Electoral Data Analysis Using GIS

Elections 2014

Using GIS Applications
to Enhance the Electoral
Experience in

The general elections in India held during the months of April and May 2014 have been described as a landmark event not only in the country's continually evolving historical paradigm but also as a landmark event in the history of global democracy. According to the Election Commission of India, the nodal agency assigned by the country's constitution to take the entire nation to the polling station one orchestrated step at a time, 551.3 million voters exercised their franchise in the world's biggest voting event. 1.4 million electronic voting machines were pressed into action at 930,000 voting centers. The unprecedented scale of the exercise required 1.1 million government employees and 5.5 million civilian employees to manage the entire election process. In addition to the general elections, polls were also held for the first Legislative Assembly of Andhra Pradesh and the Telangana region in which a whopping 76% voter turnout was recorded.

To many, however, the manner in which the latest cutting edge and over-the-horizon technologies were deployed throughout the election, is one of the most impressive characteristics of the election process besides its outcomes. This case study presents an in-depth overview and analysis of how a GIS-based software application was developed, tested and successfully implemented to enhance the voter experience both for voters as well as for those officers who were tasked with the electoral responsibility throughout the state of Andhra Pradesh.

Executive Summary

Asman Software Solutions Pvt. Ltd., a leading Hyderabad-based web technologies and GIS solutions company, was awarded the innovative challenge by the Office of the Chief Electoral Officer, Andhra Pradesh, to develop an end-to-end solution that would enable all stakeholders to access critical data with respect to voter registration, polling stations and a complete range of related logistics using GIS. This case study demonstrates how Asman Software Solutions delivered the application from conception to completion. It further aims to highlight the various benefits of GIS and the vast potential it presents as an

The Challenge

The experience of participating in the electoral process regardless of its scope and magnitude can be both chaotic and frenzied. Difficulties often arise for many owing to a multitude of challenges such as:

⊚ Identifying the most sensitive areas from a polling perspective

⊚ Lower voter registration

⊚ Over-registration when compared to the population figures in the area

⊚ Mismatch in gender demographics when compared to the actual population ratio within the polling constituency

⊚ Identification of strategic locations for the polling stations

⊚ inability to identify correct polling stations by registered voters and physically locating the polling premises

The state election commission of Andhra Pradesh recognized these challenges early and the plausible solutions GIS technology could provide. The challenge could be best addressed by a system that was both visual and pictoral in look and feel while being able to update in real time. While architecting the solution, Asman Software Solutions harnessed state-of-the-art technologies, including GIS and beyond, to bring to the people of the state a system that was easy to use, reliable and immediately accessible.

OVERVIEW

Once a voter arrives on the home page of the official website of the Chief Electoral Officer, Andhra Pradesh, <http://ceoandhra.nic.in> several gateways to information become available. Important among them is the section called GIS Applications. Figure 1.1 shows how the applications can be accessed from the home page. Voters and field officers are presented with two choices:

Polling Station Locator for

This gateway provides voters with comprehensive voter registration information and data about their polling stations as we have explained below.
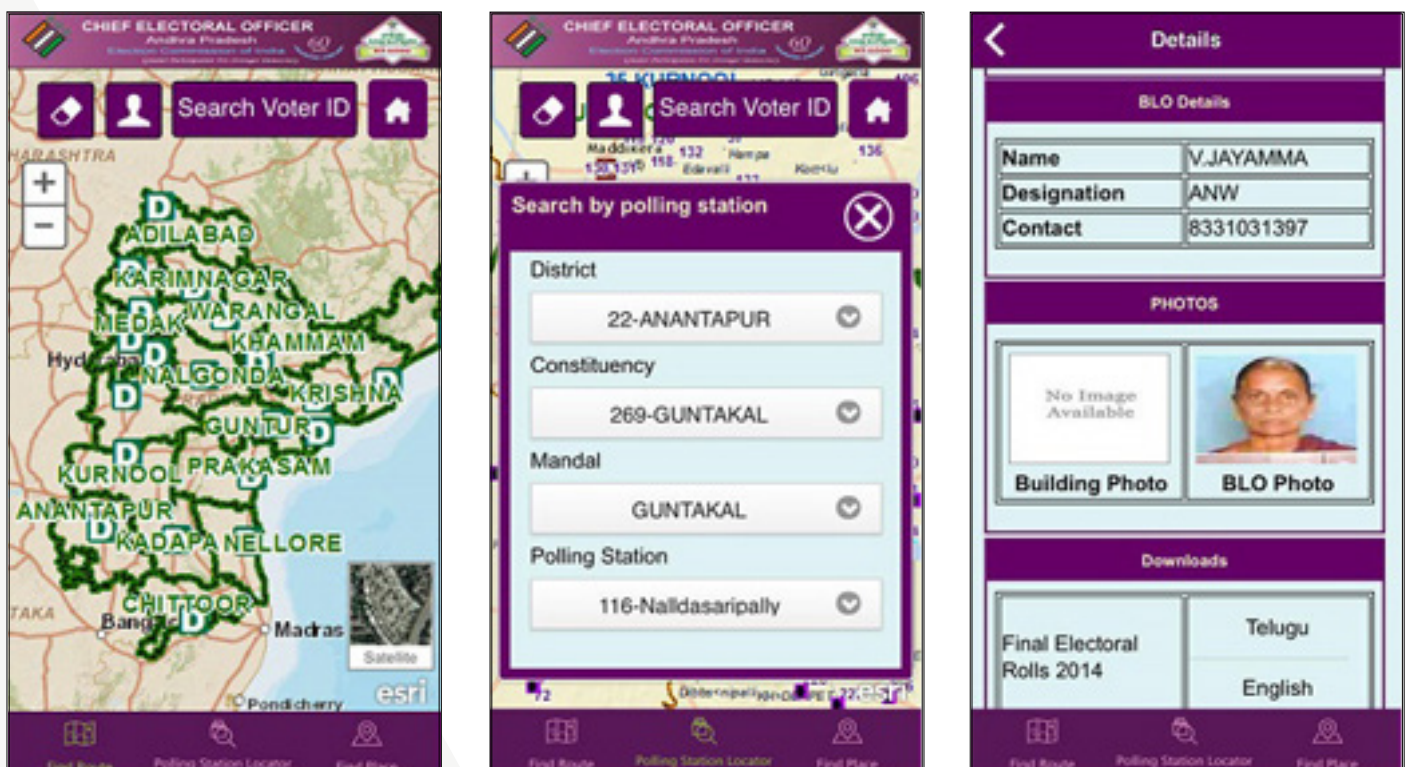
GIS Mapping Application for

Through spacial analysis, multiple databases and validated data elements, electoral officers are provided access to a full spectrum of information about critical constituents such as voter data, polling stations, personnel posted at each location, directions to polling station clusters and a host of other information available with only a few mouse clicks.

Mobile Ready Responsive Design

With more users accessing mission-critical information on their smartphones as opposed to those who do so using laptops and desktops, Asman Software Solutions believed that it was essential for the GIS applications to function intuitively on handheld devices. The entire system can be accessed on smartphones and tablet PCs through downloadable apps from the Google Play Store, Apple's iTunes Store and Windows Game Store for Windows smartphones. Figure 1.2 reflects the ergonomic design of the apps as well as their overall visual appeal

The Citizen Interface

Our comprehensive analysis of the GIS solution commences with a behind-the-scenes look at how voters in Andhra Pradesh were able to find answers to questions related to the electoral process as it reached out and touched them using a bilingual and intuitive digital interface. Once voters arrive on the Commission's home page and visit the Polling Station Locator for Citizen link featured under GIS applications, they are taken to a page with a series of active links which enables them to locate specific information:

Find my Location

If the laptop, desktop, smartphone or handheld device is Internet-enabled, voters are instantly briefed about their specific geographical locations in relation to the state's electoral map and the polling stations in the area.

Voter Registration

The link provides users with direct access to the registered voter's database which has the capability of displaying complete voter registration records by keying in the voter registration number. This enables voters to authenticate as well as validate their voter records and take corrective action if necessary. A number of services can be accessed from this page. They include:

Working and Delivering
Worldwide!

⊚ Search your Name

⊚ Enroll Now to Become a VOTER (Form-6)

⊚ Apply for Corrections (Form-8)

⊚   To Delete or Objections (Form-7)

⊚ Change your Address with in AC (Form-8A)

⊚ Know your Application Status

Locate your PS (Polling Station Locator)

By deploying proven GIS technologies, this function allows voters to obtain complete map-based information and the polling station's physical address including:

○ Constituency Details
     District Parliament Constituency
    Assembly Constituency

○ Polling Station Details
    Name
    Building
    Area

○ Booth Level Officer Details
    Name of the officer Building
    Designation
    Contact informationv

PS LOCATION

The Locate my PS button leads voters to a searchable database with dropdown combo boxes for district, constituency and polling station.   A section on photos provides pictoral representations and images associated with the information being provided. Pictoral representations include:

⊚   An image of the building in which the voter has been assigned to vote

⊚   The photo of the Booth Level Officer

Figure 1.3 provides an online view of the types of information the GIS solution can provide voters.

Benefits of the Citizen Interface

For the first time in the state's history, a GIS-enabled interface was developed and successfully implemented to refine the electoral experience for voters. The application provided multi-tiered benefits to the voters of Andhra Pradesh:

Easy access to information

With 69014 polling stations in all of Andhra Pradesh spread over   23 districts, the GIS provided instant access to polling logistics information for millions of voters through smartphones, tabs and other access devices.

Voter Transparency

Registered voters were able to claim their voter records and even correct any discrepancies by interacting directly with the Election Commission. They no longer needed to go through polling agents and other non-governmental support staff with possible vested interests.

Multilingual Interface

Since the system was able to provide information in both English and Telugu, the digital divide often caused by language considerations did not exist. Voters from remote villages used their smartphones to check their voter records in their vernacular and take timely action to update their records.

GIS MAPPING APPLICATION FOR OFFICERS

While the first part of the GIS application is voter centric, the second part focuses exclusively on the Herculean task of election management and monitoring. Through a web-based interface from the home page, election officers were able to access a highly sophisticated GIS Application that made it possible for them to perform a wide array of duties and responsibilities. The GIS application, in essence served as a backbone to aid election officers to manage their jurisdictions as well as coordinate operations. Features of the system include the following:

Officer's Viewer

Instead of delivering critical data in a traditional form such as text content, charts, tables and graphs, the system provides a map-based view of several key elements such as district boundaries, locations of polling booths within an assembly constituency as well as a parliamentary constituency , and other related data. A high level of functionality has been built into the Officers Viewer such as Base Map toggle, Map Pan, Zoom in, Zoom out, Layer toggle and Legend Display. All these features, both individually and collectively, helped officers to gain a 360 degree view of the entire electoral landscape in real time. Figure 1.4 features the widget deployed to achieve this function.

| Info Tool	Current Location	Find Address
The Info Tool places every polling booth in the state of Andhra Pradesh literally at the fingertips of election officers. From location data to logistics and from directions to relational proximity, the feature provides complete information about every polling station in the state regardless of how remotely it is located. The database also features information about the election personnel appointed by the State Election Commission to manage the polling station. Figure 1.5 provides a bird's eye view of a polling station as described above.	Asman Software Solutions repurposed proprietary map data to enable officers identify their location on an Internet-enabled device. It also served up on-demand data about the precise number of polling stations in the immediate vicinity. The feature also functions perfectly in reverse in that officers can virtually visit a polling booth simply by keying in its address.	By simply clicking or tapping any polling station on the map, this feature generates a complete address of the location which can also be stored for future use.

Thematic Maps

Known to be one of the most popular attributes of the GIS application deployed throughout the state, thematic maps build layers of precise information on a map called themes. Some of the themes implemented in this application include:
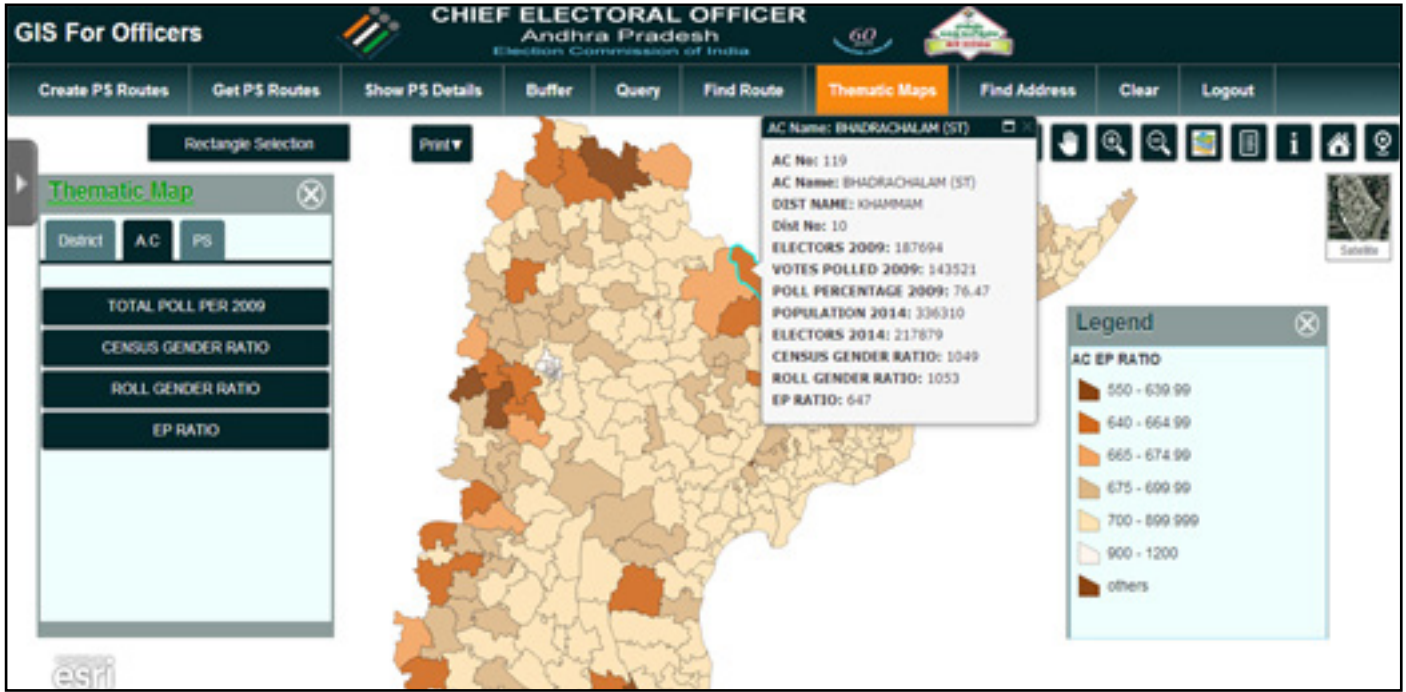
- ⊚ Total polling percentage per 2009 theme
- ⊚ Census gender ration theme
- ⊚ Electoral roll gender ratio theme
- ⊚ Electoral and population comparison theme

A dropdown combo box makes it possible for officers and other election stakeholders within the state's Election Commission to both gather and interpret relevant data about target areas with a few simple mouse clicks.

Query

Much like querying a database, this function lets officers query the system for information on a wide range of parameters. They include querries related to:

- ⊚ Poling station
- ⊚ Mandal
- ⊚ Parliamentary constituency
- ⊚ District
- ⊚ Assembly constituency

The search parameters can be based on factors such as population, poll percentage, census gender, ep ratio, votes polled etc. The query function has been designed to be self-serving and therefore query results can be added to the database for use by others much like what search engines do on the Internet.

Web Casting

Much like a live event broadcast on the Internet, this feature allows polling officers to view the live video feed of the entire voting process of a polling station by selecting the specific polling station they wish to watch and monitor. This feature especially empowers those senior polling officers who have been tasked with the responsibility to supervise several polling stations simultaneously.

Find Route

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Create PS Routes

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Buffer

Typically, a buffer in a GIS application is a zone around a map measured either in units of distance or time. Buffers are used to conduct proximity analysis. In this application buffers have been used to calculate the number of polling booths in a stated proximity or area.

Benefits of the Officer's Interface

The entire state of Andhra Pradesh witnessed a hi-tech form of e-governance in action during the 2014 elections due in part to the vast number of technologies harnessed at every level. The GIS interface for officers stands uniquely in the roll call owing to its innate ability to connect officers of the state with the people of the state. Several benefits have been derived from the interface for election officers:

Near instant decision-making

With millions of bytes of real time data at their fingertips, officers were able to take decisions swiftly and confidently. They had direct access to data which supported their decisions in every way, shape and form.

Ease of Coordination

The GIS application enabled hundreds of Booth Level Officers to coordinate with one another in the virtual space by sharing data and forwarding relevant information extracted from one or more of the various databases which drove the GIS initiative.

Significant Cost Savings

Although no estimates are readily available, the functionality of the GIS to help election personnel expertly manage election logistics has resulted in cost savings that will eventually prove to be

⊘ Monitoring

Using the webcasting feature with live video described above, polling officers can monitor the entire voting process and identify any discrepancies.

⊘ Deployment of Polling Personnel

The application facilitates the deployment of polling personnel such as polling officers, staff, security officers and others to manage the election process efficiently.

Conclusion

The dedicated GIS application developed by Asman Software Solutions for the office of the Chief Electoral Officer of Andhra Pradesh reflects the company's unqualified command and leadership position in the GIS space. The company set out to achieve a mandate-- to develop an intuitive system with a virtually invisible learning curve. The project's unprecedented success has been marked not only by early adoption but also through a sustained effort to take the electoral mission to a logical conclusion.

About GIS

ASMAN provides custom applications which are developed based on specific needs and requirements regardless of their complexity. We understand the requirements and provide a complete solutions suite to deliver the functionalities preferred. Our workflow consists of four modules i.e., specification and requirements analysis, design, coding, and deployment. We study every aspect of the problem from the grass-root levels to deliver the solution based on commercial or open source platforms. We create spatial information systems to accelerate client businesses forward and the broad range of services we offer are Map Customization, Custom Tool Development, Application Migration, Web GIS, Mobile and GIS etc.

ASMAN offers end-to-end customization and application development solutions on most of the common platforms for data conversion, application development, web application development, mobile applications, data mining and data migration.

About Asman

ASMAN Software Solutions Private Limited is a provider of cutting edge software consultancy, design and development services with headquarters in Hyderabad, India. The company made its inception into the IT arena in 2011 and offers a comprehensive range of Software and IT solutions on a wide range of Hardware and software platforms.
ASMAN takes pride in its delivery excellence, thought leadership and service quality. We leverage a unique combination of industry experience, content depth and domain expertise to deliver highly focused and best-of-breed Consulting and Technology solutions to clients.

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