

Title of Paper:

Implementing Enterprise GIS for an International Oil and Gas Company

Author's Name:

Sameer Bandhu

Vadim Zhivichin

Abstract:

In this age of globalization, our world has shrunk down into a complex amalgamation of different languages, cultures and varied business practices, requiring a universal business solution. Internationalizing a GIS implementation requires an understanding of the local culture, coupled with a tested and proven implementation methodology, and a componentized architecture built on technologies like XML, EJB and J2EE.

The current paper addresses the challenges and the problems encountered during the implementation of an Enterprise GIS solution for a major Oil and Gas corporation of Russia. It provides an insight into how standard United States business practices should be molded to bridge the culture and language barrier.

Paper Body:

I. Introduction:

The Russian Federation has been gradually opening to outside businesses. The Oil and Gas prices in the world market fluctuate very often. These facts, coupled with the recent trend of mergers and acquisitions amongst Oil and Gas exploration and production companies in Russia, has resulted in creation of truly international corporations with businesses in different parts of the world.

Managing land resources - leases or licenses, is becoming critical. Decision makers need to integrate land, exploration, production and financial information into a single interface. All these factors require a universal enterprise GIS approach.

The following sections of this paper address the implementation of an Enterprise solution for a large Russian Oil and Gas company. An explanation of the solution, some do's and don'ts and lessons learned during the enterprise implementation are addressed in detail.

II. Enterprise GIS:

Enterprise GIS is a multi-participant, multi-user, multi-disciplinary Geographic Information System that is based on shared and coherent spatial data creation, management, sharing and on-demand retrieval within an organization or between related organizations, bridging the gap between jurisdictional, departmental and physical entities.

An Enterprise-wide data repository hosts the geographic, business and tabular data within an organization and provides access to GIS users on demand. Enterprise-wide data repositories that utilize a commercial database management system traditionally provide faster access and better data management. The data repository feeds data to front-end applications that end-users utilize for their day to day operations.

An Enterprise GIS system is a multi-purpose, multi-participant, and mixed technology system. To reap the return on investment, an Enterprise GIS system must meet various purposes in an organization. The system should be able to provide geographic information to multiple users and multiple participants should be able to store and retrieve data from the enterprise system. Data stewards with administrative roles are typically assigned for a set of geographic data layers. A data steward, within a corporate setting, is responsible for the upkeep and maintenance of a pre-determined set of data layers thereby ensuring data integrity and quality.

Interoperability is an essential ingredient in the Enterprise GIS architecture. Various participants and users within an enterprise have varied software, hardware and platform requirements. Interoperability ensures that systems talk to each other and different software packages can read and write to and from the same Enterprise GIS system.

Data sharing between data creators, data consumers and data maintainers is achieved using the Enterprise GIS architecture. Huge economic benefits can be achieved by sharing data and information across departmental boundaries.

Enterprise GIS promotes data exchange between data creators and users in multiple standard formats recognized by the GIS and Engineering industries and used by various commercial off the shelf software vendors.

Universal, quick and efficient access to geographic data is one of the inherent features of an Enterprise GIS system. Enterprise users need to be

able to connect to and use the benefits of an Enterprise GIS quickly and efficiently from different locations within the company network.

Security provisions form a part of an Enterprise GIS system. The ability to create rules based on the business and workflow needs for a participant is a critical feature of an Enterprise GIS. Data stewards are provided with administrative rights for certain layers. Certain users are given view-only privileges while some users need read and write permissions.

III. Enterprise GIS in an International Setting:

Customer Profile:

Our client, a major oil and gas company headquartered in Moscow, is one of Russia's largest publicly traded corporations. Its approximately 100,000 employees work together to produce an average of 1.25 million barrels of oil every day and operate five refineries and more than 1,200 filling stations across Russia.

Business Situation:

For an enterprise as large as our client, informed decision making and effective planning depend on efficient access to critical data. Spatial and tabular land and license data were stored in many different formats and locations throughout the organization, requiring integration of disparate datasets. Moreover, the organization wanted to protect itself from any loss of valuable data. Looking for a more streamlined land management solution, our client contracted with Tobin to design and implement a Land Business System to integrate and manage their critical license, well, and mapping data.

Technical Solution:

Tobin consultants traveled to Moscow to conduct a detailed Needs Assessment on-site. After examining the company's business processes, data, software, and workflows, Tobin designed a complete solution combining Tobin applications with third-party software and expert implementation services. The finished Land Business System combined geographic information systems (GIS), relational database technology, and industry-specific tools to streamline the functions of spatial and business data integration, management, administration, visualization and decision support. Tobin's design also included a comprehensive infrastructure that provided for data security and recovery.

The applications that comprise the Land Business System fall into two functional groups: Decision Support and Data Entry. Decision Support applications include Tobin Land DataMart™, Tobin PowerViewer™, and Tobin WebViewer™. Data Entry applications include Tobin Contracts™, Tobin WellInfo™, Tobin LandGIS™, and Cimage e3 Document Management System. Tobin's Decision Support and Data Entry applications employ Oracle™ and ArcSDE™ relational database technologies.

PowerViewer™ is an easy to use, map-based retrieval, display and plotting application providing essential GIS functionality, data browsing, and integration of spatial and tabular data. Using Tobin PowerViewer™, managers, geologists, geophysicists, engineers, and other professionals are able to easily view and query both spatial and tabular license and well data together in a single application. PowerViewer™ is built using ESRI MapObjects.

WebViewer™ serves the power of GIS to every desktop. Web browser enabled and operating system independent, Tobin WebViewer™ is an intuitive visualization tool that enables the user to view and query spatial and related tabular data to facilitate better business decisions. WebViewer™ is based on ESRI ArcIMS™.

LandGIS™ is a powerful land geographic information system featuring land data creation and analysis tools. LandGIS™ allows users to easily create and analyze spatial data representing legal descriptions of land assets. LandGIS™ is an extension to ESRI's ArcView software.

Storing scanned land documents like deeds and plats in a Cimage e3 document management system ensured that important legal documents were always available to employees throughout the organization. Because Tobin applications link directly to the Cimage application and database, it's easy for users to quickly locate and view the documents associated with a given land asset.

Land Business System is a fully integrated solution, so changes and additions made to company asset data using Contracts™, WellInfo™, Cimage e3 and LandGIS™ will be immediately available to employees working in Land DataMart™, PowerViewer™ and WebViewer™.

IV. Software Architecture:

Tobin software is based on an extensible distributed architecture under the Tobin Insight framework. Tobin Insight is a system that efficiently and deploys maps as a primary entry point for access to information.

The architecture is efficient because it is tightly integrated to business databases and to Tobin's Geographic and Map Data. It is an Open Architecture system built on industry standards and best practices. It enables integration to current and future data sources and applications.

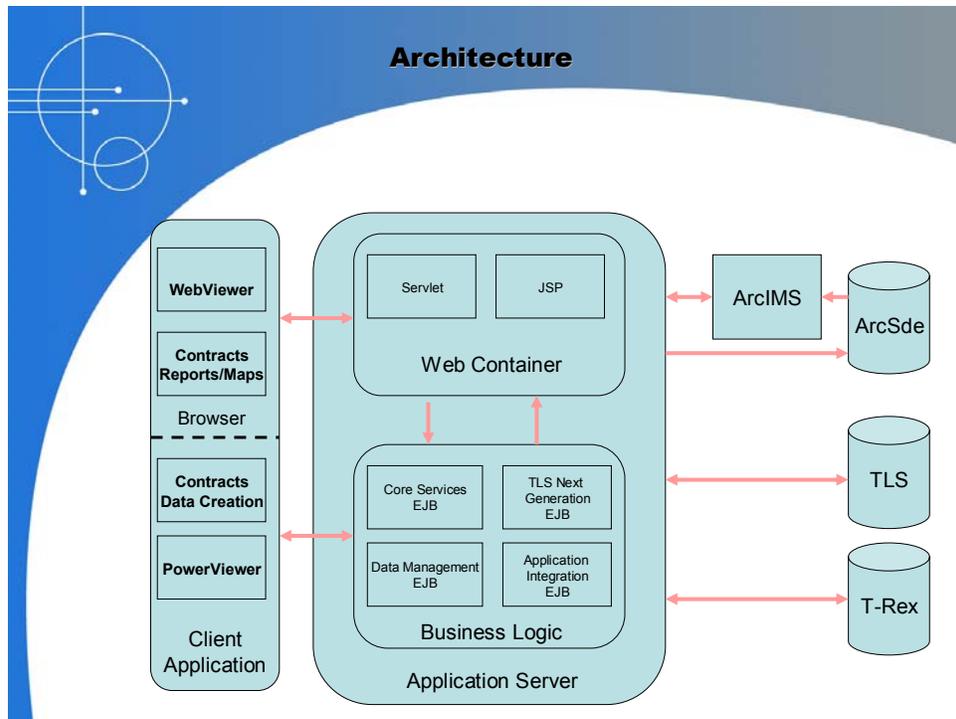
The architecture has three basic tiers - The Presentation Tier, Business Logic Tier and the Data Storage Tier. These technology components are designed to create a comprehensive geo-business information system. Each component contributes a distinct advantage to the overall system.

The Presentation Tier includes thin client and thick client applications used for data visualization, decision support as well as data creation. Tobin WebViewer™, Tobin PowerViewer™ and Tobin LandGIS™ contain presentation tier capabilities. Common business logic and data storage behavior across the suite of applications are developed to support reuse across the applications.

The Business Logic Tier is the location for business behavior that is common across multiple applications. Tobin develops the common behavior, called business components, using technologies that support integration of distributed software. These business components can then be integrated into the suite of Tobin applications. For example, many business processes require the analysis and integration of spatial and business data. Sometimes the data processing activities can take many minutes to complete the processing. One of the early reusable Tobin business components is the ability to asynchronously process data. The Tobin Job Processor framework provides a common API to customizable processes. The Job Processor is then integrated into the Tobin applications as appropriate.

Additionally, the Business Logic Tier contains core services like security, configuration, Queries, Areas of Interest, etc. Core services are shared by all software components. Data Management, Application integration, Geoprocessing, Imaging gateway also fall under the Business Logic Tier.

The Data Storage Tier hosts all business and spatial data, both raster and vector. ESRI's ArcSDE™ on a commercial off the shelf database reside in the Data Storage Tier.



The client applications in the Presentation Tier communicate with the Business Logic Tier. The Business Logic Tier, in turn, communicates with the Data Logic Tier. A call is made to specific modules and methods as the front end application loads and as the end-user performs specific workflow activities. The Data Logic Tier further communicates with the Data Storage Tier on a periodic basis to accumulate, process, and assimilate information that is passed back through to the Presentation Tier.

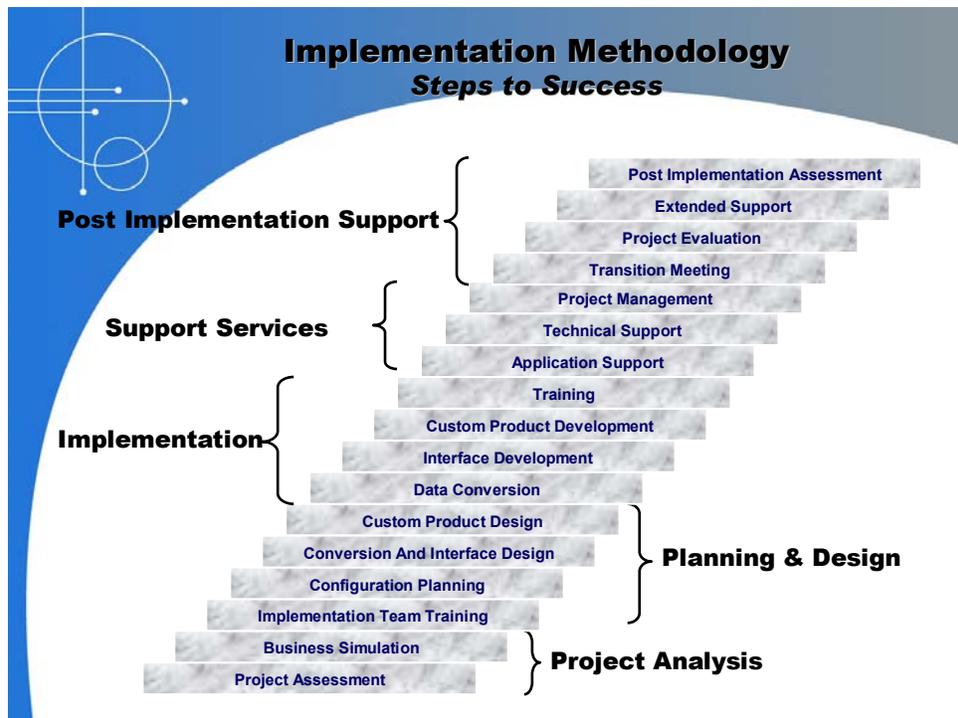
V. Implementation Methodology:

Tobin uses a tested and proven methodology for implementing software on time and on budget.

To mitigate the risk of project delays and/or cost overruns, we developed an implementation plan using a project methodology and approach that has been developed and refined over time to enable successful project completion. The Tobin project approach incorporates best practices from across the industry and is based on sound project management principles.

The implementation methodology is a phased approach. Each application module will have its own tasks associated within the methodology framework. The methodology consists of the following four phases:

- I. Project Analysis
 - a. Project Assessment
 - b. Business Simulation
- II. Planning and Design
 - a. Custom Product Design
 - b. Implementation Team Training
 - c. Business Process Review
 - d. Configuration Planning
 - e. Conversion and Interface Design
- III. Implementation
 - a. Data Conversion
 - b. Interface Development
 - c. End user Training
- IV. Post Implementation Support
 - a. Application Support
 - b. Technical Support



In the first half of 2002, Tobin completed the Project Analysis phase by providing the client with a Land Business System prototype. This prototype is the basis for the Land Business System Implementation.

With the agreement in place for this implementation, the project began with the Planning and Design Phase. During this phase, the client was involved in the business and system configuration planning process. Tobin and the client captured the business processes and configurations options specific to client business practices.

In the Implementation Phase, application configuration and data loading took place. Once all data had been loaded into the system, Tobin delivered the servers to the client for configuration into their network. Once configured, end users were trained on the applications.

Finally, in the Post Implementation support phase Tobin provided an onsite resource during the initial weeks of “go-live” to help answer questions and provide support for users.

VI. Implementation Challenges:

An international implementation needs to have a useable and homogeneous information system. The challenge is the homogenization of the implementation. To create a worthwhile system it is necessary to bring the international needs and the local structure (i.e. law, practices, customs, etc.) in sync with each other.

It is possible to fit these parts of the puzzle together by focusing on business needs, local cultural values and specific business practices in a realistic time frame for a successful on-time and on-budget implementation. For this purpose a method for international roll-out needs to be developed.

Language is one of the most important challenges encountered during an international implementation. A language interpreter who can understand technical requirements of the project and has good verbal and written communication skills is a requirement. When using interpreters there is information loss during translation. When a sentence is spoken to the interpreter, a percentage of the information is lost during the first interpretation. When the interpreter frames his/her own sentence to convey the spoken sentence to the listener, there is information loss depending on how strong the interpreter’s language skills are. The information is then transferred back to the listener thereby adding more information loss to the communication. When a response is sent back to the speaker information

is lost multiple times again. Having a translator who is industry savvy can be extremely beneficial.

GIS business practices and local customs, and traditions vary by geographical region in different parts of the world. A common challenge during an Enterprise GIS implementation is an understanding of the local ways and means of carrying out day to day business. Consultant bias, and pre-conceived notions with a lack of understanding can impair judgment and can prove almost deadly if not caught early during the planning phases of the project.

In a regular Enterprise GIS implementation setting it is desired that the consultant drive internal discussions among the client's team members so that the consultant can learn about the typical aspects of the client's unique environment and setting. These internal discussions are difficult to achieve when the ideology, thinking, culture and language of the consultant is different from that of the client.

Consultants who stay away from home can suffer from fatigue and culture shock .A long period of time working long hours in another country, can overwhelm employees and cause employee burnout. It is therefore very important that employees work in groups. A common apartment was rented for consultants to feel at home and give each other company.

A significant challenge for an international implementation is the enhancements to the software, and its ability to handle Cyrillic language, characters and work. Several enhancements were made to Tobin software for the Russian implementation. Creating a test environment with the exact same configuration was difficult because of the various interactions with other software that typically needs to be tested.

VII. Lessons Learned:

A number of lessons were learned as we went through different phases of the implementation. Some of the do's and don'ts are compiled in the following paragraphs of this section.

Learn the language

In order to ensure that communication between the consultant and company is open, it is highly recommended that the consultants are familiar with the local language. As a part of the current project, key staff took Russian language lessons before going to Moscow. Although it's difficult to master the language in a short time frame, it surely does help to

be able to get around, ask directions, or find the nearest bar while in Russia.

Making that extra effort to learn the client's language can make them feel better about the consultant. Russian people will recognize the effort, even if your pronunciation and grammar is completely incorrect.

Get teams going:

It is advisable to create a project implementation team and identify roles and responsibilities at kick-off. Creating a team spirit among the consultants as well as among the client helps smooth out many difficulties.

Management Commitment:

Getting the company management to agree and commit to a project ensures a positive flow of willingness down the chain of command. It is advisable to get a declaration approved by senior management and passed on to all the Head of the Departments impacted by the implementation. This ensures all stakeholders are informed and advised, and helps the interchange of project related information across the enterprise.

Flexibility:

Implementing an international project requires flexibility, patience and willingness to adapt. Cultural values and business practices are different from country to country. A consultant can very easily get carried away with perceptions based on previous experiences thus adversely affecting the project.

It is therefore advised that consultants practice extreme caution in expressing their views to the client. Adaptability to the client's environment, their business practices and their way of doing things is very important.

Information Recording:

This point can not be stressed enough. With translators and interpreters, languages, dialects and accents, it is very easy to misunderstand or misconstrue an important aspect of the project. It is therefore recommended that all verbal communication be scribed, documented, translated in the stakeholder's native language and passed back and forth and agreed upon. An internet based information portal can be created so that the project information and meeting minutes can be readily available.

Think Creative:

It is recommended that the consultant utilize creative ways and means to convey ideas and information and at the same make sure the clients ideas are received and recognized as well. The team found drawing pictures as a form of visual representation that greatly helped with the communication, especially during the planning and design phases of the project. Other creative ways of expression like charades can be helpful as well.

Provide Options:

Providing multiple options and letting the client choose the best based on their understanding of the local conditions can go a long way in creating a harmonious relationship for the implementation. The team advised the client with multiple options on ways and means of doing things, and then waited patiently for the client to make their choice. Approval for key decisions can sometimes take longer than expected, but it never hurts to provide options so the best alternative that suits the client is ultimately selected and implemented.

Don't forget your passport- Security is tight:

It is important to carry a passport or a Government issued ID when visiting with clients at major corporations. The security is tight as well and electronic data storage devices have to be pre-approved. So arriving an extra few minutes before a critical meeting is advisable.

Mingle with the crowd:

Morning and afternoon breaks are for *chai*, or tea in English. This time is perfect to mingle with the Russians, share pictures of your family, talk about last night's escapades, and experiment with your newly learned Russian or share a new idea about the project. A box of cookies from the kiosk on the way from the Metro station is always appreciated. Russian people are extremely friendly.

VIII: Why did we succeed? :

A software implementation is successful when end users benefit from the software and services, and when it helps end-users do their job in a better or more efficient way thereby reducing time and cost. A successful implementation improves existing workflows, enhances information flow and reduces bottlenecks.

The current implementation has been extremely successful. It has created new ways and means for the client to carry out their business. It has

provided the client with a solution that is based on cutting edge technology and sound principles of data management and Geographic Information Science.

There were a number of factors that made this enterprise GIS implement unique and successful. Some of these critical factors are enumerated below.

The Client:

Our client was one of the most critical success factors. From the very beginning of the project, there was excellent communication between the client's management and the Tobin implementation team. Periodic meetings were held so both the teams could understand each other's perspective. This was in spite of the fact that the client was extremely short handed as far as resources were concerned. All the stake holders, and additional vendors and partners involved during the implementation were quickly able to get on the same page and work towards the successful implementation of the project.

The Software:

Tobin WebViewer™- an internet based GIS tool, Tobin PowerViewer™- thick client visualization and decision support and Tobin LandGIS™ – a data creation and editing power house coupled with other land management tools provided a perfect fit for the clients license management issue resolution.

Tobin software integrates GIS maps with commercial business databases and provides an easy tab interface to see corresponding information from these databases. Tobin software has built in capability to interface with industry standard document management systems as well.

The integration of data, mapping technologies, with business applications and document management systems provided the client with a unique solution that no other vendor could.

Tobin's support for the Cyrillic character set and accommodation of the Russian workflows heavily contributed to the client's acceptance of the system.

Global Planner Data:

Tobin Global Planner is a unique integration of seamless, scanned and georeferenced 1:500,000 scale Russian topographic maps, USGS 2000 World Petroleum Survey and 1:1,000,000 Digital Chart of the World data covering the populated land areas of the world. The topographic layer allows you to see the extents of metro areas, mountain ranges, rivers and lakes, etc., in addition to the information already available with the Digital Chart of the World data.

Tobin Global Planner let the client visualize their assets over a backdrop of rich information. The client was also able to get information on assets located outside the boundaries of Russia as well.

International Implementation Team:

Tobin's implementation team consisted of GIS Consultants, IT administrators, Database Administrators and Document Management System experts along with functional land management experts with experience in dealing with complex land management issues. The team was composed of employees from the Tobin Moscow office as well as the US offices.

The team dynamics from the inception of the project through its completion were excellent. The Tobin Moscow employees were flown to the United States for training and team building before the project began. With their knowledge of US land management systems and their understanding of the local culture and language, Tobin's Moscow staff played a key role in making the implementation a success.

The team initially engaged interpreters to help communicate with the client, but towards the end the comfort level and team dynamics rose to such a level that interpreters were not required. The Moscow office staff was entrusted with accumulating and passing information back and forth.

Our Moscow Presence:

Tobin's Moscow office was instrumental in handling all the logistics and contractual obligations for the project. The Moscow office was also a home away from home for the consultants who traveled from the United States to Russia to implement the project. Tobin Moscow staff with their typical Russian hospitality made US consultants feel welcome in a foreign land.

A number of status and informational meetings were held at the centrally located Tobin Moscow office, making it an important success factor in the implementation.

Project Planning and Monitoring:

As discussed in sections above, experience implementing domestic projects on-time and on-budget can be helpful in planning for large international projects. Extensive planning and numerous iterations of the project planning process preceded an approved plan. Benchmarks with specific time frames and deadline were introduced in the project plan to ensure accountability and participation.

During the implementation, when unforeseen circumstances were noticed, the project plan was tweaked. Weekly conference calls were set up for project monitoring and the project leader was assigned the responsibility of following up on critical issues.

Project Champion:

It is important to plan and prepare, but it's a great advantage to have a project champion who can steer the project, get approvals and get the ball rolling on the client side.

A product champion was identified earlier on in the project, thereby making the implementation of this project very fast, efficient and successful. The project champion identified and escalated issues of importance from time to time, and speeded up the implementation.

IX. Conclusion:

Good software products, carefully planned execution, a well thought-out strategy and hard working consultants are the major ingredients of a successful enterprise implementation. Cultural and language barriers can be bridged with perseverance and technology. With the rate of growth in Oil and Gas exploration in Russia, and other areas of the world, United States GIS companies might need to implement internationally. We hope the experiences of Tobin with the current implementation will help the GIS community do better business internationally.

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Author Information:

Sameer Bandhu works as a GIS Solutions Architect with Tobin International, Ltd. His work involves designing and implementing GIS solutions worldwide. Sameer's prior work experience includes Oracle Corporation and Petris Technology. His most recent publication was a NOAA Technical Memorandum entitled "Great Lakes and St. Lawrence River Medium Resolution Vector Shoreline Data."

Vadim Zhivichin works as a General Director of Tobin International, Inc. Moscow branch office, Russia. The Moscow office provides implementation of Tobin Concession Information Management Systems for Russian Oil and Gas companies as well as international mapping services.

Contact Information:

Sameer Bandhu
Tobin International, Ltd.
9800 Richmond Ave., STE 750
Houston, TX 77242
Phone: 713-334-2242
Toll Free: 800-662-9144
Email: Sameer.Bandhu@Tobin.com
Web: <http://www.tobin.com>

Vadim Zhivichin
Tobin International, Inc.
M. Znamansky per., 10, building 2
Moscow, Russia
Phone: (7-095) 203-77-33
Email: Vadim.Zhivichin@Tobin.com
Web: <http://www.tobin.ru>