- For offshore constructions- platforms etc. for ONGC or other similar organizations
- Cable routing for telecommunication industry.
- Fish habitat zones for fishing industry.
- Seafloor sediment characteristics for offshore mining industries.
- Finally, the expertise gained from the program (Intellectual property) can be made available commercially to other neighboring countries, island nations, etc. for mapping their EEZ for similar applications.

2. People and Resources

a. Project management & Monitoring – Full time team in place

A full time dedicated team of experienced professional (technical and disaster expert) has been working at NCAOR office from the TCS (Application developer) and NCAOR side.

b. Achievements of training of internal & external members on the new system

This section outlines NCAOR approach to providing timely training to ensure that all the end- users in Main Location have the knowledge and capabilities necessary to effectively use the new systems and processes. Training is conducted in the following form:

- End-user training
- System administration training
- Network and database administration training

The audience for the training will be NCAOR users in different divisions.

NCAOR Application and End-User Training:

The audience for this training programme will be the end-users of the system. Groups will be formed by selecting few users from each division depending upon the size of the division. This group will be imparted training on NMGDC application usage and after getting trained, these users will train other users in their respective divisions.

Application Administration Training:
The audience for this training will be NCAOR technical resources. They will be imparted training on overall administration of the NCAOR application. After getting trained, this group of technical resources from NCAOR will be able to perform the services defined in application administration tasks of the NCAOR application.

c. Change management strategy defined and implemented

Since managing portal like NMGDC is not one time job, one need to build this over a period of time and continuously look in to the aspects of improving the same. NCAOR is also in the same manner keep looking for new areas of improvement of NMGDC portal.

d. Leadership support (Political, Bureaucratic) and its visibility

To quote Shri Rasik Ravindra, Director, NCAOR:

"This data is acquired through strenuous efforts by various scientific communities all over India. It is crucial to treasure this and to create an interface for researchers. I am sure TCS with its huge expertise and specially coming back from an experience of Tsunami early warning system for Ministry of Earth Sciences is the right partner for doing this work."

Future addition of EEZ (Exclusive Economic Zone) and Antarctic data to the application will go a long way in broadening the scope of this data centre.

3. Technology

Technology plays a very important role in successful implementation of any projects like NMGDC and at the same NCAOR has chosen the best available technological tools and methodology to attain the same.

a. Disaster Recovery & business continuity plan defined & implemented

The process of disaster recovery, as the name suggests, is to restore normal functioning of business, partially or fully, following a disaster thus ensuring

continuity of business. The method adopted for recovery would depend upon the nature of the disaster itself, the resources available for this purpose, and their readiness-for-use for recovery.

NMGDC portal will be available to public 24x7 bases. So in order to maintain the same NCAOR is setting up a disaster site at INCOIS, Hyderabad premises. The application will be hosted at INCOIS will have proper Backup and Disaster recovery Plan.

b. Technological solution cost effective and maintenance over time

TCS has been chosen by the standard selection procedure of NCAOR to develop NMGDC application. The NMGDC application has been developed using J2EE technology and based on struts platform.

Routine Maintenance Work

The following Routine Maintenance Work will be done:

- Database Maintenance
- Clearance of Applications Logs
- Application Performance Tuning
- Operating System Tuning
- Security Monitoring

c. Security and confidentiality standards defined and implemented

NCAOR emphasizes on providing this knowledge to Research, Education and Scientific community. So it is a matter of great responsibility to check the authenticity and correctness of the Information contained in the portal. The information contained in NMGDC portal needs to proper in a way not to create any kind of legal dispute. At the same time to maintain the authenticity of the information available a complete security structure is designed and implemented in the NMGDC portal. Admin will not only take care of correctness of document or resource but at the same time check the authentic source also to avoid any kind of legal and copyright issues.

To maintain the security of the NMGDC portal from virus, malwares and other threats NCAOR has provided a very strong security structure by installing the most updated and strong antivirus system and firewall security. The available security system will be updated time to time and experts will check the system security to avoid hacking and other threats.

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